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

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## 10. Evaluation of approach and results

The new approach adopted in the re-evaluation of the old and new data of West Frisia has greatly benefited from the incorporation of my background in both biology and in archaeology. The combination of fields of study has allowed for a truly interdisciplinary approach to the subsistence economy. This was achieved by incorporating the research field of systems biology to analyse a complex system such as farming; by creating an expectation of practice and only then comparing it to the observed archaeological data; and finally by being aware of and correcting for the potentially large impact of internal and external data biases which can cloud the subsequent archaeological interpretation of past human practice.

My background in biology includes knowledge of and experience with the research field of systems biology, in which individual genes, proteins, and metabolites are investigated, which are eventually combined in an attempt to understand an entire organism. This unique approach has similarly been employed to investigate a complex system such as a subsistence economy. First, the separate parts of this type of economy were researched, including animal and crop husbandry, hunting and gathering. However the separate parts are merely the means by which farmers can maintain their subsistence. The actual subsistence economy, rather, is a dynamic and complex system consisting of many interacting components that change their configuration depending on many factors including environmental conditions, temporal conditions, and social conditions. Therefore, the results of the analyses of the different components of subsistence were combined to view the farming system as a whole. Similarly, the landscape was reconstructed using all available indicators for the environment, which included biological information on both plant and animal species, which were eventually combined to view the landscape in its entirety, as an ecosystem. By researching the subsistence and landscape in this manner, many new insights were gained into the complexity and interconnectivity of both farming and nature.

Furthermore, the approach in this thesis did not only involve taking what was found archaeologically into consideration, but above all what could logically be expected of a Bronze Age subsistence farming system. This expectation was achieved first and foremost by using ethnographical studies with records of present-day farming communities comparable to the presumed Bronze Age situation. Ethnography has proven to be a very useful tool in identifying basic practices related to farming and wild resource exploitation, rather than using it for the comparison of cultural phenomena. These basic practices were shown to be similar in different areas of the world, regardless of geographical location, climate, and time period, and so provided a sound basis for comparison with prehistory. Practices which are (nearly) invisible in archaeology, such as wild plant consumption, were recognized as a result, and it is these practices which turned out to be the most essential for living a healthy life as a farmer.

Finally, by investigating the process behind each subsistence strategy, several problems could be identified with regard to practical approaches and scientific reasoning based on (flawed) bio-archaeological datasets. For these problems, new methods and viewpoints were introduced, incorporating the effects of taphonomy on botanical and zoological archaeological assemblages in order to arrive at an, as much as possible, unbiased dataset. Similar to biological research, this dataset was subsequently compared to the expectation made for each aspect of the subsistence economy/landscape. Differences or similarities observed based on this comparison could therefore be more securely related to the revelation of past human practices, which is the main focus of archaeological research.

### 10.1 NEW MODEL FOR BRONZE AGE FARMING IN WEST FRISIA

Bronze Age farming in West Frisia consisted of the employment of four subsistence strategies,

including crop and animal husbandry, but also hunting and gathering, in order to acquire the basic necessities of life. For this purpose, the settlement surroundings were exploited by people for both domestic and wild resources. This left a considerable mark on the landscape, as households would have required on average 0.3 km<sup>2</sup> of land to obtain these commodities. Especially in the Middle Bronze Age, humans and livestock, as well as wild animals impacted the environment, and West Frisia can be characterized as having been densely populated. However, during this period, forests still existed over extensive areas in the landscape.

In the Late Bronze Age, increasingly wetter surroundings reduced the size of suitable inhabitable land which would have negatively impacted the number of people and livestock in West Frisia. Farmers who did remain in this area would have practiced all subsistence strategies as before, perhaps with slight changes in crop and animal husbandry in order to adapt to the changes in the landscape. Hunting and gathering however, would have remained the same stable and flexible addition to subsistence as it was in the Middle Bronze Age.

The diet of Bronze Age farmers would have mostly consisted of cereals, followed by meat (both domestic and wild), milk, wild plants, and fish. The vegetative parts of wild plants would have been essential to this type of cereal-based diet to uphold a healthy condition by providing essential vitamins A and especially C, which could not (easily) be obtained from other food sources. Meat from wild animals and fish would also have formed essential additions to the diet during times when domestic meat was unavailable. Hunting and gathering would therefore have been essential activities for the Bronze Age diet, even though their reflection in the archaeological record is comparatively limited. That Bronze Age West Frisian people were indeed able to sustain a relatively healthy lifestyle is reflected by their average length and their ability to heal well from trauma. Only slight indications for periodical minor nutrient-deficiencies could be identified, which may be related to times of general nutrient scarcity, such as during winter.

Clothing remains have not been identified in West Frisia, but, based on comparison with contemporaneous finds, the West Frisian Bronze Age wardrobe would most likely have consisted of a combination of linen and woollen garments, as well as clothing made from skins and pelts. Dyeing of textiles would also have been a very real possibility, since for example textiles from this time period often show signs of dyeing, and West Frisia has yielded many plants suitable for dyeing in its botanical assemblage.

Houses in West Frisia were mainly constructed of wood. The interior of these houses, however, has never been truly reconstructed. Based on both the expectation and the actual finds of Bronze Age tools related to the subsistence activities, it is clear that these interiors were far from empty. West Frisian houses will have contained several activity (storage) areas, in which activities such as clothing manufacture, cooking, tool making, sleeping, consumption (*i.e.* storage), and animal husbandry (*i.e.* barn) occurred. For the production of nearly all the tools and equipment required on a settlement, raw material obtained from wild plants and, to a lesser degree, wild animals is indispensable, which again underlines their importance for subsistence, regardless of uncovered quantities.

Although house plans usually appear very similar at every site, some inter-house differences were observed at Bovenkarspel Het Valkje with regard to household size and function. Both small and large households were identified, in which significantly different compositions of domestic animal species were observed, regardless of the size of the house plan. In addition, analysis of the different compositions of botanical remains has revealed that house plans should rather be termed building/structure plans, since different building functions can exist, including separate farmhouses, separate barns, and combinations of farmhouse and barn in one building.

To obtain the different resources, each season of the year would have been spent performing different activities. In autumn, sheep would have been transported from the increasingly wet areas

in the surroundings to higher, and dryer locations. Breeding of all cattle, sheep, and goat would also occur at this time. On the arable fields, manuring (with animal dung, household waste, etc.) and ploughing to prepare fields for sowing in spring would begin. Exploitation of wild resources during this time would have included hunting game, migratory bird and fish species, and the collection of fruits, seeds, and berries. In winter, vulnerable and valuable animals would have been placed inside to protect them from the weather and predators, with other livestock kept outside. Pig breeding would also have occurred at this time. Arable fields would mostly have been left alone, whereas a second round of ploughing to prepare the seed bed may have occurred towards the end of winter. Since winter would have been a quiet time for farming activities, this season could be spent repairing or making tools and equipment. Other activities during this time would have included active game hunting for large mammals, and trapping of fur animals, and at the end of winter, catching of migratory birds and fish. Throughout winter, roots and tubers would have been the main wild plant resource available. In spring, all domestic animals would have been returned to the grazing fields, where most would now have given birth, making milk available to the farmer. Animals dying during this process would have been culled and processed for (later) consumption. Hunting would have been limited during this time due to abundance of domestic resources. However, eggs and fish would have been available now. Wild plants in their growing stages would have made young shoots and leaves available. In summer, livestock would have grazed in different areas of the landscape, and become available for breeding in late summer. On the arable fields, weeding would have occurred, and later in the summer, harvest would take place. After harvest, stubble fields would have been grazed by livestock and/or burned. Hunting water fowl would have been a viable option in summer, as they experience a flightless period during this time due to moult. The wild plant parts available would have included greens and seeds, followed by fruits, nuts, and berries.

In the Late Bronze Age, periodical flooding of the landscape would have made certain areas inaccessible for exploitation during winter. The resulting reduced

amount of available appropriate land would have been able to accommodate less people, livestock, and wild animals than before, which is reflected in the investigated crop and animal husbandry practices. Crops were stored in a more unclean state, probably related more limited available time for harvest due to deteriorating weather conditions or less people available to help. Animal husbandry practices investigated reflect a change in strategy, towards an increased production potential for meat and milk, but a less viable composition of the herd in the long-term. These changes show that people were adapting to changing environmental conditions, rather than migrating to other areas to evade these changes. Thus, throughout the Bronze Age, West Frisian farmers remained self-sufficient by combining both domestic and wild resource exploitation to complete their subsistence in a dynamic environment.

## 10.2 IS WEST FRISIA SPECIAL?

West Frisia has often been regarded as a different, almost special region within the Netherlands and the Dutch Bronze Age. Prominent characteristics of this area include many aspects of subsistence, which are the results of the analyses of Chapter 4-7. For example, animal husbandry is characterized by the presence of many cattle bones and an equal use potential of cattle for meat and milk, the latter of which is deemed a universal aspect of small-scale mixed farming communities. A presence of mainly hulled barley and emmer wheat was observed, with a slight increase in the frequency of emmer wheat occurring in the Late Bronze Age. The presence of both linseed/flax and broomcorn millet furthermore, show that other crops were also cultivated. The presence of large households at Bovenkarspel in the Middle Bronze Age was apparent, but it is the only West Frisian site with this size of household. Wild resource exploitation shows a wide range of wild animals hunted, a marked absence of collected fruits and nuts, and the overall presence of many wild plant species.

The comparison of West Frisia with other Dutch regions (including Texel, Kennemerland, Noordwijk, Haaglanden, Hattemerbroek, the western river area, and the eastern river area), and European

regions (including Denmark, southern Sweden, and Switzerland) has, however, put this area into perspective. Several aspects of West Frisian subsistence are certainly different than those observed in the other regions, but all investigated sites show local variation. Available crops and domestic animal breeds appear to differ in each region, both in composition and relative ratios.

In addition, some of the observed differences have only become apparent after the analysis of practices based on the rich West Frisian data. For example, herd characteristics and livestock use were analysed for the West Frisian situation, and, after comparison with other regions, have revealed inter-regional differences in the purposes for herds kept. In West Frisia, an equal use of cattle for meat and milk was observed, whereas other regions inclined more towards use for meat (Dutch river area – east), or milk (Nordic Late Bronze Age Denmark).

Besides differences in many of the investigated subsistence strategies between regions, there are also similarities observed, but again, these have only become apparent after the reconstruction of practices based on the West Frisian data. For instance, the analysis of harvest processing has enabled the identification of different household sizes in both West Frisia and Denmark, and the recognition of a trend towards smaller households in the (Nordic) Late Bronze Age in these regions. It has also been established that other practices regarding crop husbandry were similar in many regions, including sowing time, harvesting height, and overall conditions of arable fields.

Hunting and gathering appear to have been constant factors aiding subsistence throughout the Bronze Age, throughout the different regions. The most frequently found large mammal species were hunted in every region, regardless of climate, geographical location, and time period. This basic “set” of animals was furthermore complemented with locally available or desired animals, which are different in every region, but do fall within similar categories, including fur animals, and migratory bird and fish species. Wild plant gathering also shows a similar trend to hunting, in which a basic “set” of wild plants

was gathered, and which was further complemented with locally available or desired plants. These latter plants, although belonging to different species, also seem to belong to consistent categories, which include consistent uses such as fibre, bedding, basketry, and dye (observed in all regions), as well as tannin, soap, repellent, and thatch (observed in both the Dutch and Nordic regions). Both hunting and gathering would have occurred on a year-round basis, exploiting different animals and plants in different seasons to obtain raw material and food to complement subsistence.

West Frisia can thus be regarded as special where its excellent preservation conditions are concerned, since these allowed for a detailed analysis of the subsistence economy in the Bronze Age with which other regions could be compared. However, it is not special with regard to its differences in subsistence when compared to those of the other researched regions because every region showed local differences. This local variation appears to be a consistent aspect of farming in the Bronze Age and can in fact be regarded as a common feature of subsistence during this time.

It has become clear from the international comparison that the diverse exploitation strategies employed in the West Frisian subsistence economy were by no means an exception in the Bronze Age. Rather, the good preservation of remains in West Frisia has improved the visibility and recognition of practices which otherwise would not have been easily identified. West Frisia was therefore not exceptional with regard to its subsistence economy in the Bronze Age, but rather has been able to provide a basic understanding of Bronze Age subsistence due to its richness in data.

### **10.3 BRONZE AGE FARMING IN NORTH- WEST EUROPEAN COASTAL COMMUNITIES**

Bronze Age subsistence can in general be characterised as a balanced combination of domestic and wild resource exploitation, of which the individual components complement each other in a flexible manner throughout the year.

Crop and animal husbandry form a constant system which forms the basis of the subsistence economy. Farmers need to be able to rely on the products produced, which mainly provide them with food in the form of cereals, but also meat and milk, and raw material, including bone, hide, wool, etc. Since cereals form the major staple food and crop failure is a potentially devastating phenomenon, this product needs to be produced in a reliable manner. Therefore, the basic activities related to crop husbandry are kept the same throughout the Bronze Age. Animal husbandry practices also remain similar, although the purpose of the herds seems to shift from the Middle to the Late Bronze Age in different regions. So, overall, crop and animal husbandry both seem to consist of different species and landraces/breeds, with similar basic practices; especially animals have changing purposes throughout the Bronze Age.

Hunting and gathering on the other hand, is also a constant factor of subsistence, and a more flexible system which provides a variable but essential addition to the subsistence economy throughout the year. The availability of desired wild plant and animal species changes from season to season and people exploited different resources for both raw material and dietary addition, which were not available from their own produced crops or animals. However, gaining these essential resources means that different practices are required every time, also because they need to be combinable with crop and animal husbandry practices. Hunting activities therefore range from active hunting with bow and arrow to passive hunting including the use of nets and traps, and different plant parts are collected in different seasons and at different times in order not to interfere with the activities related to crop and domestic animal production. Both hunting and gathering appear to possess a clear set of species which are always targeted, complemented by other locally available or desired species. These latter species, although different in every region, appear to belong to similar categories, such as fur animals, and migratory bird and fish species. Living in close proximity to the coast, be it freshwater or sea, means that coastal communities are able to exploit many of these species of wildlife, which are abundant in wetland environments. Furthermore, since these

animals are mostly unavailable in other types of environments, they can be considered as potentially very valuable commodities for trade or exchange.

To summarize, hunting and gathering throughout the Bronze Age consisted of targeting similar species, with varying basic practices, but consistent uses for the plants and animals.

It is clear that Bronze Age subsistence could not have existed without incorporation of all four subsistence strategies. Crop and animal husbandry provided people with relatively secure production of staple foods and some basic raw materials, but could never have solely ensured healthy people, livestock, and settlements in the long-term. Hunting and gathering, although less visible as a practice, provided people with critical dietary micro-nutrients, additional sources of food during less bountiful times. It also ensured the availability of the raw material for the buildings, and almost all of the tools, equipment, clothing, and other products essential to daily life in the Bronze Age.

#### **10.4 CONCLUSION AND FURTHER APPLICABILITY**

The new results, summarized in this chapter, were only achieved by the approach presented in this thesis: by thinking things through in a logical manner and analysing data with the use of several disciplines, not by copying previous methods. This has resulted in specific new insights including, amongst others: a landscape reconstruction including available vegetation as well as the impact of farmers on it; the contribution of hunting and gathering in a farming system; a new method to analyse animal husbandry practices; and the role and composition of manure to fertilize arable fields.

The holistic approach has furthermore resulted in an integrated analysis of these different aspects related to subsistence. It has yielded a detailed understanding of the complexity of subsistence to a level which could not have been achieved by only considering single or unintegrated disciplines. In effect, a completely new image of what it means to be a farmer in the Bronze Age living in a wetland environment was created.

For example, the required skill and knowledge level of Bronze Age farmers for exploiting their surroundings has become clear: farmers needed to know what to do for every subsistence-related activity, at what time, and how this needed to occur. It required great planning skills to ensure the compatibility of different activities and to maintain their balanced interconnectedness throughout the year. It has also become apparent from the applied method that prehistoric farmers may have depended even more on wild resources than the present-day farmers observed in ethnographic parallels, as they needed to produce everything required for subsistence with the materials available in the (immediate) surroundings of the settlement. The importance and influence of the landscape was significant, providing people with resources for fulfilling basic survival needs such as food, clothing, and shelter. Living in a wetland environment provided many opportunities for exploitation, but this type of landscape is also continuously changing and challenging. Nevertheless, throughout the Bronze Age, the opportunities for both farming and hunting and gathering in a wetland environment must have exceeded the disadvantages, because people adapted to these changes rather than that they started migrating to other areas when conditions became less favourable. Staying in this wetland area meant that all subsistence strategies could be, and were practiced, in a carefully balanced manner, allowing farmers to continue their subsistence in Bronze Age West Frisia.

The approach presented in this thesis has proven to be very valuable in researching Bronze Age wetland communities. It is also potentially very valuable for research on other areas or subjects, since it is by no means restricted to the Bronze Age, to farming, or to a specific geographical location. Rather, the approach is applicable to any time period, area, or form of subsistence so long as the expectations made before the comparison with the data (*e.g.* ethnographic parallels) are chosen appropriately and possible data biases are taken into consideration.

The combination and integration of several disciplines in this thesis, related to biology and archaeology, but also ethnography, has proven to give new impulses

to the research, providing new views on old subjects, which are not often attempted or observed by researchers who stay within their own respective areas of expertise. The yields of the approach presented here in my opinion greatly outweigh the debatable trouble of making oneself familiar with (the methods of) other disciplines. Even if there is a good reason not to venture into other research fields when studying a subject, the interaction with other people and integration of results is surely possible. Therefore, the results of this thesis and its approach should be considered a call for more integrated research into complex systems to allow for a better understanding of the past.

The final chapter lists the subjects which were not included in this thesis, but are of value for an even better understanding of Bronze Age subsistence in wetlands. Possible manners in which these topics could be researched when enough appropriate data becomes available are presented, with the aim of ensuring that knowledge on and research towards Bronze Age wetland communities continues to expand in the future.