# Wild West Frisia : the role of domestic and wild resource exploitation in Bronze Age subsistence

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# 7. Wild plant gathering

## 7.1 INTRODUCTION

In this chapter, the final subsistence strategy that is a part of small-scale subsistence farming is researched: wild plant gathering. This strategy is not often considered as an important part of farming life, and its contribution to subsistence in the Bronze Age is investigated in order to confirm or contradict this image. The role and praxis of wild plant gathering is assessed by re-evaluating old and new available data, similar to the previous data analysis chapters 4, 5 and 6. The old data used also included unpublished work, mainly by Buurman. Her elaborate work on wild plants from sites such as Bovenkarspel is published here for the first time. Similar to previous chapters, the current view towards wild plant gathering and its main components are listed first, after which they are challenged with the new results of the analysis made in this chapter. It is important to note that consumption is the main reason for discussing the collection of wild plants in this chapter. Other reasons for gathering these plants (which can be manifold and equally important to subsistence) are discussed in section 7.4.6.4. Also, throughout this chapter, the term fruit is applied to stone fruits (such as sloe plum) and pome fruits (such as apple), whereas the term berry refers to true berries (such as bilberry) as well as aggregate berries (such as blackberry).

### 7.1.1 Previous research

Wild plant gathering has been appointed a similar unimportant role as hunting for the Bronze Age (cf. Chapter 4). Bronze Age farmers are even collectively summarized as starting to live with their back towards nature (1) (Louwe Kooijmans 1993, 80; Brinkkemper 2013: 171, 186). Bio-resources in general seemed to have played a very restricted role during this time (2) (Louwe Kooijmans 1993, 104), a theory which is mostly based on the general scarcity of wild plant remains in the Bronze Age archaeobotanical record. These wild plant species, which do not possess edible parts such as nuts, fruits, or berries, are often characterized as weeds instead (3). In some areas, such as in West Frisia, a wide array of wild plant species was uncovered, both in charred and uncharred form (*e.g*. Buurman 1996, 107-56). Also in the West Frisian list of wild plant species, not many obviously collected plants, such as nuts and berries are found, which seems to be a trend in the Bronze Age in general (Brinkkemper 2013). The near-absence of remains of seeds, fruits, and nuts has led to the conclusion that edible wild plants were practically abandoned during the Bronze Age (4) (Brinkkemper 2013, 186), which would be related to a lack of interest in these sources of food or ideological restrictions (Brinkkemper 2013, 184). Based on the few remains of berries, fruits, and nuts found at Bronze Age settlements, it is concluded that these plants were only scarcely collected during autumn (5).

The clear absence of evidence for wild plant collecting has been related to the growing importance of crop and animal husbandry in the Bronze Age in the western Netherlands. In comparison to the Late Neolithic, Bronze Age farmers in the western Netherlands, and by extent West Frisia, are thought not to have needed or wanted wild plants for their subsistence, since communities are viewed as having been able to sustain themselves by fully relying on their own production system (Louwe Kooijmans 1993, 100): because people were farmers, they had no apparent need for the addition of wild plants to their subsistence, since they could produce their own crops. By placing all their confidence in this traditional agricultural production (6) (Louwe Kooijmans 1993, 104), Bronze Age farmers were able to maintain their subsistence without the need for wild resources.

It is unclear what this need for wild resources would include, but they may have been part of the diet and/or have been a source of raw material for people. Therefore, according to the current view on the use of wild resources, both types of use were not necessary on the farm. Thus, the current view towards the collection

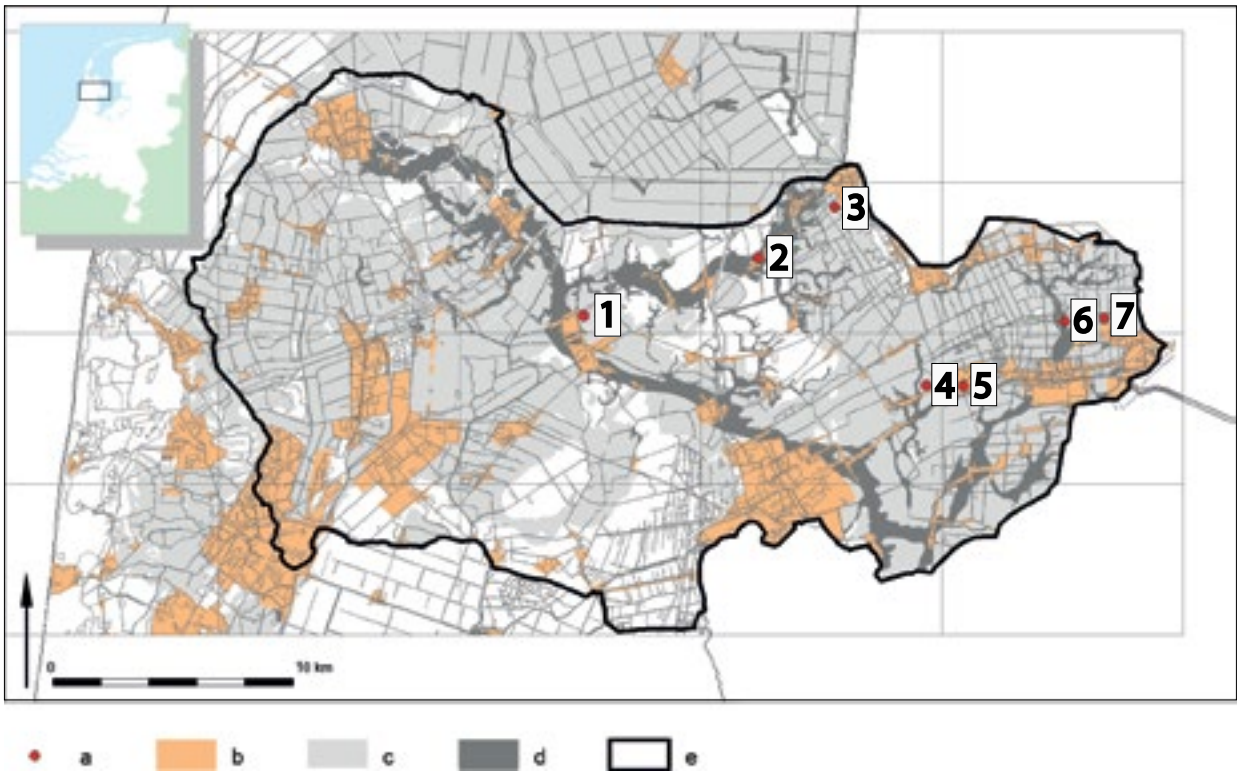


Figure 7.1. Overview of the researched sites of West Frisia that yielded wild plant remains. 1: Hoogwoud Opmeer; 2: Twisk; 3: Medemblik Schepenwijk II; 4: Westwoud; 5: Hoogkarspel Tolhuis and Hoogkarspel Watertoren; 6: Bovenkarspel Het Valkje; 7: Enkhuizen Kadijken; a: location of an excavated site; b: present-day urban areas; c: tidal marsh deposits; d: creek deposits; e: outline of present-day West Frisia.

of wild plants implies that this practice is not required because of the availability of cultivated crops, and that it is not practiced, except for occasionally picking berries or gathering nuts in autumn.

### 7.1.2 The proxies and the sites

In this chapter, the used proxies for the re-evaluation and re-analysis of data from both the old as well as the more recent excavations include ethnography, ethnobotany, ecology, and archaeology (section 7.2). Information from these different proxies has been gathered and combined for the creation of an expectation of the practice of wild plant gathering in a small-scale mixed farming community (section 7.3). The analysis of the data and a comparison with the expectation was used to re-evaluate the current view on wild plant gathering within a farming community (section 7.4).

The information on the sites which yielded wild plant remains are shown in Figure 7.1 and Table 7.1, including location, name, date, dating method, and sieving mesh size.

Throughout the text, site names are addressed by their first name only, unless further specification is necessary to avoid confusion between different sites from the same location.

### 7.1.3 Main current model components

The current view of wild plant gathering consists of the following main components, which are challenged in this chapter:

(1) People started to live with their backs towards nature in the Bronze Age.
(2) Bio-resources play a very restricted role in Bronze Age subsistence.

(3) Wild plant remains which are not considered to have been collected, such as nuts, fruits, or berries, belong to plants which can be described as weeds.
(4) Collection of edible wild plants is almost abandoned during the Bronze Age, evidenced by the near-absence of remains of nuts, fruits, and berries.
(5) The few finds of berries and nuts indicate only occasional collection of wild plants during autumn.
(6) All confidence was placed in agricultural production in the Bronze Age, eliminating the need for the collection of wild plants.

## 7.2 METHODS

The investigation into the role and organisation of wild plant gathering in Bronze Age West Frisia, as well as the evaluation of the current view towards this practice, is done by using the same main approach as that used in the previous three chapters. First, the basic activities related to wild plant gathering (Table 7.2) are used as a starting point for the creation of an expectation of crop husbandry practices (section 7.3), as well as for the analysis of the West Frisian data (section 7.4). The main proxies with which both the expectation is created and the analyses are performed are briefly discussed below. The application of multiple proxies enables the recognition of the activities related to wild plant gathering, but most of all shows the importance of this practice for farming life. After the separate components of the expectation and the data analyses have been compared and discussed, the effects of taphonomy and methodological archaeological practice are evaluated. The impact of these effects on the interpretation of the missing components of wild plant gathering that have become apparent during the creation of the expectation of practice or during comparison with the data are discussed in section 7.4.6. Through this discussion, it has become clear that some vital aspects of wild plant gathering may in fact be nearly invisible to archaeology when only one discipline is used for analysis.

Finally, the new results are re-combined and re-integrated to form a new model for wild plant gathering in small-scale mixed farming subsistence (section 7.5).

Table 7.1. Information on the sites of West Frisia used for the analysis of wild plant gathering.

| Site location | Toponym | Excavated | Date | Dating method | Sieving mesh size | Reference(s) |
|---|---|---|---|---|---|---|
| Bovenkarspel | Het Valkje | 1974-1978 | 1500-800 cal BC | 14C-dating and pottery typology | 0.25-1.0 mm | Buurman 1996, 83-104 |
| Enkhuizen | Kadijken | 2007-2009 | 1500-800 cal BC | 14C-dating and pottery typology | 0.25-1.0 mm | Moolhuizen & Bos 2011, 259-69 |
| Hoogkarspel | Watertoren | 1973-1978 | 1500-800 cal BC | 14C-dating | 0.25-1.0 mm | Pals 1977, 189-225 |
| Hoogwoud | Opmeer | 2004 | 1300-1100 BC | pottery typology | 0.25-1.0 mm | van Haaster 2005, 50-4 |
| Medemblik | Schepenwijk II | 2007 | 1450-800 cal BC | 14C-dating and pottery typology | 0.25-1.0 mm | Kooistra 2010, 125-42 |
| Twisk | | 1980 | 1300-1100 BC | 14C-dating | 0.25-1.0 mm | Buurman 1996, 37-68 |
| Westwoud | 1988 | 1988 | 1400-800 cal BC | AMS-dating | 0.25-1.0 mm | Buurman 1996, 107-56 |

Table 7.2. Basic activities related to wild plant gathering.

| |
|---|
| **Preparation** |
| locating worthy gathering spots |
| **Gathering** |
| collecting wanted plants/plant parts |
| **Processing** |
| short-term (direct use) |
| long-term (preservation for later use) |
| **Optional** |
| storage |

Similar to the previous Chapters 4, 5, and 6, the multiple activities related to wild plant gathering were analysed individually (Table 7.2) to first create an understanding of each separate basic activity, before finally viewing gathering practices in their entirety.

### 7.2.1 Ethnography

The ethnographical work by Murdock (1981) was studied to create a general idea of the importance of wild plants for the subsistence of mixed farmers. Similar to the previous three chapters, a selection was made on the available culture groups studied by Murdock, so that only cultures remained that most closely resemble the Dutch Bronze Age situation. Again, the selection criteria were: more than 50% of the food economy needed to consist of crop and animal husbandry (*i.e.* full-time farmers); the type of agriculture needed to be intensive agriculture on permanent fields with short fallow; crops needed to consist of cereals; settlement size needed to be relatively small, consisting of homesteads, hamlets, or compact settlements; animal husbandry should be focused on bovine animals. N.B.: The work of Murdock only reviews the food economy part of subsistence.

### 7.2.2 Ethnobotany

Several ethnobotanical studies were consulted to investigate the range of wild plant species used by European (farming) communities, irrespective of geographical location or climate (Ertuğ 2000; 2004; Łuczaj 2010, 2012; Kalle & Sõukand 2012). Furthermore, an online ethnobotanical database (PFAF 2016) was consulted to evaluate the edibility of the West Frisian wild plants, as well as the part of the plant used for consumption. It is assumed that gathering and consumption of wild plants remained the same throughout the Bronze Age.

### 7.2.3 Ecology

The ecological groups to which the found plant species belong were based on the work of Tamis *et al.* 2004. These groups were applied to the species in order to identify if plant species could have grown strictly locally or whether it was morev likely that the assemblage was the result of intentional gathering from the further surroundings.

### 7.2.4 Archaeology

Some archaeological indications for prehistoric wild plant collecting and consumption were listed by Behre (2008). This information is mainly based on the presence of wild plant seeds in the stomach of bog bodies and also as pure concentrations uncovered on excavated settlement sites.

## 7.3 CREATING AN EXPECTATION OF WILD PLANT GATHERING

Wild plant gathering is an integral part of hunter-gatherer communities. As presented in the introduction it is often thought that farmers would not have needed wild plant foods. In order to evaluate whether this is true, the role of wild plant gathering in small-scale mixed subsistence farming communities was investigated. This was researched by employing the work of Murdock (1981), similar to the previous chapters. A summary of the selected cultures from this work resulted in an average contribution of wild plant gathering to subsistence of 3% (Appendix

A1.3). Although this share is very low, it is clear that gathering is still practiced in relatively recent small-scale mixed farming communities. The role of gathering is however, hard to assess based on this contribution percentage alone, since Murdock is ineffective in his description of what is meant by this contribution, and to its importance to subsistence in general (cf. Chapter 4, section 4.3).

To further investigate the role of wild plant foods in farming communities, more specific ethnobotanical research was consulted. In recent ethnobotanical studies on farming communities from Poland, Slovakia, Estonia, and Turkey, the role of wild plant gathering to aid subsistence is clear: people collect on average 120 different edible wild plant species and collecting occurs on a weekly basis (Ertuğ 2000; 2004; Łuczaj 2010; Kalle & Sõukand 2012; Łuczaj 2012). Such a regular and substantial activity cannot be regarded as unimportant for subsistence, and thus contradicts the value provided by Murdock.

Therefore, in order to create a clear expectation of the practice and role of wild plant gathering in Bronze Age subsistence, in this section, each of the activities related to plant gathering are analysed in turn.

### 7.3.1 Preparation

The collection of wild plants as a practice is not particularly difficult, but does require preparatory steps in order to be successful. In particular the knowledge of the available (edible) plants in the environment, where to find them (*i.e.* location), and when they are available (*i.e.* seasonality) must form the basis for wild plant gathering.

**Gathering location**

Different plants can have different preferences for their growing conditions and are therefore often found at particular locations. So, when wild plants are uncovered at a site, an overview of their individual growing conditions can provide insight into the different places visited by people for collection. Since some plants may have grown near or within the settlement itself, this would not directly confirm active gathering by people. However, when wild plant seeds from (different) areas outside the house/settlement are uncovered together in one context, this gives a stronger indication for gathering practices.

By investigating the plant species from house contexts and their habitat preferences, clear indications for the visited gathering locations can be identified. The habitat preferences (*i.e.* eco groups) of past plants can be reconstructed based on recorded present-day plants species' preferences (Ellenberg *et al.* 1991; Tamis *et al.* 2004), under the assumption that the general characteristics of plants remained the same since the Bronze Age.

**Seasonality**

Plants are immobile, which means they remain at the same location throughout their lives, adapting to the environment around them. Seasonality of plants is therefore not related to migration, such as with animals, but rather to a difference in appearance and growth stage throughout the year. For most plants, growth (re-)commences after winter, after which several life stages are passed. These life stages are related to the part of the plant which is actively growing or already matured, which in turn can have an effect on its availability and palatability/edibility. In general, a deciduous annual or perennial plant goes through its life stages in the following order: in spring, young shoots and stems appear as well as flower buds; in summer, flowers and stems mature; in late summer/autumn, green parts of plants wilt and seeds, fruits, and nuts are produced, and roots and tubers store the nutrients required for the following growth period; in winter (depending on the species and type of plant), non-woody parts die off. Annual plants perform all life stages in a year, whereas perennial plant may require several years to flower and set seed.

Regardless of the type of plant however, people exploit the different available parts of a plant each season, and take advantage of the different life stages of a plant.

In Figure 7.2, a summary is made of the available plant parts throughout the year, thus indicating the times at which certain plant parts can be collected for consumption.

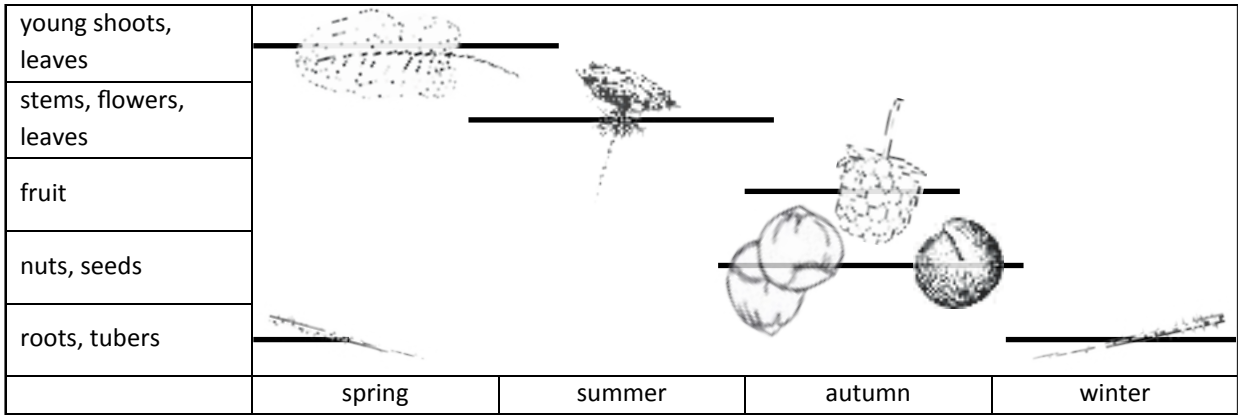


Figure 7.2. Seasonality diagram of the availability of different plant parts throughout the year.

**Ethnobotanical indications for seasonality**
In Turkey, wild greens are the most consistent component of the diet, consisting of mostly leaves and shoots (Ertuğ 2000, 170; Ertuğ 2004, 164). These plant parts are most required from October to June, and can even still be collected when snow has fallen (Ertuğ 2000, 170-1). However, the available diversity of species is lowest during this time, being highest in (early) spring (Figure 7.3). In addition, bulbs and fruits are gathered, indicating a year-round collection of wild plants (Ertuğ 2000, 176).

In other, more northern countries (*i.e.* Slovakia, Poland, Estonia), there is a less strong preference for green wild plant parts, but many different plant parts (including flowers, fruits, subterranean parts, and green parts) are gathered, indicating collection throughout the year (Łuczaj 2010; Kalle & Sõukand 2012; Łuczaj 2012).

**Archaeological indications for seasonality**
The seasonality of gathering is hard to assess based on archaeobotanical assemblages: at most excavated sites seeds are only preserved, and subsequently uncovered, in charred form. The charring of seeds only logically occurs through contact with fire, but, as is observed in section 7.3.3, many wild plants are often consumed raw. In addition, even if wild plants come in contact with fire, the chance of preservation of most of their individual parts is very low. Although seeds and fruits will sometimes become charred and therefore preserved, most vegetative parts either completely burn, or become so unrecognizable after the charring process that adequate identification to the genus or species level is no longer possible. Vegetative edible plant parts which are not cooked and thus not charred will, through normal plant degradation processes, also disappear completely. It is clear that although vegetative plant parts are most often collected based on ethnobotanical research (section 7.3.2), this gathering practice, which occurs throughout most of the year, may be near invisible due to taphonomical processes. It is therefore wrong to assume that people only collected plants in autumn, purely based on the fact that only charred remains of nuts and fruits were preserved.

### 7.3.2 Gathering

The practice of gathering was first researched by trying to create an expectation of which plants were usually gathered in farming communities. To aid this investigation, ethnobotanical studies were combined with archaeological indications for the gathering and consumption of wild plants (section 7.2.2 and 7.2.4). The second part of this section consisted of identifying the praxis of gathering in farming communities, also based on the ethnobotanical studies mentioned in section 7.2.2.

**Gathered plants**

**Ethnobotanical indications for gathered plants: recent farmers**.
The wild plants which are collected for consumption differ per community and region, but in general,

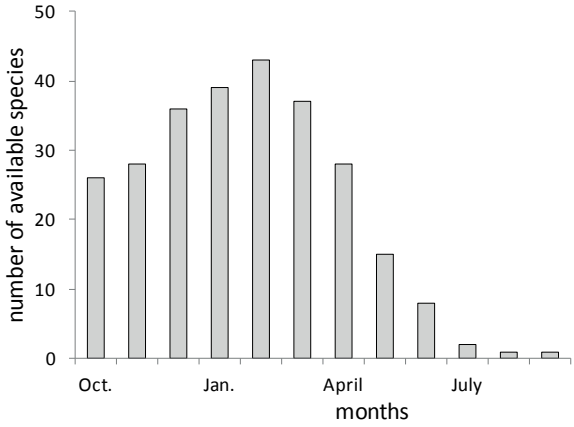


Figure 7.3. Availability of edible wild plant species collected for their greens in Bodrum, Turkey (from: Ertuğ 2004, 164, Table 2).

mostly vegetative parts are collected, such as in Turkey (Ertuğ 2000, 170; 2004, 165). Ethnobotanical studies from more northern countries (*i.e.* Slovakia, Poland, Estonia) show less preference for mainly vegetative wild plant parts, but plant greens remain an important addition to subsistence (Kalle & Sõukand 2012; Łuczaj 2010, 2012). The wild plant species most often collected in these communities are summarized in Table 7.3. Note that plants included in the table are those considered to have been collected and brought to the farm (excluding *e.g.* tree sap), for direct consumption or to be processed for indirect consumption (*e.g.* tea), and are considered to have grown in Bronze Age north-western Europe.

**Archaeological indications for gathered plants: prehistoric farmers**

Behre has provided an overview of prehistoric contexts which can be related to the collection and consumption of wild plants. These contexts include the stomachs of bog bodies and large clean stores of wild plant seeds (Behre 2008). Based on this overview, he has indicated several plants potentially gathered in prehistory, which are summarized in Table 7.3. Although emphasizing that green plant parts are also important in reconstructing the prehistoric diet, Behre only includes seeds, since leaves, bulbs, roots, and/or rhizomes are rarely preserved. However, some plant species were rejected by Behre for unclear reasons, even though these plants occur at similar frequencies as the plant species that he does include in his final conclusions (Behre 2008, 68, Table 2). In order to not miss any plant species for comparison in this research, every species uncovered from bog body stomachs was included in Table 7.3 as edible collected plant. Although some plants were not found in large concentrations, they still indicate consumption, and so they are added to the table as well. Plants which were found in bog body stomachs, but which were not present in Behre's final list of collected plants are characterized as potentially collected in Table 7.3.

**Gathering practices**

For gathering plants, not many tools are required: usually a digging stick, a cutting tool, and a container suffice (Ertuğ 2000, 175). Gathering of plants is often a social activity performed by women and children (Ertuğ 2000, 175; 2004; Figure 7.4). In Turkey, the maximum distance travelled from the settlement for gathering was 1-1.5 km (Ertuğ 2000, 175), and similar trends are observed in other areas of present-day Europe, indicating that plant collecting mainly occurs relatively close to the home (Schulp *et al.* 2014, 303). Often, groups of women and children collect several species of edible plants within 2-3 hours, which their family consume in 3-5 days (Ertuğ 2000, 175). Interestingly, gathering wild plants is independent of the level of income, and seems to be more related to nutrition and taste, rather than economic need. Still, middle and poorer income women tended to gather greens more often and less selectively than women with higher incomes.

Such differences in selectivity also become directly apparent from the taxa lists from ethnobotanical research. In some cases, several species of plant, sometimes not even within the same plant family, are given the same local name by people (Ertuğ 2000, Table 1; 2004, Table 3; Łuczaj 2010, Table 2; Kalle & Sõukand 2012, Table 1; Łuczaj 2012, Table 1). It is interesting to note that apparently, these people cannot or do not care to differentiate between species when the plants have the same use/taste/appearance. Of course, when a specific plant characteristic is important, due to its particular use or because the plant is poisonous, people will take care to select the right species.

Table 7.3. Overview of collected wild plant species in recent and past European farming communities.

| | | Prehist. Europe | Recent Europe | | | |
|---|---|---|---|---|---|---|
| **Taxa** | **English name** | **NSC** | **TUR** | **POL** | **SLO** | **EST** |
| **Plants collected for fruits, berries, and nuts** | | | | | | |
| *Corylus avellana* | Hazel (nut) | 2 | | n/a | 2 | 2 |
| *Fragaria* spec. | Strawberries | | 2 | | 2 | 2 |
| *Juniperus communis* | Juniper berry | 2 | | | 2 | 2 |
| *Malus* spec. | Apples | 2 | | | 2 | 2 |
| *Prunus spinosa* | Sloe plum | 2 | | | 2 | |
| *Quercus* spec. | Oak (acorn) | 2 | | | 2 | 2 |
| *Rosa* spec. | Rose(hip)s | | 2 | | 2 | 2 |
| *Rubus fruticosus* | Blackberry | 2 | | | | |
| *Rubus ideaus* | Raspberry | 2 | | | 2 | 2 |
| *Rubus* spec. | Berry | 2 | | | 2 | 2 |
| *Sambucus nigra* | Elderberry | 2 | 2 | | 2 | |
| *Vaccinium myrtillus* | Bilberry | 2 | | | 2 | 2 |
| **Other wild plants** | | | | | | |
| *Atriplex* spec. | Orach/Saltbush | | | 2 | | 2 |
| *Berula erecta* | Cutleaf waterparsnip | | 2 | | | |
| *Brassica nigra* | Black mustard | | 2 | | 2 | |
| *Bromus secalinus* | Rye brome | 2 | | | | 2 |
| *Capsella bursa-pastoris* | Shepherd’s purse | 1 | 2 | | | 2 |
| *Chenopodium album* | Fat hen | 2 | 2 | 2 | | 2 |
| *Chenopodium* spec. | Goosefoot | 2 | 2 | 2 | | 2 |
| *Cirsium* spec. | Thistle | | | 2 | 2 | 2 |
| *Daucus carota* | Wild carrot | | 2 | | 2 | |
| *Echinochloa crus-galli* | Barnyard grass | 1 | | | | |
| *Equisetum arvense* | Field horsetail | | | 2 | 2 | 2 |
| *Erodium cicutarium* | Stork’s bill | | 2 | | | |
| *Eryngium campestre* | Field eryngo | | 2 | | | |
| *Fallopia convolvulus* | Black bindweed | 2 | | 2 | | |
| *Filipendula ulmaria* | Meadowsweet | | | | | 2 |
| *Fumaria officinalis* | Fumitory | | | | | 2 |
| *Galeopsis tetrahit* | Common hempnettle | 1 | | | | 2 |
| *Glechoma hederacea* | Ground ivy | | | 2 | 2 | |
| *Glyceria fluitans* | Floating manna grass | 2 | | | | |
| *Hyoscyamus albus* | White henbane | | 2 | | | |
| *Lamium album* | White deadnettle | | | | 2 | 2 |

| | | Prehist. Europe | Recent Europe | | | |
|---|---|---|---|---|---|---|
| **Taxa** | **English name** | **NSC** | **TUR** | **POL** | **SLO** | **EST** |
| **Other wild plants** | | | | | | |
| *Lamium* spec. | Deadnettle | | 2 | | 2 | |
| *Malva sylvestris* | Common mallow | | 2 | 2 | 2 | |
| *Malva* spec. | Mallow | | | 2 | 2 | 2 |
| *Mentha* spec. | Mint | | 2 | 2 | | 2 |
| *Menyanthes trifoliata* | Bogbean | | | | | 2 |
| *Nasturtium officinale* | Watercress | | 2 | | 2 | |
| *Oenanthe pimpinelloides* | Meadow parsley | | 2 | | | |
| *Oxalis* spec. | Woodsorrel | | 2 | 2 | 2 | 2 |
| *Persicaria lapathifolia* | Curlytop knotweed | 2 | | | | |
| *Phragmites australis* | Common reed | | | | | 2 |
| *Plantago lanceolata* | Ribwort plantain | 1 | | | | |
| *Plantago major* | Common plantain | | | | 2 | 2 |
| *Polygonum* spec. | Knotweed | | 2 | 2 | | |
| *Polypodium vulgare* | Adders fern | | | | 2 | 2 |
| *Potentilla erecta* | Tormentil | | | | 2 | 2 |
| *Prunella vulgaris* | Self-heal | | | 2 | | 2 |
| *Raphanus raphanistrum* | Wild radish | 1 | 2 | 2 | | |
| *Rumex acetosella* | Sheep’s sorrel | 2 | 2 | 2 | | 2 |
| *Rumex* spec. | Sorrel | | 2 | 2 | 2 | 2 |
| *Salvia* spec. | Sage | | 2 | | | |
| *Sanguisorba* spec. | Burnet | | 2 | | | |
| *Schoenoplectus tabernaemontani* | Great bulrush | | | | | 2 |
| *Setaria* spec. | Foxtail | 2 | | | | |
| *Silene vulgaris* | Bladder campion | | 2 | 2 | | |
| *Sinapis arvensis* | Charlock | | 2 | 2 | | 2 |
| *Sisymbrium* spec. | Mustard | | 2 | | | |
| *Solanum nigrum* | Black nightshade | | 2 | | | |
| *Sonchus asper* | Prickly sow thistle | | 2 | | | 2 |
| *Sonchus* cf. *oleraceus* | Sow thistle | | 2 | | | 2 |
| *Spergula arvensis* | Corn spurrey | 2 | | | | |
| *Stachys palustris* | Marsh woundwort | | | | 2 | |
| *Stellaria media* | Chickweed | 1 | 2 | 2 | | |
| *Stratiotes aloides* | Water soldier | | | 2 | | |
| *Symphytum officinale* | Comfrey | | | 2 | 2 | |
| *Taraxacum officinale* | Dandelion | | 2 | | 2 | 2 |

| | | Prehist. Europe | Recent Europe | | | |
|---|---|---|---|---|---|---|
| **Taxa** | **English name** | **NSC** | **TUR** | **POL** | **SLO** | **EST** |
| **Other wild plants** | | | | | | |
| *Trifolium* spec. | Clover | | | | 2 | 2 |
| *Tussilago farfara* | Coltsfoot | | | | 2 | 2 |
| *Urtica dioica* | Stinging nettle | | 2 | 2 | 2 | 2 |
| *Urtica urens* | Annual nettle | | | 2 | | |
| *Valeriana* spec. | Valerian | | | | 2 | 2 |
| *Veronica* spec. | Speedwell | | | 2 | 2 | |
| *Viola* spec. | Violet | 1 | | | | 2 |

Prehist.=Prehistoric. NSC=North Sea Coast, in the case of potentially and likely gathered plants surmising the sites treated by Behre (2008). Although some of his researched sites also lie in Western Central Europe (WCE), his general conclusions are based on the NSC sites. TUR=Turkey, surmising the parallels researched by Ertuğ (2000, 2004). POL=Poland, surmising the parallel researched by Łuczaj (2010). SLO=Slovakia, surmising the parallel researched by Łuczaj (2012). EST=Estonia, surmising the parallel researched by Kalle and Sõukand (2012). 1=potentially collected, 2=collected, n/a=information not available.

A similar manner of gathering can be proposed for Bronze Age people. It is sometimes already difficult for a botanist to differentiate between species in for example the sorrel (*Rumex*) and sedge (*Carex*) genera, so it can be assumed that Bronze Age people might have even been unaware of these differences. Therefore, it can be expected that within such genera or families where characteristics are very similar, people may have collected a range of species for the same purpose.

### 7.3.3 Processing

The processing of wild plants for consumption can range from just rinsing the plant when consuming the plant raw, to cutting and cooking it, and to drying it for long-term use. The manner and level of processing differs for each plant part. Tender young shoots, leaves, berries, and flowers can often be consumed raw; but most roots and tubers, older leaves, and stems are usually boiled before consumption (Kalle & Sõukand 2012, Table 1). Alternatively, these plant parts can be dried for later use, but this does decrease their nutritive properties. Nuts and seeds can be consumed raw in some instances, but normally these are part of cooked dishes or dried with the aid of fire for later use, similar to cereals.

What these above examples show is that when it is assumed that wild plants were mostly gathered for their vegetative parts (cf. section 7.3.2), it can be expected that the visibility of these remains will be relatively low in comparison to plants collected specifically for their seeds.

**Taphonomical considerations**

The main plant parts which survive in the archaeobotanical record are seeds (and fruits), usually in charred form. When plants are collected for their seeds, and require subsequent processing with fire, it can be expected that these species will be well represented in the soil by many charred seeds. Vegetative parts of plants preserve poorly, and plants collected for this reason will almost always be under-represented. In addition, since these plants are often collected during seasons where no seed is present (cf. Figure 7.2), their underrepresentation is even more pronounced. However, in some instances, a few seeds may accompany the plant to the settlement. For example, when plants are collected in (late) summer, some of the flowers of a plant may already have been replaced by seeds, or when plants are collected for their roots/tubers in winter, some seeds may still be attached to the plant from the preceding

autumn period. Furthermore, plants collected for their fruit also contain seed, although they are not especially collected for this plant part. The seeds deriving from plants which are collected for a different plant part will, however, be far less frequent than seeds from plants collected specifically for their seed. In addition, the seeds of plants collected for their vegetative parts will often not become charred. Therefore, in summary, it can be assumed that the plants collected for their seeds will be much better represented in the archaeobotanical record and in a different manner than plants collected for other parts.

Colledge & Conolly also recently remarked on this division between crop plants and other seed-bearing edible plants, and green plant parts with regard to their preservation in the archaeobotanical record (Colledge & Conolly 2014). They emphasize that in order to the best possible reconstruction of the overall dietary breadth of plant consumption, both charred (*i.e.* plants collected for seed) and uncharred (*i.e.* plants collected for vegetative parts) remains should be incorporated in the investigation. Still, when these two preservation states are combined in one study, it is important to realise what can be expected of the behaviour of each of the plant groups (*i.e.* plants collected for seeds, vegetative parts) in terms of prevailing preservation state and frequency. When this expectation is clear, ultimately, the possible use of an edible plant species can be reconstructed.

**Reconstructing edible plant use based on seeds**

Two preservation conditions can be considered when dealing with botanical remains (excluding mineralized remains here): dry, favouring preservation of charred remains; and wet, favouring preservation of uncharred remains.

Under dry soil conditions, charred seeds are better preserved than uncharred seeds, and uncharred seeds are thus expected to be lower in frequency than charred seeds. In addition, seeds of plants collected for this plant part will be better represented in general than seeds of plants collected for their vegetative parts (see previous paragraph). Therefore, under these dry circumstances, it is expected that charred seeds are uncovered more frequently than uncharred seeds, and plants collected for their seeds will be best represented in general (Table 7.4).

Figure 7.4. Woman in Turkey gathering wild plants (photo courtesy of F. Ertuğ).

Under wet soil conditions, charred seeds are also well preserved, in many cases even better than under dry conditions (Jacomet 2013, 501). Therefore, it can still be assumed that charred seeds are well represented in the archaeobotanical record. Uncharred seeds will now also be relatively better represented than under dry conditions. Plants collected for their seed will however, still be represented by a relatively higher number of charred seeds than uncharred seeds (Table 7.5), since their processing often requires the use of fire. Plants collected for their vegetative parts will be represented by a higher frequency of uncharred seeds than charred seeds under these conditions, but their overall frequency in comparison with plants collected for seed will still be low.

What Table 7.4 and Table 7.5 aptly illustrate is that low frequencies of (charred) plant seeds should by no means be interpreted as plants of lower importance

Table 7.4. Hypothetical table showing the expectation of frequencies of uncovered seed remains from plants collected for the seeds or vegetative parts, under dry soil conditions.

| | Dry soil conditions | |
|---|---|---|
| | Preservation state of seeds | |
| | Charred | Uncharred |
| **Plant collected for:** | | |
| **Seeds** | ++ | + |
| **Vegetative parts** | - | -- |

++=frequent, +=present, -=rarely found, --=(nearly) absent.

Table 7.5. Hypothetical table showing the expectation of frequencies of uncovered seed remains from plants collected for the seeds or vegetative parts, under wet soil conditions.

| | Wet soil conditions | |
|---|---|---|
| | Preservation state of seeds | |
| | Charred | Uncharred |
| **Plant collected for:** | | |
| **Seeds** | +++ | ++ |
| **Vegetative parts** | - | + |

+++=very frequent, ++= frequent, +=present, -=rarely found

or as proof of absence of gathering practices. The parts of the plant collected, the processing with or without fire, and the preservation conditions all affect the resulting archaeobotanical assemblage. Overall, the indications for a particular use of a plant can be derived from relative frequency and preservation state: low frequencies of seeds of both charred and uncharred preservation states under dry soil conditions indicate use of vegetative parts. Under wet soil conditions, relatively low frequencies in general, with a tendency towards uncharred seeds, also point in the direction of vegetative plant part use. High frequencies of charred seeds most probably indicate plants collected for their seed, regardless of preservation condition. It must be kept in mind however, that sample size must be high enough to conclude anything about the relative frequencies of remains.

### 7.3.4 Storage

Storage of plants mainly occurs in dried form. Most green plant parts are traditionally dried by hanging them upside-down (Figure 7.5). Nuts, seeds, and fruits can be dried, similar to the processing of cereals before storage. Dried plants require, similar to the other dried food groups mentioned in the previous chapters, dry, well-ventilated, and elevated storage areas. In addition, when for example roots or tubers are stored, they additionally require dark conditions to prevent sprouting.

Storage also requires that pests cannot access the stored food, and pure concentrations of wild plant seeds (sometimes within a vessel) uncovered from prehistoric Danish and German sites (Behre 2008, 68-9 and references therein) indicate that wild plant seeds were collected and stored in containers for later use.

### 7.3.5 Summary and additional main components

Wild plant gathering for consumption purposes within small-scale farming communities was researched by separately analysing the activities of which this practice consists. First, preparatory activities were researched, which include gathering location and seasonality: in order to successfully collect required plants, it must be known where and when plants are available. Plants often prefer specific growing conditions and when these locations are known, they can provide information on the locations visited by people for gathering. Information on seasonal gathering is most related to the time in which certain plant parts are available for collection. In many communities, plant parts which contain more nutrients in a particular season are usually collected

for consumption during that time: young shoots and flower buds in spring; flowers, leaves, and stems in summer; nuts, fruits, and seeds in autumn; and roots and tubers in autumn, winter and early spring.
Gathering itself was analysed by employing ethnobotanical studies on the matter from several areas in Europe, including Turkey, Poland, Slovakia, and Estonia. The gathered edible wild plant species from these areas were summarized and so formed an expectation of the range of plants and variety of parts consumed by recent farmers. It was observed that a vast amount of species were collected solely for their vegetative (*i.e.* not bearing seed) parts. An expectation of prehistoric collection and consumption of wild plants was established by employing species lists created after analysis of prehistoric bog body stomachs, as well as pure concentrations of wild plant seeds at excavated sites. This list of species however, only included wild plants that were most likely collected for their seed, and so was considered incomplete, since many plants are known to have been collected for other parts as well.

Ethnobotanical parallels were also used to research gathering practices. One aspect of gathering revealed by this researched seemed to be consistent regardless of region: many different plant species were considered to be the same by local people, and were even appointed the same local name. This means that for many wild plants, local people could not, or would not differentiate between scientifically different species, because the appearance or taste of the plant was deemed similar. Apparently, as long as the properties of the plants were similar and not considered harmful, it is unnecessary to provide every plant a different local name.

Processing of wild plants was investigated by assessing the effects of fire, and the part of the plant used for consumption. It was concluded that seeds of plants collected specifically for that seed are more often preserved in charred form and in relatively high frequencies, since fire is usually required for processing and long-term preservation for consumption. In contrast, seeds of plants collected for their vegetative parts are expected to be present at low frequencies because, when gathered for this purpose, plants are often not bearing seed. Furthermore, these seeds are usually better preserved in uncharred form.

Figure 7.5. Herbs are traditionally dried by hanging them upside down (photo courtesy of C. Bakels).

Depending on the preservation conditions during deposition, plant seeds will be more prone to either be preserved in charred form, or in uncharred form. It is therefore expected that under dry conditions, seeds of plants collected for seeds will be found more often, in charred form. Plants collected for vegetative parts will be nearly absent from such assemblages. On the other hand, under wet conditions, seeds of plants collected for their seeds will still be uncovered most frequently, both in charred and uncharred form; seeds of vegetative parts will now be better represented in comparison to under dry conditions, since they can be preserved in uncharred form. Their overall frequency of remains will still, however, be relatively low.

Storage of wild plant parts could have occurred with the other dried food products, which consisted of cereal grains, and may also have included dried meat and fish.

The investigated gathering practices have provided insight into the skill and knowledge of the environment that would have been required by Bronze Age people. Both the preparation for gathering as well as the gathering itself meant that people were very aware of their surroundings throughout the year. However, the fact that many wild plants were collected for vegetative parts, which do not preserve well, suggests that the reflection of gathering practices in the archaeobotanical record is greatly impaired by (differential) taphonomical

processes. The effect of these processes signifies that the importance and extent of gathering in the Bronze Age should not *a priori* be underestimated based on the presence of low numbers of seeds of wild plants. Finally, an additional main component was identified related to the observations made regarding edible wild plant collecting, and the effects of processing, respectively. This main component is added to the main components of the current model, and will be challenged in section 7.5:

(7) Seeds of plants are preserved differently depending on which plant part is used for consumption.
(7a) Seeds of plants collected for their vegetative parts will always be present in relatively lower frequencies than seeds of plants collected specifically for their seeds, regardless of preservation condition.
(7b) Under wet preservation conditions, seeds of plants collected for their vegetative parts will be relatively better represented in uncharred form than in charred form, whereas the opposite is true for plants collected for their seeds.

## 7.4 WEST FRISIAN DATA ANALYSIS

This section is concerned with the analysis of the basic aspects of wild plant gathering outlined in section 7.2 and 7.3, including preparation, gathering, processing and storage. Each part is investigated separately in order to investigate the practice of wild plant gathering in the Bronze Age, and to elucidate which plants may have been collected for consumption. In this investigation, a careful examination is made of the possible sources of evidence present for wild plant gathering in the archaeological assemblage of West Frisia. The absence of evidence for certain activities is not directly connected to the actual absence of these activities, but rather evaluated through an assessment of taphonomical and methodological impact on the data. By incorporating multiple proxies in the analysis in this chapter, other, less visible indications for wild plant gathering are identified, which would have been missed when using a single discipline analysis. For the analysis in this chapter, only remains deriving from house contexts were considered. It is assumed that the deep Late Bronze Age ditches are comparable in function to Middle Bronze Age house ditches, with both bordering the presumed house location. These particular contexts were chosen, because it is assumed that food preparation mostly occurred in and around the house so their content should reflect this practice. Furthermore, charred material is often related to human practice due to the use of fire, which ultimately resulted in this state of preservation. Therefore, in order investigate human practice related to consumption of wild plants, mainly charred material from house ditches was researched.

However, recent research by Colledge & Connolly has indicated that uncharred remains far more accurately reflect the collection of wild plant foods than charred remains (Colledge & Connolly 2014, 193). Since they also postulate that charred data alone is not sufficient to reconstruct the breadth of the diet, uncharred remains from West Frisian house ditches were also investigated, where possible.

Plants possibly growing locally in or around the house ditch contexts have been taken into consideration during analysis (section 7.4.1). It must be kept in mind however, that since the preservation of uncharred remains in West Frisia is not directly comparable to the excellent preservation of remains at water-side pile-dwelling settlements researched by Colledge & Connolly, the reconstructed dietary breadth in West Frisia will be an under-representation of the originally existing dietary range. Other uses for wild plants are investigated in section 7.4.6.4.

### 7.4.1 Preparation

Wild plant remains have been uncovered at every site in West Frisia, but not every site is suitable for analysis in terms of quantity. In the summarized data, all sites were employed, however, in more specialized analyses, fewer sites were selected for further investigation, where appropriate.

**Gathering location**
The locations visited to gather edible plants (section 7.4.2.1, Table 7.8) were investigated by summarizing the eco groups and combined frequencies of both uncharred and charred plant species from house

Table 7.6. Summarized list of the eco groups and frequencies of edible wild plant species deriving from samples from MBA house ditches (n=174) and LBA ditches (n=23). The range of eco groups signifies a wide exploitation of the environment of settlements in West Frisia.

| Ecogroup (Gorteria) | Description of ecogroup | General habitat | MBA | LBA |
|---|---|---|---|---|
| 1a | arable fields on nutrient-rich, non-calcarious soil | Arable fields | 8 | 5 |
| 1c | arable fields on medium nutrient-rich, poor calcareous soil | Arable fields | 1 | 1 |
| 1d | trodden soils on dry, nutrient-rich soil | Grassland | 3 | 3 |
| 5a | fertilized grassland on medium moist soil | Grassland | 5 | 4 |
| 6d | grasslands on dry, medium nutrient-poor, poor calcareous, acidic soils | Grassland | 1 | 1 |
| 8b | borders on nutrient- (especially nitrogen-)rich, non-calcareous, humous, medium moist soil | Grassland | 2 | 1 |
| 1e | brushwood on rarely trodden, nutrient-rich, non-humous or calcareous, dry soils | Shrubland | 5 | 3 |
| 1f | brushwood on rarely trodden, calcareous, non-humous, dry soil | Shrub land | 1 | 0 |
| 8d | brush on medium moist to dry, nutrient-rich soil | Shrub land | 1 | 1 |
| 9a | forests on nutrient-rich, moist to wet soil | Trees | 2 | 0 |
| 9b | forests on mature, medium nutrient-rich to nutrient-rich, medium moist to dry soil | Trees | 0 | 1 |
| 3b | saline and highly brackish waters, mudflats, and tidal marshes | Saltmarsh | 0 | 1 |
| 7a | medium nutrient-rich, poor calcareous, acidic eutrophic peat bogs, and wet, humous dune valleys | Eutrophic peat | 1 | 1 |
| 2a | nutrient-rich locations with fluctuating water levels or otherwise greatly fluctuating environmental conditions | Wet grassland | 3 | 3 |
| 2b | open, nutrient- (especially nitrogen-)rich, wet soil | Wet grassland | 3 | 3 |
| 2c | open, medium nutrient-rich to nutrient poor, moist soil | Wet grassland | 0 | 1 |
| 5b | medium fertilized grassland on medium moist soil | Wet grassland | 1 | 0 |
| 4a | fresh to medium brackish, nutrient-rich waters | Wetlands | 1 | 1 |
| 4c | fresh, medium to very nutrient-poor waters and their periodically drying banks | Wetlands | 5 | 8 |
| 4d | water way deposits, wet brushwood, and river-accompanying willow brush | Wetlands | 2 | 3 |
| | | | 45 | 41 |

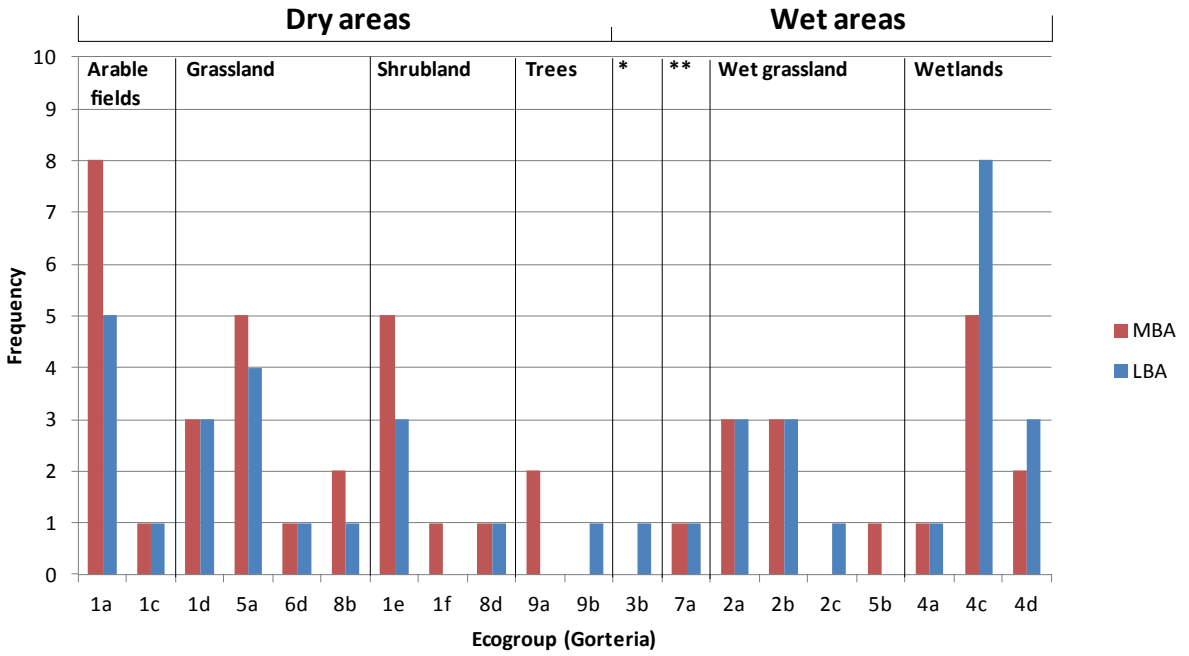


Figure 7.6. Graph of the data in Table 7.6, which shows the frequencies of the different edible plant species representing the different eco groups (cf. Tamis *et al.* 2004) and general habitats exploited in West Frisia deriving from both MBA house ditches and LBA ditches. The frequencies of the Middle and Late Bronze Age should not be compared directly, since a different number of samples was available for each period (n=174 in the Middle Bronze Age; n=23 in the Late Bronze Age). However, a general trend of exploitation per time period can be observed. *=saltmarsh; **=oligotrophic peat.

ditches. The results are summarized in Table 7.6 and Figure 7.6, for both the Middle and Late Bronze Age. What becomes immediately clear from both Table 7.6 and Figure 7.6, is that the range of locations visited by Bronze Age people in West Frisia was very wide. The range of charred plant seeds from different locations underlines that the assemblage in the house ditch was most likely not a coincidence. Rather, plants from different locations were gathered and finally deposited together in the ditch.

Visited locations for gathering wild plants for consumption are comparable for both periods, and include arable fields, (wet) grassland, shrub land, areas with trees, wetlands, eutrophic peat, and, in the Late Bronze Age, also saltmarsh.

The specific eco groups can be grouped into more generalized categories, which are comparable to the habitat types described in previous chapters. Gathering locations now include dry and wet locations, consisting of grassland, shrub land, arable fields, trees, saltmarsh, peat, wet grassland, and wetlands, of which the first three groups yields the highest frequencies of plants. Trees are not well represented. Even though wood of several tree species has been uncovered at the West Frisian settlements, and therefore presumably used in the Bronze Age (section 7.4.6.4), nuts, fruits, and catkins of trees are comparatively scarce in the archaeobotanical record. Based on Figure 7.6, it appears as if in the Middle Bronze Age more wild plant gathering occurred than in the Late Bronze Age, but this is merely related to the fewer amount of samples from this latter period (n=174 in the Middle Bronze Age versus n=23 in the Late Bronze Age). However, despite this difference in number of samples, the fact that some eco groups in the Late Bronze Age (wet grassland (2c), wetlands (4c and 4d)) show higher numbers of plants compared with the Middle Bronze Age, may indeed reflect the wetter surroundings during this period.

**Gathering location in relation to the context**

The eco groups and general habitats from Figure 7.6 were subsequently translated into location types (Table 7.7, Figure 7.7, and Figure 7.8) in order to more accurately assess the distance at which plants were collected in relation to the house. Plants which, based on their eco group, could have grown in the context in which the botanical remains were uncovered were termed local vegetation, plants which could have grown within the settlement were called settlement vegetation, and plants from arable fields were called arable vegetation. Plants from all other eco groups were termed off-site, since their growing conditions were not expected to exist within the settlement.

Location types were deemed local if plants could have grown in and around the (house) ditch. All other location types were categorized accordingly. Since the soil conditions of MBA house ditches differ from those of the LBA ditches, local growing conditions and therefore appointed local location types also differ between the periods.

What is apparent from Table 7.7 is that plants which could have grown locally in the Middle Bronze Age are not necessarily the same as those in the Late Bronze Age. This difference can be related to the fact that the local conditions within the sampled contexts differed throughout the Bronze Age. In the Middle Bronze Age, the house ditches were dry (Mink 2014) and probably trampled often, which resulted in local growing conditions for plants which reflect these aspects. In the Late Bronze Age however, the ditches are definitely wet for part of the year (Mink 2014), which means that local growing conditions also include additional wet eco groups. Therefore, plants which are identified as off-site in one period, can become identified as local in the other. This different wetness of contexts is further examined in relation to the inherent differences in preservation conditions and taphonomy between the Middle and Late Bronze Age in section 7.4.2.

What becomes clear from both Table 7.7, Figure 7.7 and Figure 7.8, is that edible plants derived from both settlement and arable field contexts, but also from many different off-site locations in both the Middle and Late Bronze Age. This range of off-site locations again underlines that people consciously visited many locations outside the settlement for the collection and consumption of wild plants. However, plant remains may also have derived from animal dung, indicating the locations visited by domestic animals (section 7.4.6.4).

Note again that the difference in frequency of remains between periods is related to the number of samples

Table 7.7. List of the eco groups (Tamis *et al*. 2004) of the edible plants from MBA and LBA (house) ditches and their corresponding location types.

| | **MBA: dry conditions** | **LBA: wet conditions** |
|---|---|---|
| **Eco group (cf. Tamis *et al*. 2004)** | **Location in relation to the context (house ditch)** | **Location in relation to the context (deep ditch)** |
| 1a | arable | arable |
| 1c | arable | arable |
| 1d | local | local |
| 1e | settlement | settlement |
| 1f | settlement | - |
| 2a | settlement | local |
| 2b | off-site | local |
| 2c | - | local |
| 3b | - | off-site |
| 4a | off-site | off-site |
| 4c | off-site | local |
| 4d | off-site | off-site |
| 5a | off-site | off-site |
| 5b | off-site | - |
| 6d | off-site | off-site |
| 7a | off-site | off-site |
| 8b | off-site | off-site |
| 8d | off-site | off-site |
| 9a | off-site | off-site |
| 9b | - | off-site |

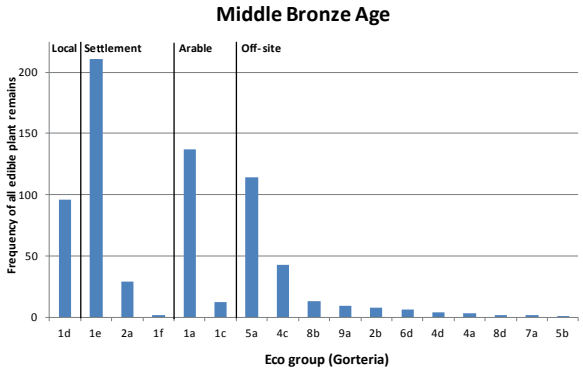


Figure 7.7. Frequencies of edible plant seeds from MBA house ditches, categorized into the different eco groups (Tamis *et al.* 2004) and location types.

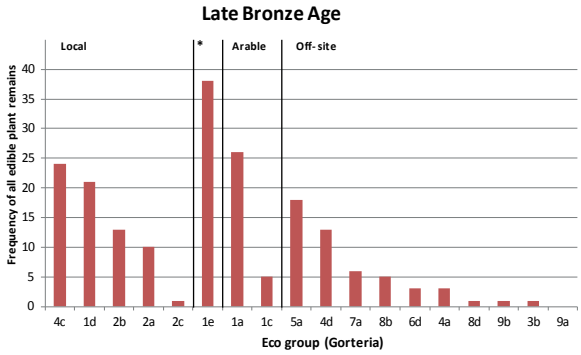


Figure 7.8. Frequencies of edible plant seeds from MBA house ditches, categorized into the different eco groups (Tamis *et al.* 2004) and location types. *=settlement.

available, not relative importance. In addition, a higher frequency of remains of a particular eco group in comparison to other eco groups does not signify higher importance or mean that a plant (group) was collected more often, as will become apparent in section 7.4.2 below.

**Seasonality of gathering**

Research on the collection and consumption of vegetative plant parts is, as stated in section 7.3.1, difficult. However, some techniques can be employed to identify (indirect) consumption of wild plants. In one instance, the processing of starch-containing plant parts (*i.e.* roots/tubers), was established based on the microscopic analysis of a food crust on ceramics (Kubiak-Martens & Oudemans 2011). Since no cultivation of tuber or root crops is assumed for the Bronze Age, this indicates that the collection and processing of roots, was most likely for consumption. Although this is only one indication for the consumption of the vegetative parts of wild plants, it does prove that this gathering practice still existed in the Bronze Age. More research is required to directly identify similar practices in West Frisia, and also for other plant parts. Indirect indications for the collection of plants for consumption of their vegetative parts in West Frisia were established however, based on the plant species present (section 7.4.2 below), and based on required dietary addition and general health (Chapter 8, section 8.3.2). Therefore, it is assumed that plant collecting occurred throughout the year in West Frisia, and different plant parts were collected depending on the season (cf. section 7.3.1).

7.4.2 Gathering

In order to assess which plants may have been collected for consumption, the remains from house ditches were employed for the Middle Bronze Age situation, and the remains from ditches for the Late Bronze Age situation. As stated in section 7.4.1, both charred and uncharred seeds were included in this analysis (cf. Colledge & Conolly 2014). The results for the Middle Bronze Age consist of an amalgamation of data from Bovenkarspel, Medemblik, Enkhuizen, and Westwoud; the Late Bronze Age data consisted of combined data from Bovenkarspel, Medemblik, Westwoud, and Hoogkarspel (Table 7.1).

The edibility of the West Frisian plant species was assessed by employing an online ethnobotanical database (PFAF 2016). This database consists of records of more than 7000 plant species, and provides information on plant characteristics and plant use based on an extensive bibliography list. Plant use includes both use for consumption as well as for other purposes. In the database, each plant species is appointed an edibility score ranging from 0-5, and it is noted which parts of the plant are used for consumption. In addition, information on the processing is provided, including whether fire is required. This database was used to establish the

ethnobotanical uses of (edible) plants not known from the ethnobotanical parallels, and to form a basis of comparison for the West Frisian data with the data from Table 7.3.

Each species present in the house contexts of West Frisia was researched, and plants were only considered edible when their edibility score was higher than 1, since it was observed that many plants with an edibility score of 0 or 1 were either poisonous, or not collected based on the ethnobotanical and prehistoric datasets (section 7.3.2, Table 7.3). These plants are thus not considered to have been consumed, although they may still have possessed other qualities for Bronze Age people. Of course, plants with a higher edibility score could also have been used for other purposes, so other uses of all plant species from house contexts are further explored in section 7.4.6.4.

*7.4.2.1 Edible plants from house contexts*

The resulting list of edible plants from house contexts is shown in Table 7.8, for both the Middle and Late Bronze Age situation. This distinction is made to assess possible differences in practice throughout time, but also because conditions within the researched contexts are not directly comparable, as is discussed in detail below.

Information on the edibility and edible plant parts was taken from the online ethnobotanical database (PFAF 2016). The specific parts of the plants consumed were also researched and noted; when plants were only collected for their vegetative parts, this was made clear in Table 7.8 by marking the particular species green. In addition, it was indicated when a species was also expected based on the expectation of collected species in prehistoric and recent farming communities (Table 7.3). In concurrence with section 7.3.2, it is assumed that plants with similar appearance and edibility may have been collected as if it were one species. Therefore, plants with such similar characteristics are combined in Table 7.8.

**Collected species**

A total of 55 edible plants, 47 edible after a combination of similar species, were potentially collected in Bronze Age West Frisia based on the online ethnobotanical database (Table 7.8). On average 120 edible plant species were collected based on the researched ethnobotanical parallels (Table 7.3), which means that the number of West Frisian edible plants only amounts to less than half this number. However, as stated in section 7.4, this total number of edible plants uncovered in West Frisia will form a conservative estimate of the original total amount of species collected, due to, amongst other reasons, taphonomical processes, even though the preservation conditions in West Frisia are very favourable.

Still, although only less than half of the number of expected species of edible plant was uncovered in West Frisia, there is a 62% overlap in the specific plant species collected (Table 7.8). This observation shows that regardless of geographic location, climate, and time period, it seems that a basic set of collected plants which can aid farming life may exist. The remaining species differing between regions may reflect local preference or availability (cf. section 7.3.2).

Finally, no obvious difference between the Middle and Late Bronze Age edible species was observed which reinforces the assumption that collecting species may not have differed much between the two periods.

**Collected plant parts**

Table 7.8 clearly shows that most edible plants in West Frisian house contexts could have been collected for multiple parts. Only one species, floating manna grass (*Glyceria fluitans*), is known to be collected for just its seeds. A further 25 species (23 after combination) are known only to be collected for their vegetative parts (including leaves, roots, oil, flowers, and roots; PFAF 2016), which amounts to 45% of the total number of edible plants in Table 7.8. Although this value is perhaps lower than expected based on the ethnobotanical parallels, it must again be realised that there is an under-representation of remains due to taphonomical processes. Furthermore, several of the plants present in Table 7.8 which can potentially be gathered for many different parts, could, in reality, have been solely collected for their vegetative parts. In order to assess whether West Frisian people may

Table 7.8. Overview of the edible plants uncovered from MBA and LBA house contexts of the summarized West Frisian sites Bovenkarspel, Medemblik, Enkhuizen, Westwoud, Hoogkarspel, and Twisk.

| *Taxa* | English name | MBA | LBA | Present in Table 7.3? | Edible parts |
|---|---|---|---|---|---|
| *Anagallis arvensis* | Scarlet pimpernel | x | | | leaves |
| *Atriplex hastata*-type/ *patula* | Hastate/Spreading orach | x | | yes | seed, root, leaves |
| *Aster tripolium* | Sea aster | | x | | leaves |
| *Bidens tripartites* | Burr Marigold | x | x | | leaves |
| *Bolboschoenus maritimus* | Seaside bulrush | x | x | | root, seed |
| *Brassica rapa* | Turnip | x | x | | seed, leaves, root |
| *Capsella bursa-pastoris* | Shepherd's purse | x | x | yes | seed, leaves, oil |
| *Chenopodium album/ ficifolium* | Fat hen/Fig-leaved goosefoot | x | x | yes | seed, leaves, flowers |
| *Chenopodium polyspermum* | Manyseed goosefoot | x | | yes | seed, leaves |
| *Chenopodium glaucum/ rubrum* | Oak-leaved/Red goosefoot | x | x | yes | seed, leaves |
| *Daucus carota* | Wild carrot | x | x | yes | flowers, root |
| *Descurainia sophia* | Flixweed | x | | | seed, leaves |
| *Echinochloa crus-galli* | Barnyard grass | x | x | yes | seed, leaves |
| *Epilobium hirsutum* | Codlins and cream | x | x | | leaves |
| *Filipendula ulmaria* | Meadowsweet | x | | yes | flowers, leaves, root |
| *Galium aparine* | Goosegrass | x | | | leaves |
| *Glyceria fluitans* | Floating manna grass | | x | yes | seed |
| *Hippuris vulgaris* | Common marestail | x | x | | leaves |
| *Lamium purpureum* | Red/Purple deadnettle | x | | | leaves |
| *Lythrum salicaria* | Purple loosestrife | x | x | | leaves, root |
| *Medicago lupulina* | Black medick | x | x | | seed, leaves |
| *Mentha aquatica/ arvensis* | Water/Wild mint | x | x | yes | leaves |
| *Menyanthes trifoliata* | Bogbean | x | x | yes | root |
| *Montia fontana* | Water blinks | x | | | leaves |
| *Phragmites australis* | Common reed | x | x | yes | leaves, root, seed, stem |
| *Plantago lanceolata* | Ribwort plantain | x | x | yes | seed, leaves |
| *Plantago major* | Common plantain | x | x | yes | leaves, root, seed |
| *Polygonum aviculare* | Knotweed | x | x | yes | seed, leaves |
| *Potentilla anserina* | Silverweed | x | x | | leaves, root |
| *Prunella vulgaris* | Self-heal | x | x | yes | leaves |
| *Rorippa amphibia* | Great yellow cress | | x | | leaves |

| | | | | | |
|---|---|---|---|---|---|
| *Rorippa palustris* | Yellow marsh cress | x | x | | leaves |
| *Rubus fruticosus* | Blackberry | | x | yes | leaves, root, fruit |
| *Rumex acetosella/ acetosa*-type | Sheep's/Garden sorrel | x | x | yes | seed, leaves, root |
| *Rumex crispus/crispus*-type | Curly dock | x | x | yes | leaves, seed |
| *Rumex sanguineus* type | Red-veined dock | x | | yes | leaves |
| *Sambucus nigra* | Elderberry | x | x | yes | flower, fruit |
| *Samolus valerandi* | Brookweed | | x | | leaves |
| *Schoenoplectus lacustris/ subsp. tabernaemontani* | (Great) bulrush | x | x | yes | leaves, pollen, root, seed, stem |
| *Solanum nigrum* | Black nightshade | x | x | yes | fruit, leaves |
| *Sonchus asper* | Prickly sow thistle | x | x | yes | leaves, stem |
| *Sparganium erectum* | Bur reed | x | x | | root, stem |
| *Stachys palustris* | Marsh woundwort | | x | yes | seed, leaves, root |
| *Stellaria media* | Chickweed | x | x | yes | seed, leaves |
| *Urtica dioica/urens* | Stinging/Annual nettle | x | x | yes | leaves, oil |
| *Veronica anagallis-aquatica* | Water speedwell | | x | yes | leaves |
| *Vicia hirsuta* | Hairy tare | x | x | | leaves, seed |

x=present, green emphasis=edible plant only collected for vegetative parts. Yes=also present based on the expectation of collected edible plants in prehistoric and/or recent farming communities (Table 7.3).

have indeed collected less plants for vegetative matter than was expected, or whether multiple use (*i.e.* seeds and vegetative matter) plants could also be included as being collected mainly for their vegetative parts, taphonomical effects on the West Frisian assemblage were researched in more detail (cf. section 7.3.3).

**Preservation differences between the Middle and Late Bronze Age West Frisia**

The Middle and Late Bronze Age house contexts in West Frisia appear to possess similar edible wild plant species based on Table 7.8. However, to accurately compare the two types of context, as well as the edible uses of the plant species in them, their differing prevailing preservation conditions need to be taken into consideration. In the Middle Bronze Age, the house ditches were dry most of the time (Mink 2014), which means that charred remains have a higher chance of preservation than uncharred remains during this time; whereas in the Late Bronze Age, the deep ditches were wet for most of the year (Mink 2014), resulting in better preservation conditions for uncharred remains in comparison to charred remains. In effect, the Middle Bronze Age house contexts can be regarded as possessing a prevailing preservation condition comparable to the dry soil conditions in hypothetical Table 7.4, and the Late Bronze Age house contexts to the wet soil conditions in hypothetical Table 7.5 (Table 7.9; Table 7.10).

Therefore, the potential use of the plant for specific parts can be reconstructed, when the difference in reflection in each of the contexts is kept in mind, and when it is assumed that plants were collected for the same purpose in both periods.

**Edible use of collected wild plants**

**Middle Bronze Age**

The edible plant species from the Middle Bronze Age contexts from the sites Bovenkarpsel, Medemblik,

Table 7.9. Middle Bronze Age house contexts possess dry soil conditions. Relative frequencies of seeds of plants collected for different parts, and their uncovered states of preservation, can be expected accordingly (cf. Table 7.4).

| | Middle Bronze Age situation | Middle Bronze Age situation |
|---|---|---|
| | Preservation state of seeds | Preservation state of seeds |
| Plant collected for: | Charred | Uncharred |
| Seeds | ++ | + |
| Vegetative parts | - | -- |

++=frequent, +=present, -=rarely found, --=(nearly) absent.

Enkhuizen, and Westwoud (*i.e.* total=174 samples) were plotted with their respective frequencies of charred and uncharred seeds (Figure 7.9). Species were combined in some instances due to similarity in appearance and/or taste (cf. section 7.3.2), meaning that the combined individual frequency of these species could result in higher values than the total number of 174 samples (*e.g.* fat hen/fig-leaved goosefoot: *Chenopodium album*/*ficifolium*). For clarity reasons, species are only referred to by their scientific name, rather than their English name.

Conform Table 7.9, it was expected that plants gathered for their seeds would show relatively high frequencies of charred seeds and lower frequencies of uncharred seeds, whereas plants gathered for their vegetative parts would be reflected by low frequencies of both.

What is clear from Figure 7.9 is that only very few wild plant species appear in relatively high frequencies of charred seeds (present in more than 25 samples). These species include *Chenopodium album*/*ficifolium*, *Plantago major*, *Stellaria media*, *Plantago lanceolata*, *Solanum nigrum*, *Mentha aquatica*/*arvensis*, and *Medicago lupulina*, which can all, and especially *Chenopodium*, be considered the usual suspects within charred assemblages preserved under dry conditions. The high frequencies of charred seeds seem to imply collection for seeds.

Table 7.10. Late Bronze Age house contexts possess wet soil conditions. Relative frequencies of seeds of plants collected for different parts, and their uncovered states of preservation, can be expected accordingly (cf. Table 7.5).

| | Late Bronze Age situation | |
|---|---|---|
| | Preservation state of seeds | |
| Plant collected for: | Charred | Uncharred |
| Seeds | +++ | ++ |
| Vegetative parts | - | + |

+++=very frequent, ++= frequent, +=present, -=rarely found

In lower frequencies (present in between 10 and 25 samples), plants such as *Bolboschoenus maritima*, *Prunella vulgaris*, *Rumex crispus*/*crispus-type*, and *Echinochloa crus-galli* can be found. Several of the above-mentioned plants have also been uncovered from bog body stomachs (Behre 2008, Table 2).

From *Polygonum aviculare* onwards, species occur at increasingly lower frequencies (present in less than 10 samples), sometimes in combination with uncharred seeds as well. These characteristics appear to match well with the expectation of how plants collected for their vegetative parts preserve under dry conditions. Indeed, when Table 7.8 (PFAF 2016) is consulted, many of these plants are only collected for their vegetative parts (green boxes in Figure 7.9). It is tempting to assign plant use immediately, also to plants which behave in the same manner and are not necessarily only collected for their vegetative parts, such as *Brassica rapa*. However, to confirm their potential use, it is important to investigate whether the same species, now tentatively classified as being collected for their vegetative parts, behave in the same expected manner in the Late Bronze Age, during which wet soil conditions exist. When species fall within the vegetative category in both periods, a more secure conclusion can be drawn.

Species which are not behaving as expected are *Mentha aquatica*/*arvensis* and *Prunella vulgaris*.

Although usually collected for the consumption of their vegetative parts, they portray relatively high frequencies of charred seeds instead (Figure 7.9 left).

**Late Bronze Age**

The edible plant species from the Late Bronze Age included contexts from the sites Bovenkarpsel, Medemblik, Westwoud, and Hoogkarspel (*i.e.* total=23 samples). These species were, similar to the Middle Bronze Age, plotted with their respective frequencies of charred and uncharred seeds (Figure 7.10). Again, for clarity reasons, species are only referred to by their scientific name, rather than their English name.

It was expected that, conform Table 7.10, plants gathered for their seeds would be reflected by relatively high frequencies of charred seeds as well as uncharred seeds, whereas plants gathered for their vegetative parts would be reflected by low frequencies of charred seeds, and somewhat higher frequencies of uncharred seeds.

Figure 7.10 shows that indeed, several species with relatively higher frequencies of charred seeds than uncharred seeds were present, which were mostly the same as the species from the Middle Bronze Age. New plants in this group include *Rumex acetosella*, *Vicia hirsuta*, and *Phragmites australis*. All these species are therefore potentially collected for their seed.

Plants with higher frequencies of uncharred seeds still outnumber those of opposite characteristics, and these species would be characteristic of plants collected for their vegetative parts. Again, after consulting Table 7.8, it is clear that indeed many of the plants with these frequency characteristics are only collected for their vegetative parts (green boxes in Figure 7.10).

Similar to the MBA data, also in the LBA data some species are not behaving as expected, including *Prunella vulgaris*, *Hippuris vulgaris*, and *Glyceria fluitans*: the former two species are only collected for their vegetative parts, and show high(er) frequencies of charred seeds under wet conditions, whereas the latter is only collected for its seed, but does not yield any charred seeds.

Still, before assigning potential use to the plant species, it must be taken into consideration that not many samples were available for the LBA analysis and as such, differences observed in Figure 7.10 may be related to the low number of samples. Therefore, since it is assumed that the MBA and LBA are comparable in their species and gathering practices, both the Middle and Late Bronze Age data is combined and compared to Table 7.9 and Table 7.10 to elucidate potential plant use.

**Middle and Late Bronze Age compared**

The careful separate assessment of the two Bronze Age periods has brought to light several differences in preservation state and frequency of remains. Although many of the edible plants were present in both periods, it was possible to elucidate a potential use by comparing the Middle and Late Bronze Age data (Table 7.11). Each individual edible plant species was assessed for its prevailing preservation state and overall frequency in each of the periods, which was subsequently compared with Figure 7.9 and Figure 7.10 to estimate the likelihood for collection for either seed, vegetative parts, or a combination of both. In some cases, it was not possible to assign a potential use, due to the absence of data from the Late Bronze Age, which normally provides the deciding data between both uses. However, when the prevailing preservation state in the (dry) Middle Bronze Age was uncharred, collection for vegetative parts was presumed, regardless of whether Late Bronze Age data was available or not. In other cases, a mixed use was proposed, since the data reflected a mix of the expected values for the two uses. Finally, in cases where species behaved completely opposite of what was expected, another, different use than for consumption purposes was deemed likely. These particular species are further discussed in section 7.4.6.4.

The analysis of edible plant use has yielded several results. First of all, a total of 57% (*i.e.* 27/47 species) of the uncovered edible plants was most likely collected for their vegetative parts, which is very comparable to the ratios observed in Slovakia (58% edible species consumed for vegetative parts; Łuczaj 2012, 246). Although many species were known to be collected only for this purpose, also

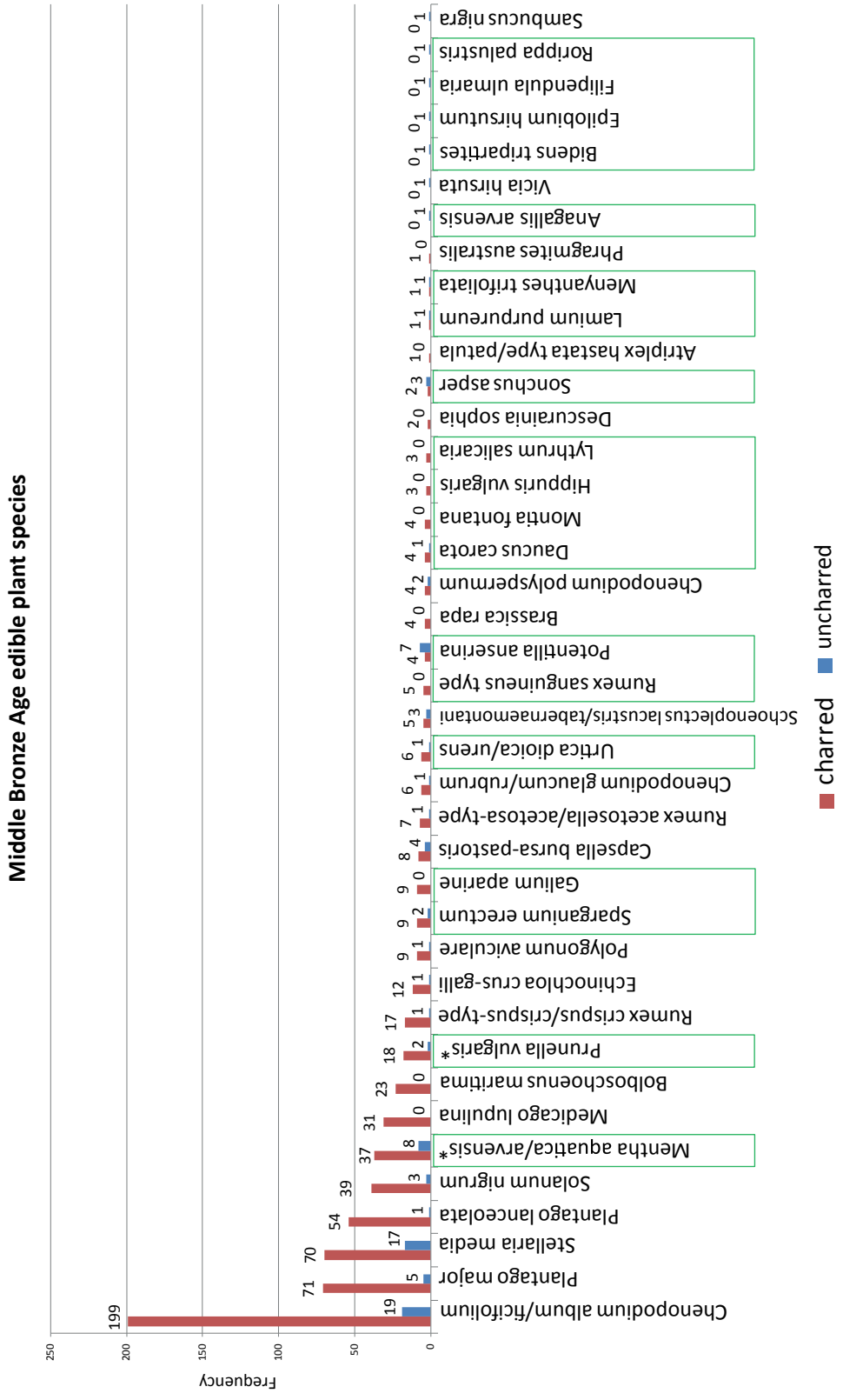


Figure 7.9. Frequencies of charred and uncharred seeds from combined edible plant species from Middle Bronze Age house contexts, from Bovenkarspel, Medemblik, Enkhuizen, and Westwoud. Green boxes denote plants collected for the consumption of their vegetative parts only (PFAF 2016).

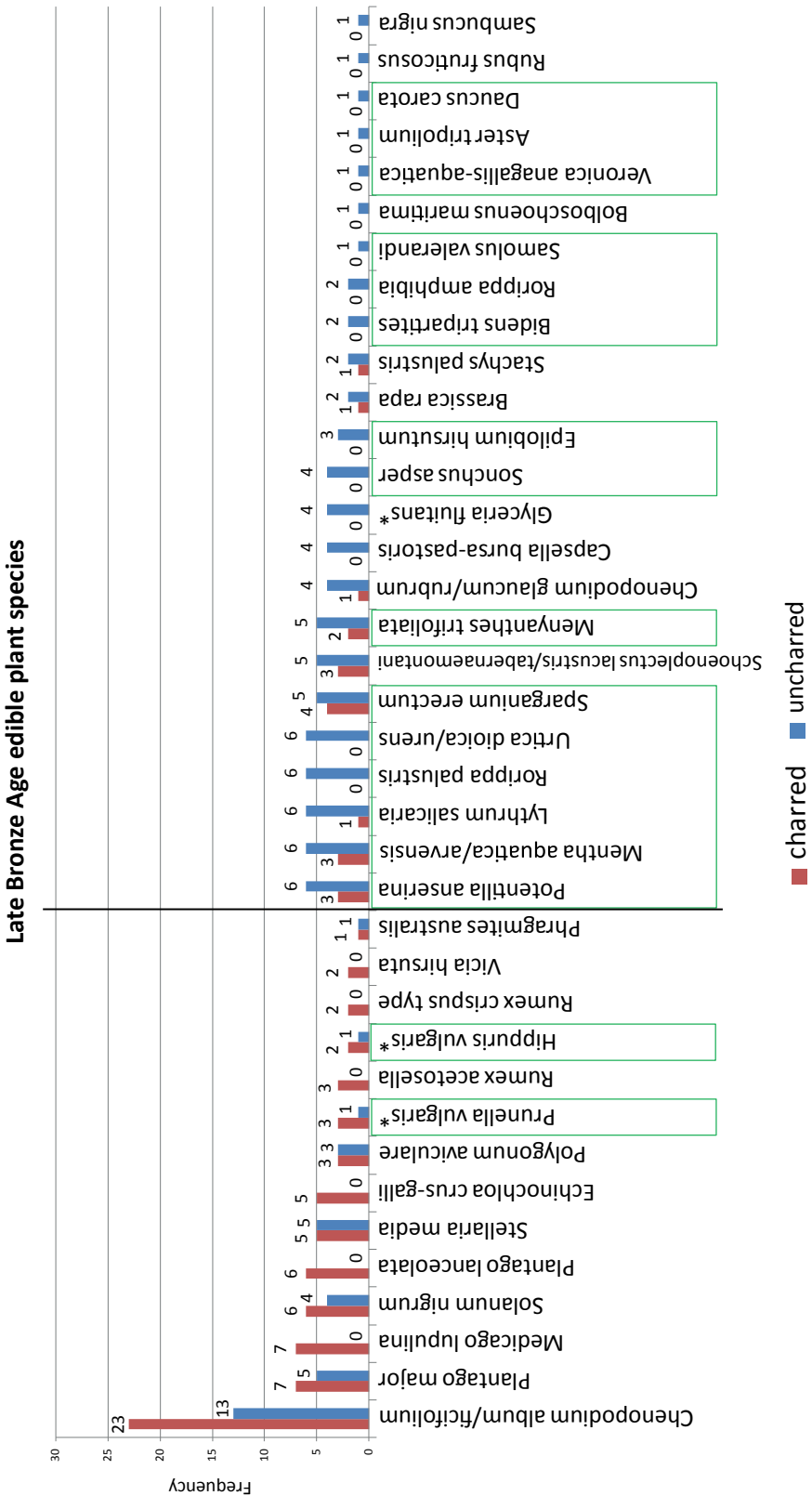


Figure 7.10. Frequencies of charred and uncharred seeds from combined edible plant species from Late Bronze Age house contexts, from Bovenkarspel, Medemblik, Westwoud, and Hoogkarspel. Green boxes denote plants collected for the consumption of their vegetative parts only (PFAF 2016).

Table 7.11. Edible plant use of species deriving from both Middle and Late Bronze Age house contexts. The elucidation of use was based on a comparison of the data in Figure 7.9 and Figure 7.10 with the expectation of prevailing preservation state and relative frequency of seeds (Table 7.9 and Table 7.10).

| | | Prevailing preservation state | | Relative frequency | | |
|---|---|---|---|---|---|---|
| **Taxa** | **English name** | **MBA** | **LBA** | **MBA** | **LBA** | **Potentially collected for:** |
| *Anagallis arvensis* | Scarlet pimpernel | uncharred | - | low | - | vegetative parts |
| *Atriplex hastata type/patula* | Hastate/Spreading orach | charred | - | low | - | cannot be determined |
| *Aster tripolium* | Sea aster | - | uncharred | - | low | vegetative parts |
| *Bidens tripartites* | Burr marigold | uncharred | uncharred | low | low | vegetative parts |
| *Bolboschoenus maritimus* | Seaside bulrush | charred | uncharred | medium | low | vegetative parts/ other use |
| *Brassica rapa* | Turnip | charred | uncharred | low | low | vegetative parts |
| *Capsella bursa-pastoris* | Shepherd's purse | charred | uncharred | low | medium | vegetative parts |
| *Chenopodium album/ficifolium* | Fat hen/Fig-leaved goosefoot | charred | charred | high | high | seed |
| *Chenopodium polyspermum* | Manyseed goosefoot | charred | - | low | - | cannot be determined |
| *Chenopodium glaucum/rubrum* | Oak-leaved/Red goosefoot | charred | uncharred | low | medium | vegetative parts |
| *Daucus carota* | Wild carrot | charred | uncharred | low | low | vegetative parts |
| *Descurainia sophia* | Flixweed | charred | - | low | - | cannot be determined |
| *Echinochloa crus-galli* | Barnyard grass | charred | charred | medium | high | seed |
| *Epilobium hirsutum* | Codlins and cream | uncharred | uncharred | low | medium | vegetative parts |
| *Filipendula ulmaria* | Meadowsweet | uncharred | - | low | - | vegetative parts |
| *Galium aparine** | Goosegrass | charred | - | low | - | other use |
| *Glyceria fluitans** | Floating manna grass | - | uncharred | - | medium | other use/local plant? |
| *Hippuris vulgaris** | Common marestail | charred | charred | low | low | other use |
| *Lamium purpureum* | Red/Purple deadnettle | equal | - | low | | vegetative parts |
| *Lythrum salicaria* | Purple loosestrife | charred | uncharred | low | high | vegetative parts |
| *Medicago lupulina* | Black medick | charred | charred | high | high | seed |
| *Mentha aquatica/ arvensis** | Water/Wild mint | charred | uncharred | high | high | vegetative parts/ other use |
| *Menyanthes trifoliata* | Bogbean | equal | uncharred | low | high | vegetative parts |
| *Montia fontana* | Water blinks | charred | - | low | - | cannot be determined |

| | | Prevailing preservation state | | Relative frequency | | |
|---|---|---|---|---|---|---|
| **Taxa** | **English name** | **MBA** | **LBA** | **MBA** | **LBA** | **Potentially collected for:** |
| *Phragmites australis* | Common reed | charred | equal | low | low | mixed |
| *Plantago lanceolata* | Ribwort plantain | charred | charred | high | high | seed |
| *Plantago major* | Common plantain | charred | charred | high | high | seed |
| *Polygonum aviculare* | Knotweed | charred | equal | low | medium | mixed |
| *Potentilla anserina* | Silverweed | uncharred | uncharred | low | high | vegetative parts |
| *Prunella vulgaris** | Self-heal | charred | charred | medium | medium | other use |
| *Rorippa amphibia* | Great yellow cress | - | uncharred | - | low | vegetative parts |
| *Rorippa palustris* | Yellow marsh cress | uncharred | uncharred | low | high | vegetative parts |
| *Rubus fruticosus* | Blackberry | - | uncharred | - | low | vegetative parts/ raw fruit |
| *Rumex acetosella/ acetosa*-type | Sheep's/Garden sorrel | charred | charred | low | medium | seed |
| *Rumex crispus/ crispus*-type | Curly dock | charred | charred | medium | low | seed |
| *Rumex sanguineus* type | Red-veined dock | charred | - | low | - | cannot be determined |
| *Sambucus nigra* | Elderberry | uncharred | uncharred | low | low | vegetative parts/ raw fruit |
| *Samolus valerandi* | Brookweed | - | uncharred | - | low | vegetative parts |
| *Schoenoplectus lacustris*/ssp. *tabernaemontanii* | (Great) bulrush | charred | uncharred | low | high | vegetative parts |
| *Solanum nigrum* | Black nightshade | charred | charred | high | high | seed, fruit |
| *Sonchus asper* | Prickly sow thistle | uncharred | uncharred | low | medium | vegetative parts |
| *Sparganium erectum* | Bur reed | charred | uncharred | low | high | vegetative parts |
| *Stachys palustris* | Marsh woundwort | - | uncharred | - | low | vegetative parts |
| *Stellaria media* | Chickweed | charred | equal | high | high | mixed |
| *Urtica dioica/urens* | Stinging/Annual nettle | charred | uncharred | low | high | vegetative parts |
| *Veronica anagallis-aquatica* | Water speedwell | - | uncharred | - | low | vegetative parts |
| *Vicia hirsuta* | Hairy tare | uncharred | charred | low | low | seed |

Green emphasis in left column: plants solely collected for their vegetative parts; MBA: low=present in less than 10 samples, medium=present in between 10 and 25 samples, high=present in more than 25 samples; LBA: low=present in less than 3 samples, medium=present in between 3 and 5 samples, high=present in more than 5 samples; *=plant which does not behave according to the expectation (cf. section 7.3.3) and will probably have been used for reasons other than consumption.

some species were present of which the seeds are also edible. These species include *Bolboschoenus maritima*, *Brassica rapa*, *Capsella bursa-pastoris*, *Chenopodium glaucum/rubrum*, *Schoenoplectus lacustrus/ssp tabermontani*, and *Stachys palustris*. Apparently, these species were not (specifically/ only) gathered for their seed, but rather for parts including the leaves, roots, and stems (Table 7.8).

The edible fruit-bearing species *Rubus fruticosus* and *Sambucus nigra*, show indications for being collected for their vegetative parts, but can also be considered to have been exploited for a combination of their vegetative parts and raw fruit: since the seeds of consumed raw fruit are not specifically targeted during collection (cf. section 7.3.3), they can, in a way, be regarded as being collected as vegetative parts.

*Solanum nigrum* on the other hand, which also bears edible fruits, does portray high frequencies of charred seed remains. When comparing this observation with the online ethnobotanical database, it becomes clear that berries from this plant should not be consumed raw, but only cooked (PFAF 2016). Most likely, the seeds of *Solanum nigrum* arrived at the settlement through the collection of berries, but had a higher chance of becoming preserved in charred form than the other fruit-bearing plant species, as fire is required for their processing.

Only nine species from Table 7.11 (*i.e.* 19%) are suggested as being collected just for their seed. These species include *Chenopodium album/ ficifolium*, *Echinochloa crus-galli*, *Medicago lupulina*, *Plantago lanceolata*, *Plantago major*, *Rumex acetosella/acetosa-type*, *Rumex crispus/ crispus-type*, *Solanum nigrum*, and *Vicia hirsuta*. Although the seeds of some of these species can also be consumed raw, most seeds need to be cooked before consumption, such as those of *Echinochloa crus-galli*, *Medicago lupulina*, *Plantago lanceolata/ major*, and *Vicia hirsuta* (PFAF 2016), underlining their high chance of charred preservation.

A final three species from Table 7.11 show mixed signals, showing no clear preference for the collection of seeds or vegetative parts. Although this may be regarded as an actual mixed use for consumption, it could also be that collection for consumption and other uses may be both reflected here, for example of the species *Phragmites australis*, or reed. The use of these species is further investigated in section 7.4.6.4.

The relatively low number of wild species collected for their seeds in comparison with other plant parts can be explained by the fact that most of the nutrients and other properties of these seeds were already present in the cultivated cereals at the settlement. There is therefore no clear indication of the need to gather many species for this plant part, except perhaps for when cereal stores were depleting or food was scarce in general. A similar trend was observed in Poland, where the number of collected wild green plants for consumption decreased after the introduction of cultivated vegetables (Łuczaj 2010, 400-1): people collect what they cannot produce themselves. The essential nature of the collection of vegetative plant parts for the diet of a Bronze Age farmer is further explored in Chapter 8.

*7.4.2.2 Gathering practices*

The exact manner in which wild plant gathering occurred cannot be reconstructed based on the data available. Therefore, it is assumed that collecting was practiced in a similar manner to the other farming communities researched in the ethnobotanical parallels (cf. section 7.3.2). This means that, in order to be combined with other farming activities, gathering would most likely have occurred on a regular basis (every 3-5 days), probably for a few hours in the early morning or evening. The distance travelled from the settlement will be no further than 1.5 km away.

Since the materials required for the collection of wild plants are few and often perishable, these are not (recognisably) uncovered at West Frisian settlements. However, in one instance, evidence for basketry was uncovered in West Frisia (section 7.4.6.4), indicating that the means for gathering wild plants were available. Ironically, the evidence for basketry is of course in itself also evidence for the collection of wild plants.

### 7.4.3 Processing

Section 7.4.2 has indicated that wild plants were probably collected for consumption, but no clear indications for the processing of wild plants have (yet) been uncovered in West Frisia. However, many food crusts have been recognised in West Frisian ceramics, which might be analysed to investigate the use of wild plants for consumption (cf. section 7.4.1). Future analysis on these valuable sources of information should shed light on edible wild plant use in the West Frisian Bronze Age.

Another factor which limits the information on wild plant processing in West Frisia is the absence of the original Bronze Age surface, which means that hearths and rich in-house contexts are no longer present. Such contexts may provide insight into locations within the house where processing occurred, and systematic sampling of house contexts can be employed to identify possible activity areas within or around houses (Grabowski & Linderholm 2014). Finally, since no charred dried fruits specimens have been uncovered, the analysis of processing for long-term preservation could also not be completed.

Still, the different preservation states and uses of plants from Table 7.11 indirectly indicate that plants would have been processed by a range of different methods (PFAF 2016).

### 7.4.4 Storage

Pure concentrations of wild plant seeds were not uncovered or recognized in West Frisia. However, since it is assumed that a minority of wild plants were gathered for their seeds, due to the presence of cultivated cereals, the chance of finding such concentrations is not deemed high. Therefore, it is unclear whether storage of wild plants occurred here in the Bronze Age. The further near-absence of nuts and absence of charred fruits means that storage of seeds and fruits in general could not be established. Storage of dried vegetative parts is even harder to identify, due to taphonomic processes. Drying vegetative parts may be performed for later use of the plants, but this does affect the critical micronutrient composition (Chapter 8). Furthermore, storage needs to occur at sufficiently low and constant temperatures to prevent sprouting and decay (Calverley 1998, Chapter 3), which may not have been possible throughout the year in the Bronze Age houses. It is therefore more likely that wild plant parts were collected and consumed within a relatively short time after gathering, which is consistent with the ethnobotanical parallels (*e.g.* Ertuğ 2000).

### 7.4.5 Summary

In this chapter, the role of wild plant gathering for subsistence was reconstructed based on an analysis of all the different activities related to this practice. Research into the preparatory stages for gathering has revealed that many different locations surrounding the settlements were exploited based on the growing locations of edible wild plants which were found in house contexts. Both dry and wet areas were visited, and these locations were comparable for the Middle and Late Bronze Age. The seasonality of gathering could not be directly established, since only remains of seeds and fruits are usually preserved, which would indicate that gathering only occurred in autumn. Based on other indications and taphonomical considerations however, it could be concluded that gathering would most likely have occurred throughout the year, not just when fruits and nuts are available.

Gathering itself was analysed by first investigating which plants found in house ditches could have been collected for consumption. For this purpose, all plant species from these contexts were analysed for their edibility as well as their concurrence in species lists of ethnobotanical studies on farming communities. Once it was established which plants were possibly consumed, further research into the edible use of these species was undertaken. The potential edible uses of the West Frisian plants could be proposed by comparing the relative frequency and prevailing preservation state of the edible plants from Middle and Late Bronze Age house contexts with the expected values for different edible uses (*i.e.* for seed or vegetative parts). Of the total number of uncovered West Frisian edible species (n=55), 57% was potentially collected for their vegetative parts, 19% for their seed, 15% for either mixed use or a use other

than for consumption, and a final 9% could not be attributed based on the available data. The relatively low number of species collected for their seed seems at first surprising, but is in fact in agreement with observations made in recent farming communities. Here, wild plants were only collected for specific properties when these parts were unavailable in cultivated form. Since cultivated staple cereal food was available in West Frisia, the collection of wild plants for their seed was most likely less required than for example for their vegetative parts, since the cultivation of vegetable plants is not assumed for this time period. The manner in which gathering occurred exactly could not be investigated in detail, because this practice leaves few traces: both gathering tools as well as most gathered plant parts perish easily. Therefore, it was assumed that gathering practices were comparable to the investigated ethnobotanical parallels. Gathering would occur on a near-weekly basis and this activity would last for a few hours. The distance travelled to collect wild plans would probably be no further than about 1.5 km from the settlement. Processing and subsequent storage of wild plant remains could also not be established due to the lack of appropriate data. Furthermore, it unlikely that storage (of especially vegetative plant parts) for consumption played a major role in the West Frisian Bronze Age, because of an absence of adequate storage conditions for these plant parts, as well as the decrease in critical micronutrients after drying. After taking the differential taphonomic effects on plants collected for different edible uses into consideration, it has become apparent that an absence or low frequency of seeds preserved in charred form does not signify that wild plant gathering played no role in the Bronze Age. Instead, low frequencies of charred seeds preserved under dry conditions, in combination with relatively high frequencies of uncharred seeds preserved under wet conditions may indeed indicate collection of plants for parts other than seeds. The collection of plants for parts other than seeds may, although nearly invisible in the archaeobotanical record, have formed one of the most important additions to the Bronze Age subsistence, which will become apparent in the next chapter.

### 7.4.6 Discussion

#### *7.4.6.1 Methodology*

An attempt was made to recognize differences in wild plant composition in order to identify possible activity areas within a house (data not shown). However, the employed data derived from samples which were not taken systematically in the field, which meant that the differences observed based on the analysis could not be safely regarded as actual differences due to past practices. Therefore, to enable such analyses in the future, the main methodological aspect which would aid the research towards the use of wild plants in and around the house, which has scarcely been adopted for this area and time period, is the systematic sampling of house contexts.

Species from such samples can be analysed for their uses in order to find areas related to activities within or around a house.

Besides house contexts, it has become clear that not all activities related to subsistence are practiced in or directly next to the house. Some activities (section 7.4.6.4) require wet conditions, and the remains of rope making and basketry found in a deep pit not associated with a house context indeed indicate that some activities may be missed when the focus is only on house contexts. Especially contexts which can be assumed to have been permanently wet since the Bronze Age could be valuable sources of organic material, as well as possibly provide more direct evidence for the use of wild plants.

The consumption of wild plants in West Frisia in the Bronze Age needs to be established in more detail. By for example analysing the food crusts which are often observed on West Frisian pottery by the techniques applied by Kubiak-Martens and Oudemans, more insight can be gained into gathering practices, seasonality and consumed wild plants and their parts (*e.g.* Kubiak-Martens & Oudemans 2011).

#### *7.4.6.2 Taphonomy*

Taphonomical impact on wild plant assemblages have been extensively discussed in the main text.

Therefore, only a short summary of the effects of taphonomy and on the subsequent interpretation of uncovered remains is provided here.

**Why wild plants are invisible**

Although often interpreted as (crop) weeds, this chapter has shown that the virtues of wild plants lie far beyond this condescending connotation. Wild plants are however, present as a minority of plant remains in charred assemblages in the Bronze Age. Their reduced visibility in comparison to previous periods is usually related to a low importance of gathering and gathered plants for subsistence during this time.

It seems that the effects of taphonomy are not taken into adequate consideration for this conclusion. Besides the fact that not all seeds are preserved in a similar manner (Colledge & Conolly 2014, 194 and references therein), it should also be realised that plants collected for different reasons and during different times may not be reflected in a comparable manner in the archaeobotanical record either (cf. section 7.3.3). Plants collected for parts other than seeds will *always* be underrepresented: they are normally collected during times when plants do not bear seed, and their processing often does not require the use of fire. When only charred assemblages are available, many collected wild plant species will not be found, and subsequent analysis will most likely be performed on an incomplete range of wild plants. The reduced possibility for preservation of vegetative plant parts during the Bronze Age, combined with the reduced nutritional value of plants after preservation, means that these plants are often consumed directly after collection. Possible storage of seeds or dried fruits is possible, but evidence for these practices is yet to be uncovered in West Frisia. In addition, the availability of staple cereal grains reduces the necessity of the collection of wild plant seeds and subsequent storage, further reducing visibility.

Rather than immediately interpreting low frequencies of wild plant seeds as unimportant for subsistence, the above taphonomical processes should be taken into consideration first. When this is completed, the role of wild plant gathering can truly be concluded for Bronze Age farming communities.

*7.4.6.3 Possible selection criteria for consumption*

Very few inedible species were found in house ditches. Of the 101 different plant species uncovered in the house ditches, only 12 were deemed inedible (*i.e.* edibility score of 0; PFAF 2016). Due to taphonomy, it is hard to compare the frequency of remains with preference for certain plants, since most parts/species will not have preserved. Possible specific selections of wild plants for consumption, and their role in the human diet in general is further explored in Chapter 8, section 8.3.1.

*7.4.6.4 Other reasons for wild plant gathering*

Besides consumption, several other reasons for wild plant collecting exist. From the study of Ertuğ's work (2004, 165) it has become clear that 58% of all wild plants collected in Turkey are collected for other reasons than for consumption. The range of other uses of wild plants is shortly discussed below, mainly based on the study of Ertuğ's work. After this summary of known uses, indirect and direct indications for the use of wild plants in the Bronze Age are presented, and, where possible, also for in West Frisia.

**Uses known from ethnography**

**Medicine**

Medicinal plant use is a practice seen in many cultures through the ages. In the research, plants used for medicinal purposes form the second largest group (Ertuğ 2000, 177 and references therein; Ertuğ 2004, 165) after plant used for food. Ertuğ indicates that many plants used for nutritional purposes also have medicinal properties (*i.e.* 25-35%) and that in fact, often no distinction is made between food and medicine. Clearly, health and food are very closely related. It was noted however, that people separated the plants with medicinal use from those kept for food, even if the same species could be used for both purposes. Plants gathered for the treatment of livestock have also been reported in several instances (*e.g.* Ketzis *et al.* 2002; Ertuğ 2004, Table 3; Jeruto *et al.*2008; Tadesse *et al.* 2014). Although these particular species are not native to north-western Europe, it does show that wild plants can also be employed for aiding animal husbandry practices.

**Fuel**
Plants, especially wood, are often collected for fuel, including plants used as tinder. Again, species used in Turkey are dissimilar from plants in north-western Europe (cf. Ertuğ 2000), but still it can be expected that several species of local plant were collected in West Frisia for tinder as well.

**Oil**
Only two plants in Turkey were used for (lamp) oil of which one is linseed, and the other a local oil-containing plant (Ertuğ 2000, 180). Other wild plants applicable for the extraction of oil can include for example several species of mustard plant.

**Animal fodder**
In Turkey, cultivated fodder plants include barley, oats, and vetch. Forty-one species used as animal fodder were also used for human consumption, but different parts of the plant were collected at different times of the year as fodder for animals. Some wild plants used for fodder were cut in the summer and autumn, when plants are seed-bearing. Some of these were stored as winter fodder, such as prickly sow thistle (*Sonchus asper*).

For more northern latitudes, historical sources from Canada also describe a list of more than 60 different species used as fodder plants (Clark & Malte 1913).

**Raw material**

Matting
Plants used for making mats include reed (*Phragmites australis*) and bulrush (*Typha* spec.) in Turkey (Ertuğ 2000, 177).

Basketry
Wild plants used for basketry include water-bordering plants such as bulrushes, rushes, and sedges, and tree and shrub species including willow, hazelnut, birch, and oak (Ertuğ 2000, 177).

Rope
Some plants in Turkey were used to create rope. However, it is unclear from the publications exactly which species were meant (Ertuğ 2004, Table 3).

Building material
The construction of a house generally requires wood. In Turkey (Ertuğ 2000, 180), almost all available trees were used as building materials. Furthermore, reed can be used for the thatching of roofs.

**Dye**
Several species of plant are known to be collected for their dyeing properties. In Turkey, ten wild plant species were collected for this reason (Ertuğ 2000).

**Social/ritual**
Ertuğ (2000, 180) has indicated that several plants can be used in ritual and social context (*i.e.* use as amulet, incense, musical instrument, or (children's) game).

**Indirect indications for wild plant use in the Bronze Age**
In the Bronze Age, nearly everything required construction by the farmers themselves. It can therefore be expected that wild plants for other uses than consumption may have been even more important to Bronze Age farmers than in recent farming communities. Indirect indications for the other uses of wild plants listed above were investigated for the West Frisian data based on the online ethnobotanical database (PFAF 2016). All the different uses were noted of each species present in the house contexts of both the Middle and Late Bronze Age. These uses were then summarized for each time period, including charred and uncharred seeds, and are shown in Figure 7.11 and Figure 7.12.

Most indirect indications for other uses are similar to the known uses based on the research of Ertuğ. However, also some new uses were observed, including for soap, a source of tannin, hygiene/teeth cleaning, textile fibre, preservative, and repellent.
The most often encountered uses in the Middle Bronze Age house contexts include medicinal, dye, thatch, soap, and bedding, followed by several other uses in lower frequencies.

In the Late Bronze Age, main uses reflected are similar to the Middle Bronze Age, but repellent and tannin are now more frequent.

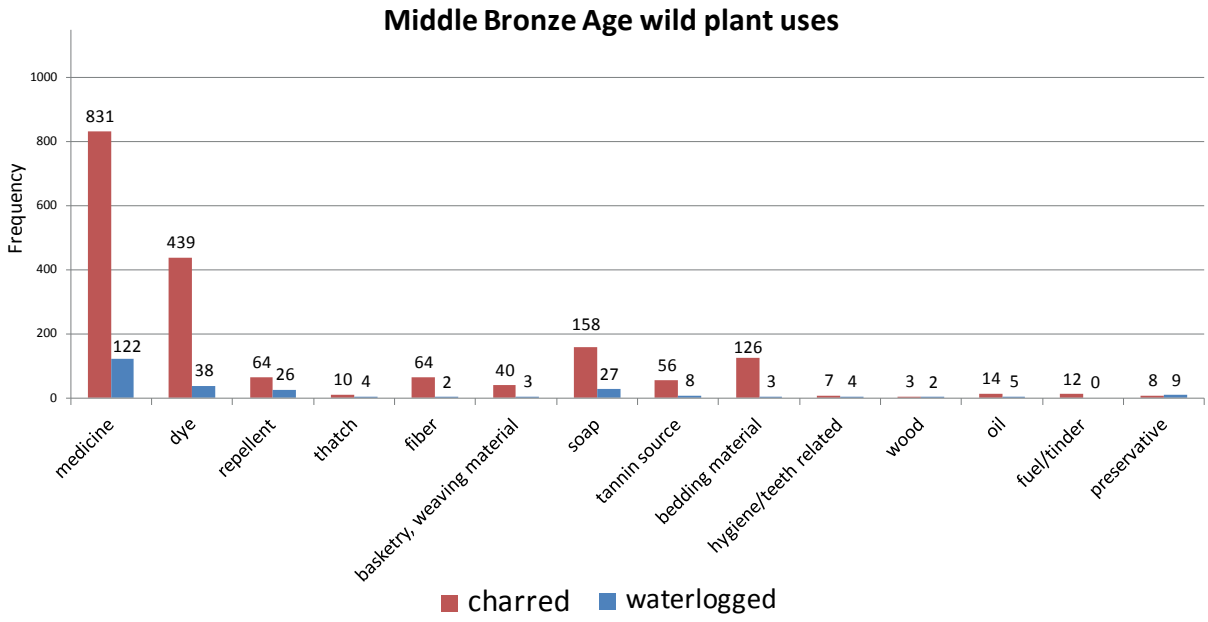


Figure 7.11. Frequencies of wild plant uses from the West Frisian Middle Bronze Age house ditches.

Differences in uses observed between the Middle and Late Bronze Age may, as was also mentioned for consumption (section 7.3.3), be related to prevailing preservation conditions and plant part used. Similar assumptions may therefore be postulated for other uses of wild plants. When, during the particular use of a plant, seeds are present, this use will be represented by relatively high frequencies of seeds. Along the same line of reasoning, when only vegetative parts of a plant are required for certain activities, these will be represented by low frequencies of seeds. Under wet preservation conditions furthermore, these latter uses will be better represented by uncharred seeds rather than charred seeds.

These assumptions seems to be confirmed by what is observed in Figure 7.11 and Figure 7.12. Uses which do not require the use of fire, such as teeth cleaning, the use of tannin for creating leather, and repellent, are much better represented by uncharred seeds in the Late Bronze Age contexts. Other uses, such as thatch and bedding, are better represented by charred seeds in both periods. Most species used for bedding include members of the sedge (*Carex*) family. The seeds of these plants are inedible and may have become charred when old bedding was ultimately used for fuel. Plants used for medicinal purposes, dyeing, and soap may have been used in their entirety, since (relatively) many seeds were uncovered, although most were preserved in uncharred state. The uses wood and thatch are scarcely represented. This near-absence can be explained by the fact that seeds/nuts of trees are not attached during building construction. Several species of tree were however found in West Frisia in the form of preserved wood itself (see direct indications for wild plant use in the Bronze Age below). The near-absence of thatch based on wild plant species may be explained by the fact that cultivated crop residue is equally applicable for thatching and this may indeed have been applied in West Frisia. Basketry and weaving, as well as plants used for their fibres are not represented well either, and this may be the result of the fact that water is required during these activities. The remains of rope making and basketry in a deep pit indicates that this activity was most likely not performed in or around the house (see below). The same may be assumed for the retting (*i.e.* forced rotting in water) of plants for the release of their fibres. Seeds of oil plants are almost exclusively preserved in uncharred form, which is logical, since oil-containing seeds completely burn after contact with fire rather than being preserved in charred state (Chapter 6, section 6.4.8.2).

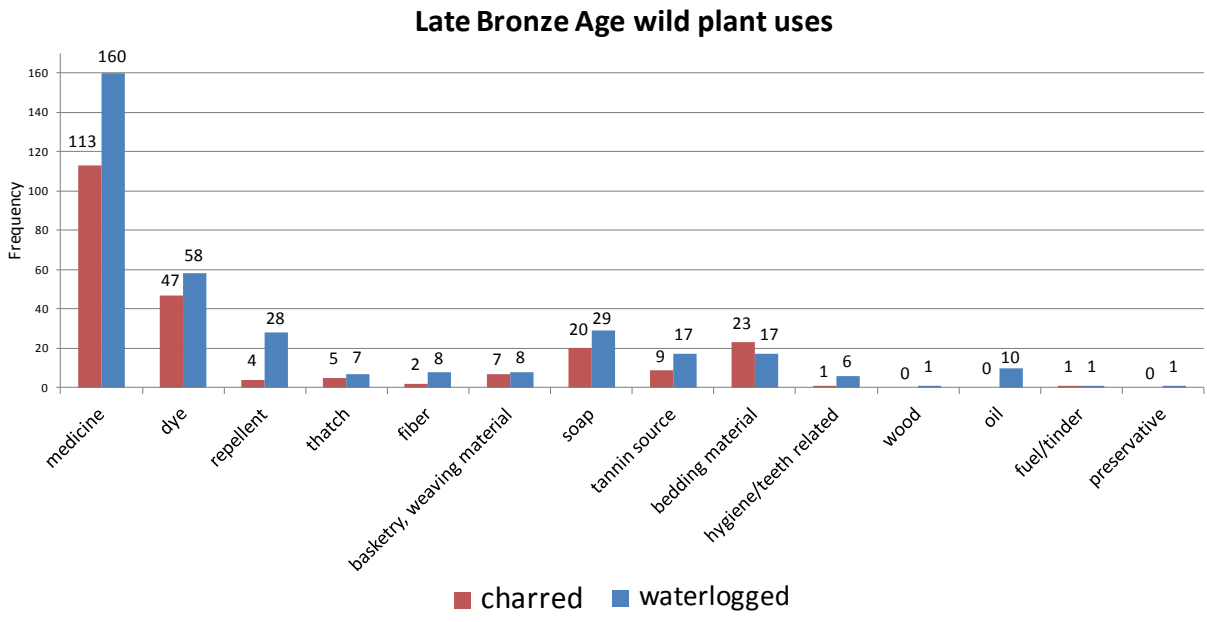


Figure 7.12. Frequencies of wild plant uses from the West Frisian Late Bronze Age ditches.

Overall, the analysis of indirect indications for different uses of wild plants has yielded a wide array of possibilities. Clearly, based on the assemblages within house contexts, activities related to the use of raw material of wild plants did exist. Direct indications for these activities are further explored below.

**Direct indications for wild plant use in the Bronze Age**

Direct evidence for other uses of wild plants were sought first and foremost in the West Frisian data. In some instances, examples from the Bronze Age in general were provided as well. Results are summarized in Table 7.12 and are also shortly discussed separately.

The different possible uses are based on the ethnobotanical online database (PFAF 2016) and an ethnobotanical study in Turkey (Ertuğ 2000). Only in cases where direct evidence for a use in Europe is rare, an exemplary reference is given; for West Frisia, all possible direct evidence is listed.

**Medicine**

It is very hard to incontestably establish the use of plants solely for medicine through analysis of archaeological evidence. However, it is assumed wild plants have been used medicinally in the Bronze Age, since medicinal plant use has been recorded in nearly every period thereafter, and even by animals such as chimpanzees and other higher primates (Sumner 2000; Engel 2002).

**Fuel**

All charred remains from West Frisia have of course been in contact with fire, but they were probably not all used as fuel. At Bovenkarspel, several pieces of wood have been uncovered, most of which were charred. Tree species include alder, birch, hazel, ash, pine, poplar, oak, willow, and elm (cf. Chapter 2, Figure 2.6). In the Late Bronze Age, only alder, willow, and birch wood have been found in charred form, indicating a wetter landscape than in the Middle Bronze Age, but still allowing enough wood for fuel.

**Oil**

Oil use has been established for the Bronze Age in general (Kučan 2007), but there were are no clear indications for the use of oil in West Frisia.

**Animal fodder**

Although no clear dung layers were found in West

Table 7.12. Overview of the direct indications of other uses of wild plants (excl. medicinal use) from Bronze Age Europe and West Frisia.

| Use | | | References |
|---|---|---|---|
| **Raw material** | **Europe** | **West Frisia** | |
| Matting | yes | yes | Richmond *et al*. 2010; Besteman 1979, 218 |
| Basketry | yes | yes | Jones et al. 2014; van Iterson Scholten 1977, 137; Bakker *et al.* 1968, 198 |
| Rope | yes | yes | Pryor 2002, 244; van Iterson Scholten 1977, 136 |
| Building material | yes | yes | Kooistra 2010, 138 |
| Textile fibre | yes | no | Bergfjord *et al.* 2012 |
| **Miscellaneous** | **Europe** | **West Frisia** | **References** |
| Fuel | yes | no, but likely | |
| Animal fodder | yes | no, but likely | Karg 1998 |
| Oil | yes | no | Kučan 2007 |
| Dye | yes | no, but Dutch Bronze Age examples exist | Hofmann-de Keijzer *et al.* 2005; Greimer, unpubl.; Joosten & van Bommel 2015 |

Frisia which could have provided insight into consumed plants by livestock, several plants were found that are known from historical sources to have been used as fodder (Clark & Malte 1913). These plants are summarized in Table 7.13. Besides these plants mentioned in old Canadian records, many more could undoubtedly have been used as fodder, such as prickly sow thistle (*Sonchus asper*). Therefore, Table 7.13 is only an indication of the richness of fodder plants available in West Frisia.

Although not exactly fodder, bait for hunting purposes could also have been a reason to collect certain wild plants. The species used for this purpose can however, be so general in nature, that it was not possible to identify them with certainty in West Frisia.

**Raw material**

Matting

The plants indicated for making mats in Turkey – reed and bulrush – have both been uncovered in West Frisia, with reed being the most common. In Medemblik Oude Haven, also a platform of alder branches was found, covered by a secondary wicker work (Besteman 1979, 218).

Basketry

At Hoogkarspel, evidence for basketry is found in the form of a basket fragment, and several remains of raw material found at the bottom of pit, suggesting a work place for practicing basketry (van Iterson Scholten 1977, 137; Bakker *et al.* 1968, 198; Figure 7.13).

Rope

Evidence for rope production is found in Hoogkarspel

Table 7.13. Potential fodder plants uncovered in West Frisia.

| Taxa | English name |
|---|---|
| *Agrostis stolonifera** | creeping bent |
| *Echinochloa crus-galli* | barnyard millet |
| *Festuca arundinacea*-type | tall fescue |
| *Lolium perenne* | perennial ryegrass |
| *Medicago lupulina* | black medick |
| *Panicum miliaceum* | European millet |
| *Phalaris arundinacea* | reed canary grass |
| *Phleum pratense* | timothy |
| *Poa palustris* | swamp meadow grass |
| *Poa pratensis* | smooth meadow grass |
| *Poa pratensis/trivialis** | smooth/rough meadow grass |
| *Trifolium repens** | white clover |
| *Vicia faba* var. *minor** | tick bean |
| *Vicia sativa* ssp. *angustifolia* | narrow-leaved vetch |

*=plant not uncovered specifically in house context

(van Iterson Scholten 1977, 136; Figure 7.14) in the same pit where the basketry remains were found. Wood, bast, chips, and fibres were found alongside the unfinished rope products which together measured 88 cm. This rope shows that the knowledge to construct nets for hunting purposes was present in West Frisia.

Building material

Wood and plants for thatching have been uncovered in West Frisia. In Medemblik, two rare pieces of alder wood were found in post holes of a house, indicating their use as building material (Kooistra 2010, 138). In general, remains of construction wood are very rare in West Frisia. However, it is not possible to directly reconstruct whether plants were used for thatching and which species these may have been.

Material to create tools would also have consisted mostly of wood, but no clear tools have been uncovered in West Frisia so far. The ard marks present at many sites in West Frisia (Chapter 6) however, show that ards were present, which were probably made out of wood.

**Textile fibre**

It has recently become clear from a find in Denmark that stinging nettle (*Urtica dioica*) was used in the Bronze Age to produce textiles from its fibre (Bergfjord *et al.* 2012). This shows that not only cultivated fibre plants were used in the production of textiles. No evidence for textile is known from West Frisia, which may be the result of it not being recognised during excavations. Although textile fibre plants have been found, such as stinging nettle and ribwort plantain, no clear indications for the production of textiles could be ascertained.

**Dye**

Prehistorically, various plants are known to have been used in dyeing textiles, as evidenced by the analyses on Bronze and Iron Age textiles from Hallstatt, Austria (Joosten *et al.* 2006). However, only plants cultivated for dyeing in later time periods (*i.e.* Middle Ages) are used as a reference, so the various unknown dye components visible in these textiles may have derived from previously unknown wild dye plants (pers. comm. M. van Bommel). In Drenthe, the Netherlands, the use of the blue dye plant woad (*Isatis tinctoria*) (Geimer, in prep.) as well as an unknown yellow dye plant (Joosten & van Bommel 2015) has been established on woollen textiles connected to the yarn balls and the Emmer-Erfscheidenveen bog body clothing, both dating to the Bronze Age (Appendix A1.4; Chapter 8, section 8.3.2). Surely, similar dying plants would also have been available to the West Frisian people.

Several potential dye plants have been uncovered in West Frisia. Assuming people in West Frisia also used wool to create textiles, several plant species could have been used for dyeing blue, purple, pink, red, yellow, green, brown, and black (Chapter 8, section 8.3.2).

Figure 7.13. Remains of basketry (left) and raw material (right) uncovered in a deep pit at Hoogkarspel; scale 1:2 (from: van Iterson Scholten 1977, 38).

**Social/ritual**

No clear indications for these uses were identified in West Frisia.

**Miscellaneous uses**

Besides the uses indicated above, plants used as insect repellent have also been found. These plants could have been used to repel insects from domestic animals, people, and stored food, which is still common practice in many small farm holdings today (*e.g.* Payne 2002).

**Edible plants rejected for consumption**

The plants which did not follow the expected pattern for consumption, were assessed for their other uses. Goosegrass (*Galium aparine*) has uses such as fuel/tinder, or dye; water/wild mint (*Mentha aquatica*/*arvensis*) can be used as repellent; and self-heal (*Prunella vulgaris*) can also be used asdye. Common marestail (*Hippuris vulgaris*) and floating manna grass (*Glyceria fluitans*) however, have no apparent other uses. Upon closer inspection, it has become apparent that common marestail is best harvested for consumption from autumn to spring, even though the vegetative parts are consumed either cooked or raw (PFAF 2016). This means that seeds may have arrived with the harvested plant and become charred in that manner. Alternatively, this plant has mild medicinal properties which may have been the reason for collection. Floating manna grass surprisingly has no known other uses (PFAF 2016). The presence of many uncharred seeds in house

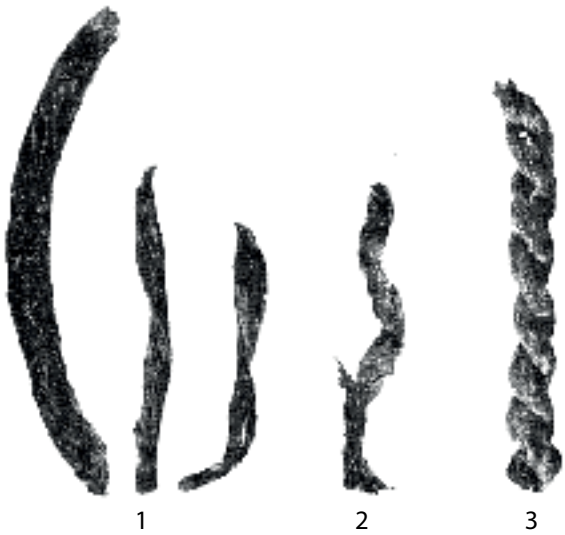


Figure 7.14. Remains of rope making uncovered in a deep pit at Hoogkarspel; 1: unfinished rope pieces; 2: single-ply rope; 3: two ply rope; scale: 1:2 (from: van Iterson Scholten 1977, 136).

contexts may therefore be explained by the fact that this plant may have grown locally in the Late Bronze Age ditches, releasing its seeds into the water, where they are ultimately preserved in uncharred form.

## 7.5 RECONSTRUCTION OF WILD PLANT GATHERING

### 7.5.1 Individual proxy contributions to the reconstruction of wild plant gathering

Every chapter so far has greatly benefitted from the application of ethnographical studies and this chapter is no exception. This research field has enabled the recognition of the contribution of wild plant gathering to the subsistence of small-scale mixed subsistence farmers, regardless of geographical location or climate. Ethnobotany has enabled a more detailed understanding and expectation of the gathering and use of wild plants, both for consumption purposes, as well as other reasons. These other purposes of wild plants, including fuel, oil, animal fodder, and raw material for the production of various tools and equipment, have firmly established the importance of wild plants for the fulfilment of basic needs that surpass consumption. Based on an online ethnobotanical database, it was possible to establish these possible uses of the different plants found in West Frisia as well. Ecological information on the preferred growing locations of edible wild plants uncovered from house contexts has provided insight into the places visited by Bronze Age people to collect plants for consumption. Archaeology finally, has both provided an overview of expected edible species present in prehistory, as well as direct indications in West Frisia for the use of plants for consumption and raw material.

The approach of this chapter was to view wild plant gathering from multiple perspectives with the use of several disciplines. The combination and integration of these proxies has once again produced new results and a more detailed understanding of the role and praxis of wild plant gathering in mixed farming subsistence. Moreover, the approach has resulted in the recognition of the different processes affecting the visibility of gathering as a practice. By taking these effects into account during interpretation, gathering of wild plant species has been revealed as a probable, and even integral part of life in the Bronze Age, which would not have become apparent when considering only one discipline.

### 7.5.2 Assessing previous main components

It is apparent from the previous section that the approach applied in this chapter has yielded many new results. Both the role and praxis of wild plant gathering in Bronze Age West Frisia has been established. In this section, the validity of the main components of the previous model are evaluated through a comparison with the new results.

Main component 1 was formulated as follows:

(1) People started to live with their backs towards nature in the Bronze Age.

Based on the analyses of the different activities related to wild plant gathering, including preparation, gathering itself, and processing, is has become clear that people must have possessed a vast knowledge of their surroundings and the different plants available in it. The different growing locations of plants, the knowledge of their availability throughout the year, and their different uses further attests to the fact that people knew what they were doing. Similar results were obtained in Chapter 4 on hunting, which means that main component 1 is in need of reformulation:

(N1) People lived together with nature in the Bronze Age, exploiting it for what they required to aid their subsistence.

Main components 2 was formulated as follows:

(2) Bio-resources play a very restricted role in Bronze Age subsistence.

Based on the analysis of the uses of wild plants (but also wild animals, see chapter 4) it has become clear that the collection of wild plants most likely complemented Bronze Age subsistence by providing people with material which was not produced by farmers during this time: vegetative plant matter including leaves, green stems, roots, flowers,

fruits, and nuts. These plant parts would have aided subsistence both as an addition to the diet, and as a source of raw material to produce an array of products required on the settlement. Since the new results clearly do not match main component 2, a new main component 2 is formulated:

(N2) Bio-resources play an elaborate role in Bronze Age subsistence, both as an addition to the diet, as well as a source of raw material to create other products.

Main component 3 was formulated as follows:

(3) Wild plant remains which are not considered to have been collected, such as nuts, fruits, or berries, belong to plants which can be described as weeds.

Based on the analysis of possible plant uses with the help of ethnobotanical studies, it has become clear that wild plants have many virtues and are often especially collected for parts other than fruits or nuts. Besides their use as food, vegetative parts can also be used, as stated, as a source of raw material. In effect, these plant parts have more uses than nuts and fruits, and are often available for a longer period of time. Again it seems that the current main component and the new results are not compatible and main component 3 is therefore newly formulated:

(N3) Wild plant remains which are not known collected nuts, fruits, or berries often belong to species which have many more uses than consumption only, potentially have more uses, are available during longer periods of time, and should therefore be considered as potential valuable additions to subsistence, not weeds.

Main component 4 was formulated as follows:

(4) Collection of edible wild plants is almost abandoned during the Bronze Age, evidenced by the near-absence of remains of nuts, fruits, and berries.

Based on a re-analysis of plant remains the extensive effects of taphonomy on assemblages and subsequent interpretation have become apparent. When plants are collected for their seeds, they are likely to come in contact with fire. Therefore, their prevailing preservation will be in charred state, and frequencies will be relatively high. However, it has become clear that no large amounts of nuts are required during the Bronze Age in comparison to the Neolithic, since staple food now consists of cereals. Berries can be consumed raw, and may therefore also be preserved in uncharred form rather than charred form.

When plants are not specifically collected for their seed or fruit, the resulting frequencies of seeds will be low in general. Processing of these plant parts often does not involve the use of fire, and therefore, their main preservation will occur in uncharred form. The frequencies of charred seeds from plants collected for their vegetative parts will thus be low regardless of the soil in which they are preserved. Since most assemblages consist of only charred material, plants collected for parts other than seeds will either be absent or severely under-represented.

The role of collecting seeds, fruits, and nuts as staple food has most likely shifted in comparison with previous periods, since cereals form the main staple food. Such (charred) remains of collected fruits and nuts will thus be less frequent than before. Remaining edible plant species are collected for their vegetative plant parts, of which seeds are also logically present at low frequencies. The near-absence of remains of edible wild plants in general, and of nuts, fruits, and berries in particular, can therefore not be directly interpreted as an unimportance of edible wild plants during the Bronze Age.

Main component 4 is no longer valid and is therefore newly formulated as well:

(N4) Edible wild plants are not abandoned during the Bronze Age, but the reflection of their remains is restricted by the shift in use in comparison with previous periods; less wild plant species are collected for staple food, since cereals form the staple food source: species collected for their other parts, which complement subsistence during this time, are nearly invisible due to the absence of seeds and poor preservation of vegetative matter.

Main component 5 was formulated as follows:

(5) The few finds of berries and nuts indicate only occasional collection of wild plants during autumn.

Based on the results highlighted under main component 4, few remains of wild plants do not directly relate to the actual extent of collecting being practiced. Since these plants were no longer required as the main staple food in the Bronze Age, their reflection in the archaeobotanical record is greatly overshadowed by the daily processing of cereals. Many direct and indirect indications which were presented in this chapter have shown that wild plants must have been collected on a regular basis throughout the year, for a multitude of reasons and parts. The results suggest that main component 5 should also be reformulated:

(N5) The few finds of berries and nuts only represent the visible tip of the iceberg, which in its totality will have consisted of a wide array of wild plant species collected throughout the year, for various reasons and parts.

Main component 6 was formulated as follows:

(6) All confidence was placed in agricultural production in the Bronze Age, eliminating the need for the collection of wild plants.

The range of edible plant species found in house contexts as well as the other uses for which these wild plants may have been used, indicate that apparently the yields of agricultural production were not sufficient for Bronze Age subsistence. The properties and uses of plants that were perhaps missing in the cultivated plants would have encouraged wild plant gathering, and this will be explored in more detail in Chapter 8. Based on this chapter however, it is clear that main component 6 is not in concurrence with the results and it is therefore reformulated as follows:

(N6) All confidence was placed in agricultural production in the Bronze Age to provide people with staple food in the form of cereals, and raw material in the form of crop residue; the collection of wild plants was needed to aid this part of subsistence by providing farmers with additional plant parts which were not or could not be produced by themselves.

Main components 7, 7a and 7b were formulated as follows:

(7) Seeds of plants are preserved differently depending on which plant part is used for consumption.
(7a) Seeds of plants collected for their vegetative parts will always be present in relatively lower frequencies than seeds of plants collected specifically for their seeds, regardless of preservation condition.
(7b) Under wet preservation conditions, seeds of plants collected for their vegetative parts will be relatively better represented in uncharred form than in charred form, whereas the opposite is true for plants collected for their seeds.

Based on the comparison of the expectations of the different preservation states and frequencies of plants collected for different purposes along with the known uses of these plants based on ethnobotanical information, it could be concluded that there was a clear consistency in results. Almost all plants collected for vegetative parts followed the expected pattern for this use and the same was observed for plants mainly collected for seed. Main components 7, 7a, and 7b therefore do not require reformulation.

Almost none of the main components of the current model were able to describe the role and praxis of wild plant gathering to an extent where they were compatible with the new results. Thus, the new main components outlined above are combined and integrated to form a new model for wild plant gathering in Bronze Age West Frisia.

### 7.5.3 New model for wild plant gathering

Although wild plant gathering leaves few recognisable traces in the archaeobotanical record, this food strategy formed an integral part of subsistence in the Bronze Age. West Frisian people exploited many different habitats surrounding their settlement in order to obtain wanted plants. Gathering

will have occurred on a near-weekly basis and would have been consistently practiced throughout the year to collect plants which complemented the available staple cereal diet. Different plant parts will have been exploited each season: young shoots, stems, and flower buds would be collected in spring; flowers and leaves in summer; fruits, seeds, and nuts in autumn; roots and tubers in late autumn, winter, and early spring. Most plants will have been collected for their vegetative parts, to provide people with food, which was unavailable as a cultivated variety during this time, and raw material. Depending on the use of the plant, processing could have varied from rinsing, to cooking, to drying (with or without the use of fire). Although drying plants would ensure use at a later time, long-term preservation of wild plant remains is not assumed. This assumption is based on the fact that vegetative parts lose their nutritive properties during drying, and spoilage would have been difficult to prevent under the conditions in West Frisian houses during the Bronze Age. Therefore, wild plants for consumption were probably collected for immediate processing, although wild plants for other use may have been preserved until time was available for the creation of products.

In the Bronze Age, nearly everything needed to be constructed by farmers themselves. It can therefore be assumed that the collection and processing of wild plants contributed even more to subsistence in the Bronze Age than in more recent farming communities. By being fully aware of the potential of the environment surrounding their settlements, Bronze Age farmers were able to combine exploitation and production of plants to match their requirements. Without the use of wild plants, both the diet of people, as well as life at the settlement would be incomplete. Wild plants should therefore not be regarded as weeds, but rather as plants whose virtues have not yet been discovered (Ralph Waldo Emerson).