PART ONE: THE FRAMEWORK
1 Introduction to the research

1.1 Introduction
Circumstances triggered this archaeobotanical study of agriculture in Bronze Age and Early Iron Age society. Obviously, botanical material being made available was a primary condition at the start of this research. In fact, in 1994 when this project was started, archaeologists from surrounding countries had turned to the University of Leiden with their botanical samples. At the time, virtually no specialist staffs were available in these countries to do the job. This is especially true for the region of Lorraine in the northeastern part of France. In this region, the Service Régional de l’Archéologie de Lorraine is the institution that carries out the majority of large-scale archaeological rescue excavations annually. Over the years this service had collected enormous quantities of botanical soil samples that needed further study. Also, the Musée National de Luxembourg whose small staff carries out the main excavations in Luxembourg, asked for our assistance at analysing their botanical samples. Eventually, the majority of the plant material investigated in this study has derived from these two areas, which are referred to as the Moselle region in this book.

Secondly, the time was also scientifically ripe for this research. At the beginning of the 90’s some Dutch archaeologists believed that the archaeological research of agrarian developments in later prehistory needed a new impulse. There were still a number of questions left to be solved on the organisation and nature of agriculture in Bronze Age and Early Iron Age. There appeared to be consensus that the archaeological analysis of large-scale excavations could not fully solve these specific questions alone. It was expected that an interdisciplinary approach, i.e. the integrated study of fossil plant remains and settlement archaeology could offer an interesting contribution to the solution of questions regarding agricultural change in this period. The combination of the two conditions, i.e. an existing scientific issue and material becoming available for further analysis which could possibly deliver an answer to this issue, made up the point of departure of this study of agricultural change.

A vast body of ideas on Bronze Age and Iron Age society and the role of agriculture in this period has been developed in (Dutch) archaeology over the past decades. Chapter 2 reproduces a summary and an analysis of these works and ideas. In this chapter I will try to describe the archaeology of Bronze Age and Early Iron Age, concentrating on settlement development and the development of burial rites in this era. Some side-notes and criticisms are made on the ideas developed in archaeology on long-term changes in agriculture and land use in this period. For the purpose of a more accurate analysis of changing agricultural practices, in chapter 3 various models of agricultural intensification and their application in archaeology are presented. The tradition of the use in archaeology of the so-called frequency-of-cropping model developed in the ’60s by Ester Boserup is contrasted with more realistic and more fruitful models of intensification of agricultural production.

The core of this book consists of the botanical analysis of 24 archaeological sites, 20 of which are located in the northeastern part of France, the region of Lorraine. Three sites in Luxembourg and one Dutch site (Geldrop) complete the botanical database (chapters 4-7). The general results of the analyses of the botanical material from these locations are put in their respective archaeological and archaeobotanical contexts by comparing them to otherwise available material in chapter 8. For the analysis of the results from Geldrop especially, much use is made of relevant botanical evidence deriving from surrounding excavations in the so-called Meuse-Demer-Scheldt region (see below).

The next three chapters are dedicated to a more thorough analysis of three categories of plant remains, recovered from the seed assemblages, i.e. cultivated species, their associating arable weeds and the wild plants collected for human consumption (chapters 9-11). In the course of these chapters I hope to discuss the hypotheses put forward earlier in the book on agriculture in the period under study. Finally, in chapter 12, the aim is to reach a more general level of analysis. Therefore, the ideas on agricultural change set out in the first part of this book are combined and sometimes contrasted with the results of the botanical study of part two. In this way, hopefully some of the loose ends in archaeology with regard to food procurement, agricultural practices and land use in Bronze Age and Early Iron Age can be tied together.
1.2 Defining the field of archaeobotany

Introduction

For a long time, it seems, the development of ideas on agricultural change in prehistoric society has been dominated by archaeological evidence. Due to a lack of integration of this archaeological evidence with contemporaneous botanical evidence, missing links were kept intact. Although in some countries, like the Netherlands, there has been a powerful increase of archaeobotanical data, the integration of these data in archaeological discourse has still been very scarce. In this study, I hope to be able to evaluate the prevailing ideas on prehistoric agrarian regimes, and if necessary to formulate new ones: it is especially the integration of archaeological theories and models, and archaeobotanical data which allows for this type of evaluation. Many archaeologists and archaeobotanists have become increasingly aware of the necessity and the value of integrated research. This awareness is accompanied by an increasing attention in environmental literature for the explicit definition of the status and aims of our discipline. Several authors recently formulated some interesting reflections upon the status of environmental archaeology, what the discipline is fundamentally about and what objectives can be set (e.g. O’Connor 1998; Viklund 1998; van der Veen/O’Connor 1998). In my view, three recent developments in the definition of archaeobotany are worth paying attention to: a relative shift of scientific attention from the (natural) environment to people, from archaeobotany as an objective as such to a means of studying past societies. These disciplinary shifts can all be related to a stronger integration of the environmental specialist studies into archaeological science.

Definitions of environmental archaeology

Many different scholars have given their own definitions of environmental archaeology during the last decade(s) (see for an overview e.g. O’Connor 1998). Scholarly discussions (like the one published in Circaea 7/2, 1990) very clearly reflect that there is still a strong difference of opinion on the definition of environmental archaeology. The discussion seems to split those who emphasise the ecological character and those who stress the archaeological dimension of the discipline. Recently, the latter seem to gain some ground. The following quotes still strongly emphasise the ecological more than the archaeological. Or, as Bell comments: “they are redolent of earlier deterministic views of man-environment relationships, where environment is still the backcloth to human activities” (Bell 1990, 70).

[Environmental archaeology is] “the scientific study of the ecological relationships of past human communities (...) Our central task should be the reconstruction of past geographies. Environmental archaeology is prehistoric geography” (Butzer 1982; Boyd 1990).

“Environmental archaeology is the study of the material (usually non artefactual) evidence which contributes to the understanding of past environments in relation to past human activity, with particular emphasis on the interaction between social and natural environmental systems” (Boyd 1990, 68).

“Environmental archaeology is concerned with the community ecology of ecosystems in which the genus Homo and its immediate ancestors were active elements” (Coles 1995).

It becomes clear from the above that for some environmental archaeologists environment still precedes people. First careful reflections of an alternative approach with regard to the objectives archaeobotany has set for itself can also be found.

[Environmental archaeology is] “the application of the natural sciences to the better understanding of the material remains of man’s past by the analysis of biological remains and organic deposits from archaeological excavations” (Keeley 1984). Or:

“Environmental archaeology is directed toward understanding the dynamic relationships between humans and the ecological systems in which they live. Environmental archaeologists apply information and techniques from the natural sciences to studies of the human past through analysis of archaeological deposits” (Reitz 1996).

This change is expressed even more emphatically by environmental archaeologists who see themselves as mere archaeologists:

“Environmental archaeology is part and parcel of archaeology, which I regard to be part of historical sciences, rather than either the natural or the social sciences” (van der Veen 1990). And:

“Archaeobotany is archaeology based on botanical remains, and only incidentally, and of secondary importance, palaeoecology” (Bakels pers. comm.). Or:

“Environmental studies are to be seen as an element of the archaeology of material culture” (Rackham 1995, 22).

It is exactly the part-and-parcel character of archaeobotany, being as it is an integrated part of archaeology that will bring us to more interesting and meaningful scientific results. As M. Jones (1990, 71) notes, “Where is sharpening the outline of the discipline of environmental archaeology
going to get us? It is along the disciplinary boundaries and by integration with other (sub-) disciplines that archaeobotany books results that are interesting and significant to others”. Significant results, to me, form at the same time the legitimisation of the discipline, and “our strength as an academic discipline lies in the questions we can answer, not in the structure within which we answer them. If those questions are deemed significant by our academic peers, our subject will prosper: if not, no amount of redefinition and prescriptive statement will save us” (M. Jones 1990).

Thomas (1990, 74) also stresses that “the search for academic boundaries between so-called disciplines which some people seem to think important for defining environmental archaeology, is surely a waste of effort. Scholars are increasingly seeing the traditional limits between disciplines as irrelevant. It is research which straddles the borders of the old-fashioned “subjects” which is most exciting”. So we must look for common areas of interest which will be inclusive of all relevant specialists.

With this we come to focus on the objectives of environmental archaeology. Traditional ideas on the objectives of environmental archaeology are to be found easily: “Palaeoethnobotany is defined as the analysis and interpretation of archaeobotanical remains in order to provide information on the interactions of human populations and plants” (Van Zeist et al. 1991). Merely providing information, however, appears too restrictive to some as an objective. “Environmental archaeology … should seek to understand the relationships between past human populations and their environments, where environments include physical, biological and socio-economic aspects” (Thomas 1990, 74; italics by the author of this book). I would indeed, like Thomas, take the definition beyond the reconstruction of past environments toward understanding the interactions between people and their environment. The concept of archaeobotany as a means to a better understanding of the past fits well into the position that is taken in by Bakels and van der Veen (above) and is in my opinion the best way to define archaeobotany. It might seem to be almost a disqualifier to consider archaeobotany as a means, instead of as an end, and to look at “what environmental archaeologists actually do” and leave it at that. Still, the definition of a discipline is only of use when we consider the questions we are able to answer as our objectives: “Environmental archaeology needs to apply an analytical and explanatory approach while, at the same time, becoming more embedded within explanatory frameworks for social change” (Van der Veen/ O’Connor 1998, 127). In my view, archaeobotany as archaeology of material culture and as an integrated part of archaeology has its best objectives in the answers we can offer to archaeological questions of social change.

I, too, prefer to consider archaeobotany as the means to the answer on the complex questions archaeology is trying to solve with regard to prehistoric society. Complex questions need an integrated approach and vice versa: a cross-fertilisation between archaeology and archaeobotany offers the archaeobotanist the opportunity to move beyond the level of mere identification, description and plant species listing. I find it very important that archaeobotany of the 21st century should attempt — with the help of our species lists, of course — to reach the level of development of ideas (see also Rackham 1995). The fact that we have gained so much insight with all fundamental, scientific analyses over the past decades enables us to make a leap to the development of new ideas. This is only possible, of course, if both archaeologists and archaeobotanists are willing to make a choice for interdisciplinary research.

1.3 The objectives and questions of research in the present study

With this study I hope to contribute my share to the integration of archaeobotany and archaeology. To me, this approach finds its roots in the tradition that I was trained in and that I would call the “Leiden School”. In this tradition, archaeobotany is archaeology based on botanical remains and so the integration of ecology and archaeology has always been of great importance. In this perspective, archaeobotanical remains are interpreted as artefacts, just like ceramics, (worked) flint or coins would be, although the direct archaeological evidence of agricultural regimes and food, i.e. charred or waterlogged plant remains are much less ‘visible’ in the archaeological record.

The agricultural change in Bronze Age and Early Iron Age, as the formal object of this study, will be examined from the dual perspective of archaeology and archaeobotany (figure 1.1).

Traditionally, the transition from Bronze Age to Iron Age is regarded as a period of major agrarian shifts. Of course, it is

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**Fig. 1.1** Agricultural change (formal object of this study) from the dual perspective of archaeology and archaeobotany
not only in the field of subsistence economy that things were undergoing changes. Archaeological evidence for these periods demonstrates several developments regarding the organisation and structure of settlements during the Metal Ages, the introduction of the longhouse in the Middle Bronze Age and the emergence of mound barrows in the Neolithic and Bronze Age and of the urnfields in the Late Bronze Age and Early Iron Age, to mention the most radical changes.

Archaeologists have described and interpreted these developments in various ways. Many archaeologists have also explored various ways of examining the possible correlations of these changes with the economic aspect of society, i.e. agriculture. The exact nature of these agricultural changes however still remain enigmatic. To put it simply, the changes in agriculture could imply intensification of cultivation according to some, as well as the opposite, an extensification of cultivation, according to others. To demonstrate agricultural intensification, often, the well-known model of agricultural intensification as developed by Boserup is used. In this model, demographical growth is regarded as the prime mover of a gradual process of intensifying agriculture, which according to Boserup, infers an increasing frequency of cropping, that is an increasingly long-lasting exploitation of arable land. The preference for the extensification model is often related to environmental circumstances or socio-political changes in these periods, as will be demonstrated in the continuation of this book.

**Research design**
In this study, I will first describe the archaeological evidence of the period concerned, explore the archaeological arguments on agricultural change and critically 'deconstruct' some interpretations and implications made in archaeology. Next, various models of agricultural change and definitions of agricultural intensification will be presented and commented upon. These include the frequency-of-cropping model by Boserup and an alternative intensification model as was presented by Morrison (Boserup 1965; Morrison 1994, 1996). This exploration forms the basis for my investigation of the seed assemblages from 24 archaeological sites, on the basis of which a diachronical sequence on the nature of subsistence economy and agricultural strategies in the Bronze Age and the Early Iron Age is given. Against the background of these botanical analyses from the sites under study I will reconsider the problem of agricultural intensification in the Bronze Age and Early Iron Age. The observed temporal differences between the characteristics of agricultural strategies are described and analysed, using the concepts on agricultural intensification. In addition, an attempt will be made to define and create insight in trends in agriculture in the Bronze Age and Early Iron Age. The design of this research is constantly supported by questions regarding the nature of possible developments in agricultural production and food regimes in this period. How can we explain a possible development? Is it possible to define a cause or causes for these developments? Which significant correlations are we able to distinguish between changes on the domain of agriculture and other developments in Bronze Age and Early Iron Age society?

**Botanical data**
Several series of botanical data sets are used in this study. Firstly, I generated new botanical data from the locations selected for this study. In addition, published or otherwise available botanical data were analysed. Finally, I made use of more general surveys in archaeobotanical literature on agricultural change.

- **new archaeobotanical data**
  Twenty-four sites located in the Netherlands, Luxemburg and in Lorraine were palaeo-botanically investigated. The analysis of the seed assemblages from these locations constitutes the core of this study. The investigated material derived from settlement excavations, which is to say that only samples from archaeological structures that are related to human activities (settlement areas: houses, granaries, pits, silos, etcetera), excluding any from a natural context, were studied. The assemblages consist mainly of carbonised plant remains.

- **available archaeobotanical data**
  Botanical research is not presently automatically included in archaeological investigations. Even so, in the course of the past decades substantial evidence has been generated and published. Where the Bronze and Early Iron Ages are concerned, we have a relatively large amount of publications or preliminary archaeobotanical reports on Dutch, Belgian, Luxemburg and French locations at our disposal. For the purpose of this study, a selection of relevant data has been made and has been analysed and compared to the material studied.

- **archaeobotanical studies on agricultural developments**
  For our (sub-) regions, archaeobotanical reconstructions of developments in the agrarian production processes from a diachronic perspective have not yet been undertaken. In general, very few archaeobotanical publications look into changes in agriculture with a long term perspective. Basically, the majority of ideas on the problem were developed in archaeological publications, based mainly on non-botanical evidence. Archaeobotanists, significantly, have seldom applied their “own” botanical data sets, integrated into the archaeological ones, in order to answer general questions on agricultural productive systems beyond the site-level. There are apparent exceptions to this rule. For the coastal areas of the Netherlands, just outside the scope of this study but in environments rather divergent from ours, we have the
studies by Buurman on the agrarian system in Bronze Age West-Friesland (1996) and Brinkkemper on the Iron Age agriculture on Voorne-Putten (1991). Besides these, there is the soon-to-be-published work by Karg on diachronic developments of landscape and agriculture in the Maas-Demer-Schelde area (Karg in prep.). I know of no further archaeobotanical on Bronze Age and Iron Age agriculture for our regions. When it comes to broad overviews of botanical data, I made much use of the publications in *Progress in Old World PalaeoEthnoBotany* (e.g. Bakels 1991), among others, as well as the publications of French archaeobotanists, like Marinval and Ruas (1991) and Matterne (2000).

**Framework**

As already mentioned, the aim of the present study is to improve our understanding of the changes that the agriculture system (food procurement and food production) and the use of agricultural land underwent in Bronze Age and Early Iron Age in Atlantic Europe. This fits closely into a broader debate on subsistence change that is conducted in the field of archaeology of the metal ages in Northwestern Europe. The attention of this study focusses only on the botanical sector, namely agricultural food production and the collecting of plants. This is primarily due to the nature of the material i.e. archaeobotanical macro remains.

The period under study is the period of Bronze Age and Early Iron Age (c. 2000-450 BC). These chronological boundaries were dictated by the questions to be solved. An *a priori* departure point for the present study was the idea that interesting changes in agriculture occurred exactly in this period, relating to other social and cultural changes.

The study region is limited to the Netherlands, Belgium, Luxemburg and the region of Lorraine (Northeastern France). The region defined this way was a choice made based on the archaeological evidence. Many archaeologists have pointed to the archaeological resemblances between these countries (e.g. Blouet et al. 1992). On the basis of these similarities the research area can be defined as a cultural unity (*Hauslandschaft*) (Harsema 1996) (figure 1.2).

The selection of material was, at least partly, based on the contacts that existed with various archaeologists and on the availability of botanical material. This availability fully depends on archaeological activities in the region, which explains why the Belgian map still shows so many white spots, despite the intensive contacts with Belgian archaeologists that we have. Consequently, within this geographical unity emphasis lies on the Moselle region (Luxemburg and Lorraine) and the so-called Meuse-Demer-Scheldt region (from here MDS region). From the point of view of landscape and environment these two zones (sub-regions) form a relatively strong contrast to each other. The MDS region is the area of the sandy soil region of the southern Netherlands and northern Belgium which forms part of a chain of large coversand plateaux, stretching out from the Flemish sand plateau to the Elbe-Weser triangle in North Germany (Roymans/Theuws 1999). Further to the south, the sandy area is adjoined by the löss areas of Central Belgium, Northern France and the German Rhineland, of which the Moselle region makes up a part. This varied landscape consists of the Côtes de Moselle in the west, that is the eastern part of the Paris Basin, where incising rivers created an extensive cuesta landscape. The region is dominated by the presence of the river Moselle with its sandy and gravel sediments and the (löss) Plateau Lorrain in the east. The majority of the locations studied in Luxemburg and Lorraine are situated near the river valley of the Moselle. This contrast regarding landscape and soil types has lead some authors to focus attention on macro-regional comparative studies to demonstrate major cultural contrasts as well (Roymans 1996 for the Iron Age) which contradicts the idea of a cultural unity (*Hauslandschaft*) mentioned by others. The contribution of this present study among other things, will be to support or weaken the claim on regional differences in agriculture.

In this present study of agricultural change, our objects, i.e. charred botanical macro remains are considered as material culture. They allow for the reconstruction of human behaviour, in this case of agrarian and other food procuring practices, and therefore for the understanding of socio-cultural change(s). In this study archaeobotany seeks to identify and understand agricultural change through time in relation to long-term social and economic change in the Bronze Age and Early Iron Age.