12 The agrarian production and food procurement systems in Bronze Age and Early Iron Age in the study area

12.1 Introduction
In this last chapter, the botanical evidence of Bronze Age and Early Iron Age agriculture and food procurement, and the analysis as presented in the previous chapters will be related with the archaeological evidence for this same period. As we saw before, various archaeological ideas on agricultural change in the Bronze Age and the Early Iron Age exist side by side (see chapters 2 and 3). In short, some people believe a gradual intensification of agriculture occurred from the beginning of the Bronze Age onwards, relating to the introduction and the growing importance of the use of manure in agriculture and the possible systematic use of the ard. The shifting of settlements over large distances in the Bronze Age, and over relatively shorter distances in the Iron Age, and finally the stability of the settlement system in the Middle and particularly in the Later Iron Age, would support the hypothesis on this unilinear development. Others assume that Bronze Age and Early Iron Age agriculture was, by definition, short-lived and extensive, due mainly to the infertility of the soils (in the MDS region) and facilitated by the large availability of agricultural land. In the Urnfield period, according to some, population would grow and pressure on land would therefore increase. This could be related to the rise of Celtic field agriculture, in which land use was better structured. According to some, Celtic field cultivation was by nature intensive, small-scale and horticulture-like, while others believe it to be extensive and short-lived. The latter assumption is mainly dictated by the infertility of the sandy soils in the areas where Celtic field systems are most frequently found. In chapters 2 and 3, we saw that these different ideas on the developments of agriculture are related to different opinions of land-use and appropriation of land. In general, the adherents of the intensification-model believe in a relatively strong appropriation of land. The authors who stress the extensive nature of agriculture in the Bronze Age and Iron Age, believe that claims on agricultural land did not make up part of prehistoric society. Interestingly, the isolated settlements in Bronze Age and Early and Middle Iron Age and the associated burial systems of burial mounds and Urnfields are related, in this respect, to communal ownership of land. The clustered settlements of Late Iron Age and the family-graves in this period are associated with a stronger private ownership of land.

In the first section of this final chapter, I shall collect the arguments that follow from the analysis of the botanical material presented in the second part of this book. The nature of Bronze and Early Iron Age agriculture following from these analyses will be described, and the causes and consequences of apparent changes in agriculture detected shall be defined. In the second section of this chapter, the key-concepts of agricultural intensification will be discussed. Further, we shall focus on the above-mentioned archaeological issues (see also the chapters 2 and 3). These will be discussed in the third section of this chapter.

12.2 Botanical evidence
We have seen in the previous chapters that several distinct phases in the development of Bronze Age and (Early) Iron Age agriculture could be discerned on the basis of the information provided by the weeds, crops and collected fruits present in the seed assemblages. In short, these phases can be characterised as follows:

MDS region
- For the first stage, i.e. the Chalcolithic and Early Bronze Age, no archaeobotanical evidence was available. Therefore, the nature of the agricultural regimes remains unknown for now.
- In the Middle Bronze Age (1800-1100 BC) we assume a cereal based (barley, millet, emmer, spelt) intensive agriculture in the MDS region (high nutrients, intensive soil working, manure, absence of fallow). The connection with permanent land-use imposes itself.
- In the Late Bronze Age (1100-800 BC), we dispose of only a little evidence. This period may be quite comparable to the next stage, the Early Iron Age.
- In the Early Iron Age (800-500 BC), the crop range of the MDS region is considerably large and diverse. The weeds indicate high nutrient values but are more diverse (manuring, soil disturbance, short fallow or crop rotation: multicropping or the combination of various cultivation regimes, sometimes higher moist values).
- For the later stages (500-50 BC), our database is too small to offer a sufficiently adequate analysis of agriculture. This period was not part of the original study object.


**Moselle region**

- For the Late Neolithic and Chalcolithic, little archaeological and archaeobotanical evidence was available. The nature of the agricultural regimes in these early periods therefore remains unclear. For the Bronze Ancien (1800-1500 BC), a cereal based (barley, millet, emmer, spelt) rather intensive (manure, soil-working), but possibly relatively short-lived cultivation was assumed.
- In the Bronze Moyen (1500-1100 BC), a diversified (large extension of the range of crops) and intensive (moderate to high nutrients, soil disturbance, short fallow — crop rotation, some manuring) partial “garden” agriculture was depicted.
- In the Late Bronze Age (1100-750 BC), a diversified and intensive agriculture has now completely developed (high variety of crops; dominance of annuals, high nutrients; cf. Group A van der Veen 1992) From c. 1100 BC onwards, the fallow as an element of the agricultural regime seems to be absent. A permanent exploitation of the arable fields seems to have occurred in the period since the dawn of the first millennium BC.
- In the Early Iron Age (750-450 BC), the crop range is considerably large and diverse. The weeds indicate high nutrient values, perennials are decreasing. This could suggest a permanency of land use.
- For the fifth stage (450-50 BC), our database is too small to offer a sufficiently adequate analysis of agriculture; this period was not part of the original study object.

We are able to note several trends. Any indications for extensive cereal cultivation in the (Early) Bronze Age, which was demonstrated, for instance, in Central Europe, were absent. The earliest evidence for cereal cultivation we could reconstruct from the seed assemblages dating from the Bronze Ancien (Moselle 1800-1500 BC) and from the Middle Bronze Age (MDS 1800-1100 BC) are clearly intensive, probably small scale permanent cereal cultivation regimes, though in the Moselle region, there are indications for a relatively more ephemeral use of arable land. The agricultural regime in the Middle Bronze Age in the MDS region was not determined by the infertility of the sandy soils, but appears to be based on intensive soil working, the use of manure and presumably the ard. The botanical evidence suggests that the agriculture system should not be characterised as an extensive or shifting cultivation (as was described in chapter 2). The evidence in the Moselle region from 1500 BC onwards points to a similar system where permanent arable fields were in use. This evidence suggests that the regime should not be characterized as an *agriculture itinérente* (see chapter 2). We should note however, that in both regions, but more powerfully demonstrated in the Moselle region (inferred from the presence of perennials), both intensive and more short-lived cultivation systems may well have been simultaneously in use.

A highly diversified agriculture based on high numbers of different crops developed from the beginning of the Bronze final (1250 BC) but certainly after 1100 BC in the Moselle area and after 800 BC in the MDS complex — the latter possibly relates to the emergence of the Celtic fields system. We should note that the seed assemblage of only one Late Bronze Age context in the MDS area was available for investigation. It is definitely necessary for more material from this period to be collected before we can assess whether an expansion of crops in this region did not take place earlier than the Early Iron Age. 20

The development towards the simultaneous cultivation of so many different crops almost automatically implies an infield-outfield-type system, or the co-occurrence of different scales and intensities of cropping. This assumption could also be inferred from the weed seed assemblages from these periods. These assemblages are characterized by intensification-indicators (such as large numbers of annuals and high values on nutrient availability) on the one hand, and some indications for a partially extensive and possibly short-term agriculture on the other.

The role of gathering wild fruits and nuts is remarkably important in both regions and during all chronological stages. Indications for these practices are especially and prominently present in the early stages of later prehistory. Acorn collection and consumption which can be related to risk reduction is part of the subsistence system during all stages.

To summarise, we may define two major characteristics of agriculture during the Bronze Age and the Early Iron Age. It was intensified, in the proper sense of the word, during the Bronze Age especially, but in later periods as well, and diversified (a principal element of intensification s.l. as defined in chapter 3) since the beginning of the first millennium B.C. approximately. The reduction of risk, which could take numerous shapes and forms, appears to be a guiding principle to the farming communities through all chronological stages.

### 12.3 Agricultural change

**Intensification**

If we would conclude that agriculture in late prehistory was intensified during all stages, be it in the narrow or broad sense of the word, what then, is precisely expressed by the term “agricultural intensification”? By this, I mean: should we infer from the foregoing that prehistoric agriculture has always been an intensive agricultural system? Might “extensive” be anachronistic term that only becomes meaningful for the agricultural system from the Roman period onwards? This conclusion would produce a highly homoge-
neous long-term image of the developments of (late-) prehistoric agriculture. A reappraisal of the term of agricultural intensification seems in place, as was already proposed in chapter 3 (Morrison 1994; 1996). Therefore, we should not merely trace the long-term developments, but precisely, the short-term trends. As Carlstein (1982, 19) stressed: “agricultural evolution is not a simple unilinear process; it takes refinement in method to sort out the trends from the long term cycles”. We should now differentiate the long-term cycles of an intensive agricultural system, by defining trends that differed for each single period, by reconstructing the paths and courses that intensification may take. As was discussed earlier above, the apparently single process of intensive agriculture is actually composed of multiple strategies of production differentially employed by individuals and groups (Morrison 1994; 1996). In chapter 3, the methodological consideration was suggested to deconstruct the intensification process into its component elements, processes, or strategies. The characteristic individual stages of intensification are:

First, intensification proper which according to the definition given in section 3.2, refers to a higher output of crops per amount of land. This is observed from the (Middle) Bronze Age onwards and involved a high level of soil management, manuring and intensive working of the field. This intensification also implies an intensified agricultural system in a Boserupian way, as it implies and allows a high frequency of cropping.

A second element is the intensification through a large variety of crops from the beginning of the 1st millennium BC onwards. Out of this diversity — as a principal element of intensification s.l. as defined in chapter 3 — results a rather complex process related to the development of various cultivation regimes and methods, a variety of technology and the organisation of technology and labour (division of labour, specialised activities with regard to the cultivation and processing of specific new crops). It also includes a variety of food procurement (agriculture and gathering of wild fruits) and a possible culinary diversification (see also chapter 10). Finally, a variety of land use systems may be observed, possibly throughout all chronological stages in varied forms (multicropping, intensive “garden” agriculture, cereal cropping, infield-outfield, relatively more ephemeral cultivation). As was described in chapter 3 above, food producers characteristically practice varieties of both shifting (short-lived/ephemeral) cultivation regimes and intensive cultivation, simultaneously. Agricultural systems (of non-western, or prehistoric societies) typically consist of multiple components, with respect both to the choice of crop type and form of land use. As described elsewhere, Morrison (1994, 137 see chapter 3) considered this diversity to be a deliberate economic strategy. Diversity itself is a protection against risk or uncertainty.

Risk reduction

The principle of risk reduction is such that by spreading of risk, the danger of shortage is reduced (Halstead 1989). The reduction of risk of food shortage, e.g. caused by harvest failure, is found to be an important element of both intensified and diversified cultivation regimes. In the preceding chapters, risk-reduction or risk-buffering strategies are often referred to. Risk spreading mechanisms seem to make up a consequent part of agriculture from the earliest periods onwards. In fact, they appear to be continuous elements of any agrarian culture. This should not strike us as odd as farming communities are constantly subjected to a variety of environmental and cultural conditions which they constantly try to influence or change.

Defining the specific risks to Bronze Age and Early Iron Age farming communities would lead to a virtually infinite enumeration. Moreover, as Bronson (1975, 74) stated, we are dealing with a complex, multifaceted system, in which single causes (=risks) do not exist. As Morrison (1994, 139) expressed it — “the measurement of risk is as problematic as its specification. In general, variability in some environmental or social parameter is employed as a proxy measure of risk, although it is clear that the mere existence of variability is insufficient to establish risk. It may be that conditions of risk are simply conditions under which imbalances between resources and demands, however generated, are more likely to occur”.

For our study, the attempt to distinguish and define the elements or mechanisms of risk-reduction that were apparently applied, is much more satisfactory. Risk reduction is, just like intensification, a similar long-term aspect of agrarian societies which needs to be deconstructed and broken down into its component elements specific for the various periods, local groups or whole regions. In the foregoing chapters, a vast number of agricultural risk reducing strategies were presented, which will be briefly summarized here.

The counteraction of soil depletion, by the application of fertilizers, of which manuring with animal dung is the most striking example, is related to the introduction of the longhouse and the myths that most certainly surrounded the relationships between animals and people (and the origin of food, see Lincoln 1986). The phenomenon of specific storage areas or structures, like remarkable pit circles or enclosed storage areas (chapter 5 above), can be related to the rituals surrounding agricultural practice and storage of agricultural products (see below).

Most apparent is the widening of the base of the subsistence system, i.e. the significantly growing number of cultivated species, related with the presumable co-existence of different cultivation strategies, the possible (but not very well established) application of maslin cultivation or mixed cropping and crop rotation systems. The connection of specific crops
with risk reduction mechanisms as described in chapter 10 above: the cultivation of millet and gold-of-pleasure because of their short growing seasons, the storage of millet in stocks of large-sized cereals (like wheats) to protect them against weevils, the growing of naked and hulled barley as malssins. Phenomena like the use of dispersed arable fields, the variety in size and nature of fields (Celtic field system) and propitiatory sacrifices in an agricultural context (see below) could also be mentioned. And finally, as described in chapter 11, risk buffering by the designation of reserved or emergency foods, that is, foods which are not eaten under ordinary circumstances, but which are consumed in the face of extreme hunger (see Halstead/O’Shea 1989, 4).

In brief, the Bronze Age and (Early) Iron Age farming communities were actively involved in numerous kinds of strategies introduced more or less consciously in particular points in time under given circumstances where conditions might demand certain actions. In general, we may assume that, over time, old mechanisms fall into disuse and new problems require innovative solutions (Halstead/O’Shea 1989, 125). Therefore, in the following sections we will attempt to observe trends that can be related to specific local groups and to specific periods in time.

12.3.1 THE USE OF MANURE

It is evident that the question on the use of manure by prehistoric agricultural communities, implies the question on the nature and diversity of agriculture itself. In the previous chapters, we saw that the presence of certain arable weeds and crop species in the seed assemblages studied allow for the hypothesis of the use of manure. In the MDS region especially, manuring must have played a major role in the agricultural regimes from the Middle Bronze Age onwards. At least from that period onwards, the care for soil nutrients was omni-present in crop husbandry (see also Bakels 1997). Under given circumstances, it was deemed necessary or relevant to take the fertility on the level that was desired. In other words, the Bronze Age farmers in the MDS region apparently took great care that nature could reproduce itself, virtually infinitely. This phenomenon is not restricted to the MDS region. In numerous cases, the results from the analyses of the weeds in the Lorraine and Luxembourg region also indicate the use of extra (surplus) fertilizers on the fields. In addition to taxa which demonstrate the natural fertility of the arable löss soils in this area, weeds were found which showed evidence of additional nutrients to the fields (see chapter 9). The evidence leads to the conclusion that the agricultural regimes of these (late) prehistoric farmers can be characterised as typical Nährstoffkonzentrations-wirtschaft systems (Bieleman, 1996; Willerding 1980). Integration between animal husbandry and the agricultural production, characteristics of the Bronze Age subsistence economy, are, in my opinion, indicative for this intensive agriculture, as well. We can put forward a relationship between the practice of stalling cattle (e.g. the introduction of the longhouse in the Middle Bronze Age) and the possible systematic use of manure in the agricultural regime. Farmers possessing a few cattle in small-scale intensive agriculture had the possibility of leaving the cattle to graze on the crop aftermath (direct manuring), if necessary. This phenomenon is normally related to rather small plots of arable land with well defined boundaries or mobile boundaries. These mobile fences are known from e.g. Middle Bronze Age Zijderveld, in the Dutch riverine area (Theunissen 1999, see chapter 2). Moreover (as shown in chapter 9), indirect manuring, i.e. the use of compost, from cattle dung that was collected in stables within the house or in separate barns mixed with household waste or other material, appeared to have been a common phenomenon in this period.

One of the main objections coming from the adversaries of the Nährstoffkonzentrations-wirtschaft model is that there would have been no economic reason to intensify agriculture with abundant land and a possible shortage of labour. Indeed, in chapter 3, the traditional, static models (like the Boserupian model) were described suggesting that traditional or prehistoric farmers would strive for a minimum effort (labour, or other resources) and a maximum profit (yield). Intensive use of arables would, according to these models, imply that land was a scarce resource and that labour was not.

But, as Stone described: “causality too often tends to run from the effective environment to food acquisition systems to cultural domains such as social organisation and settlement. Food acquisition tactics would be selected according to their efficiency or marginal utility, intrinsic properties which are independent of culture. Thus, intensive agriculture is seen [incorrectly] as less efficient than extensive, regardless of the farmers’ culture” (1994, 78). It was argued (ibidem) that similar models or economic laws (like the Law of Least Effort, and the Law of Declining Efficiency) are not applicable to prehistoric farming communities. “Efficiency” of agricultural productive systems can vary culturally and, in prehistory especially, other motives besides purely economic ones will have played a great part in agriculture and agricultural change, even at the expense of less efficient cultivation (see chapter 3). The reason(s) why farmers chose for intensification of agriculture could be found precisely within those reasons which restrained farmers from disintensifying. A strong appropriation of land by (other) local groups (families) could have been one of the reasons, just as much as it had been one of the consequences of intensive agriculture. For historic periods, a description was given about how such opposite interests could lead to the intensification of agriculture (Bastiaens/Verbruggen 1996).
12.3.2 FALLOW

Short periods of fallow were attested from the analysis of the arable weeds in the assemblages: in the Moselle region, principally in the earlier periods and in the MDS region mainly in later periods. Does the presence of short fallow as an element of the agricultural regime mean that intensification and therefore appropriation of land was more insignificant (or less developed) than in an intensified, permanent system, as implied by the Boserupian frequency-of-cropping model? Bieleman (1996, 8, note 2) correctly emphasised that (short) fallow does not necessarily mean complete abandonment of (attention to) the arable land. On the contrary, fallow may imply intensive labour. In a fallow year, there were several times of ploughing and harrowing, with periods of rest in between. According to Bieleman (1996, 2) the primary purpose of fallowing was not so much for the soil to regain fertility, but rather for the weed flora to demise. The aeration of the soil, which favours the mineralisation and therefore the fertility of the soil, was only a secondary purpose. Short periods of fallow in an intensified regime could therefore point to the superfluous use of manure, rather than to the depletion of arable soils (see also the observations in Denmark, see chapter 9). The mere existence of different fallow regimes next to each other in our study regions could point to this phenomenon.

12.3.3 VARIETY OF CROPS

In chapters 9 and 10, the shift in cultivation regimes towards intensification and diversification connected with the increasing number of different crops, was already described. The introduction of new crops from the beginning of the Bronze final (1250) but certainly after 1100 BC in the Moselle area and after 800, but possibly from the Late Bronze Age (1100 BC) in the MDS region, has many related consequences. Some of these are explored here.

The organisation of land use, technology and labour

The variety of crops attested in our study material cannot be brought in agreement with too rigid ideas on the preference for uniform land use systems. It was mentioned in the first section of this chapter that such a wide range of crops almost automatically implies the co-existence of various land use systems. An infield-outfield type system in which different scales and intensities of cultivation co-existed could be proposed. The static Boserupian frequency-of-cropping model described in chapter 3 leaves no room for such diversified cultivation regimes as this model is based on the assumption that agrarian communities abandon one cultivation stage and move into another when forced to intensify by population growth. Our botanical evidence suggests that prehistoric farming systems must have been composed of many different types of land use systems and soil management systems simultaneously.

The assumption of a highly diverse cultivation system implies that the use of technology (i.e. the agricultural implements) and the input of human labour would also be as diverse. The diversity of agricultural technology is a common phenomenon, also known from historical times. Rooijakkers (1987, 15-16) for example, described how the plough, as well as the hoe and spade were simultaneously in use until in the 19th century in southern Netherlands.

In a system of diversifying crop cultivation, the pivotal fuel is human labour (Stone 1994, 78). Therefore, not only gross labour requirements ensued out of this development but scheduling problems with respect to the agricultural agenda did as well. Stone et al (1990) observed that in the intensifying agricultural regimes of the Kofyar of Nigeria, the cost of intensification is effectively lowered via an intricate array of conventions for mobilizing labour, their reliance on the household as the basic productive unit and even some of their fundamental values. For farming groups in European later prehistory, it could have been the combination of “flexible” crops (like the short-season millet, or the mixed cultivation of naked and hulled barley) and the crops with a more stringent labour scheduling (like emmer wheat, but also the gathering of acorns) that formed a firm base of an intensified agricultural system. Relatively short-season crops such as millet, gold-of-pleasure, and flax offer the possibility of considerable scheduling flexibility as they are grown in the “slack” season (see chapter 10). Collectively, these crops are an indispensable element of intensification as they allow filling in of gaps in the principal agricultural agenda (see also Stone et al. 1990).

Decision making

The establishment of how these innovations were brought about, i.e. the decision making with regard to agricultural change and the introduction of new crops is relevant to the introduction of new crops (see also van der Veen/O’Connor 1998). Bourdieu (1963) described how in many Kabyle villages the “old-fashioned teacher”, was able, thanks to his prestige and moral authority, to introduce many innovations in all areas of life. Confidence in persons proposing the transformation engages a much greater following than the reasons invoked to justify it. It is for reasons of personal loyalty to an esteemed person that people resolve to break with the assured models of tradition (1963, 67). Wildenbeest (1988) emphasised that within farming communities in the east part of the Netherlands before the 20th century, agricultural innovations were introduced by “relative outsiders”. This has to do, according to him, with the perception of time by traditional farmers. The cyclical perception of time in pre-modern farming communities is based on repetitive acts (e.g. expressed in the agricultural cycle but also in the form of the cycle of successive generations living together in the
same house). The (modern) lineary notion of time is traditionally considered as facilitating historical consciousness of past, present and future, which is related to planning and decision making especially with regard to drastic innovations like the introduction of new crops.

Van der Veen and O’Connor (1998, 128) stressed that innovations are not automatically accepted even when the benefits are easily identifiable. First of all, the specific characteristics of the innovation play a role: simple or gradual innovations are more easily adopted than complex or extensive ones. Moreover, the social circumstances and the psychological make-up of the farmer are the main determining factors. Personal wealth, size of the farm, control over decision making and land ownership all influence the farmer’s ability to implement changes.

The latter aspect (land ownership or land tenure) was also mentioned by Palmer (1999, 300-1) in this respect. The ownership of land is an important factor affecting the adoption of crops. Palmer noted that the adoption of olives by farmers in northern Jordan was linked, among other things, to the release of land from communal tenure and the symbolism of the olive tree in terms of ownership (Palmer 1999, 302).

Some see shifts to new crops not so much as a straight forward decision to begin sowing a different species of crop. As we saw before, there is evidence that the switch to the cultivation of new crops may have come about through a change in cultivation methods. In the case of the change from emmer wheat to spelt wheat, already presented in chapter 10, this could indeed be the case. Growing of mixtures of different wheats on soils which gradually deteriorated could lead to the increase of the proportion of spelt. This change was not based on a process of conscious decision making by the farming communities, but on a change in cultivation method. However, the choice for new crops like pulses, millet and oil-species with their own specific cultivation demands and their own specific outlook cannot (in my view) be explained in the same way.

In this study, it was continuously stressed that the human choice with respect to the cultivation of specific crops is a central notion. Therefore, it is worthwhile knowing which specific demands these species pose to soil conditions, fertility and cultivation regimes. We should be aware however, that it is people who can, in fact, alter those conditions. If we consider crop choice as a social or cultural choice, environmental conditions will not have detracted much from this decision. On the contrary, the farming group who have made decisions regarding the cultivation of new crops, will modify soil conditions in accommodation to the demands of these newly chosen crops.

Risk spreading

A broad range of crops offers much spread both in time (different sowing seasons, different agricultural rhythms, cycles) and space (different plots that are simultaneously tilled and on which various crops are grown). Farmers have clear goals: to feed the family and to minimise risk. Many achieve this by “growing a little bit of everything” (van der Veen/O’Connor 1998, 128; see also Halstead 1990, 149). Moreover, it offers the opportunity to exploit the arable fields over many successive years, through rotating of the crops, e.g. with a stage of legumes cultivation as fertilizers.

12.4 The results in their archaeological context

The nature of arable production regimes in the Bronze Age and Early Iron Age seems to have undergone several fundamental developments. The first one is evident from the Bronze Age, but may have taken place long before, as we have no evidence at our disposal for the beginning of this development. It is characterised by intensive cereal agriculture, the use of manure and presumably, of the plough as well. The number of different cereal crops is rather low. This period is archaeologically characterised by large burial mounds, relatively short-lived, i.e. one-generation, shifting settlements consisting of single farmhouses and the introduction of the long house (see chapter 3). The relatively permanent use of the arable soil (as revealed by the botanical evidence on the arable weeds) should be related to a considerable degree of land tenure, i.e. the strong appropriation of land. The second agricultural development takes place parallel to the beginning of the Urnfield period (Late Bronze Age/Early Iron Age). A major reorganisation of agricultural and food regimes is recorded in this period, consisting of a wide variety of crops, a division and organisation of labour, the cultivation on well-defined plots of land, etc. This period is archaeologically characterised by (among other things) continuity (shifting settlements of individual farms) and change (the emergence of the urnfields and field systems like the Celtic fields).

In this section, we will look at the agricultural phenomena outlined above and their significant relations with other aspects and developments in society. Therefore, the principal cultural aspects of Bronze Age and (Early) Iron Age will be reconsidered. A range of aspects associated with the agricultural shifts described above, will be addressed. The first observation, i.e. of an intensive agriculture in the Bronze Age will be related to the land tenure (i.e. the appropriation of land), the introduction of the longhouse and the use of manure, and the ideas on the possible cultural unity within Atlantic Europe in the form of a Hausländschaft (see also chapter 2). In the second place, the appropriation of agricultural land in the Early Iron Age, the rise of Celtic fields and risk reduction will be discussed in the light of the develop-
12.4.1 THE APPROPRIATION OF LAND IN THE MIDDLE BRONZE AGE

For the MDS region, I dare to suggest the threefold reasoning that intensive manuring equals permanency of agricultural land use equals appropriation of agricultural land. From the Middle Bronze Age onwards, fixed fields were exploited in the neighbourhood of the (long-) house-settlements which, in their turn, stayed fixed for one generation. It was suggested that the inhabitants of a (Middle) Bronze Age settlement cultivated their fixed fields intensively, by weeding, manuring and perhaps ploughing with the ard, intensive soil working, with no fallow periods: thus, they strongly appropriated the arable land for (at least) one generation. The cause for the regular abandonment and (relatively long-term) shifting of the settlements should, in my view, be found neither in the soil depletion (which apparently did not take place, see also chapter 10) nor in the maximum lifespan of the post-built houses, both traditionally assumed by many authors (see chapter 2; see e.g. also Stone 1994). As ethnographic investigations have demonstrated, the abandonment or replacement of settlements is often "a telling mixture of practical and psychological needs". The shifting of settlements in prehistory should instead be explained especially in cultural terms, in the sphere of the cultural biography of settlements as described by Gerritsen (see chapter 2; Gerritsen 1999; Gerritsen in prep.).

I suggested in an earlier chapter that modifications of a landscape, like the lay-out of arable fields, or the intensive use of these fields could form the warrant of the appropriation of (i.e. the claims to) land; also, by putting fences around a certain plot of land, people would “separate it from its embodiment in the landscape” and therefore appropriate it (Ingold 1986). Other ideas on claims to land as presented in chapter 2, will be summarized here in brief. To many authors, in the Bronze Age and the Early Iron Age, the isolated, dispersed and wandering farmsteads, the Bronze Age grave barrows and the emergence of Urnfields are all indications of claims by the community (communal claims) to (plots of) agricultural land. The burial customs, in particular, show a concern with notions of unity and collectivity at the level of the community (Gerritsen 1999). For these societies in the study area, we should, according to the adherents of these ideas, probably imagine a series of overlapping claims on land, in which the ultimate claim lay with the ancestors. This means that land was externally owned (Roymans/Theuws 1999). Until the end of the Middle Iron Age or even the beginning of the Late Iron Age, this situation would undergo no drastic changes. No transformations of traditions surrounding land claims are assumed to take place. Also, in the Middle Iron Age the still isolated but more fixed (stable) farmhouses and their dispersed agricultural land would still be strongly related and therefore claimed by the ancestors. Only from the Late Iron Age onwards, individual (=family) land tenure would have developed. This could be inferred by the nucleation of settlements and the presence of family graves within the domestic sphere (see chapter 2).

In chapter 2, we suggested that, even though the authors mentioned above do skirt rather elegantly around the complex question of ownership of land, re-defining claims on land in the Bronze Age and the Early Iron Age seemed appropriate. To me, exercising claims to land (which I referred to earlier as the appropriation of land) is justified and takes shape by fencing the land, for example (as we saw in Middle Bronze Age Zijler, see chapter 2), intensive attention to plots of land by manuring, soil working, hoeing and weeding, increased attention to the crops grown on it and the products which come from it. Likewise, (uncommon) forms of storage of these products could be related to a strong appropriation of nature like the remarkable circle of Hallstatt storage pits and vase-silos that was recovered on the site of Frouard “Haut de Penotte”, and the battery of six granaries surrounded by a large palisade enclosure, recovered from the site of Aeroport Régional de Lorraine (zone G) dating from the Bronze final IIb-IIIa period.

Indications for this appropriation are already clearly visible from the Bronze Age onwards. The intensive cereal production in an agricultural system of continuous cropping in this period (see above) may be associated with private ownership of land. Agriculture in the Bronze Age appears to have been an affair of individual households living in isolated, individual houses. There are no indications of communal claims. Communal farming, communal land management and therefore communal claims seem to be more strongly related to the nucleated settlements of later periods, which appear from the Late Iron Age onwards.

12.4.2 THE LONGHOUSE-HAUSLANDSHAFT: CONTRAST OR NO CONTRAST BETWEEN THE SUB-REGIONS?

In previous chapters, we have seen that opinions differ on the question as to whether the MDS region and the Moselle region formed separate cultural unities or whether they were part of the same Hauslandschaft of Wohnstallhäuser (Harsema 1996, Roymans 1996) The principal reason to assume that powerful cultural and economic (etc.) contrasts
existed between the two regions, was formed by environmental aspects, esp. the differences in soil quality. As described above, according to Roymans the sandy soils in the MDS region did prevent large scale arable agriculture from developing. In contrast, the löss regions lent themselves perfectly to intensive agriculture (Roymans 1996, 51-56). The apparent absence of the longhouse in the löss regions would confirm this hypothesis.

In my opinion, the presence or absence of the longhouse and the infertility of the sandy soils as explanatory frameworks for an assumed contrast between the two zones are not very strong. The evidence for the presence of the longhouse in the sandy soils region is rather weak, as it is in the Moselle region (see chapter 2). Furthermore, soil conditions should not be regarded as the primary deterministic factor of agriculture (see chapter 3, Boserup). I have tried to demonstrate that the agricultural system was not a rational response of a social group to given ecological conditions. Ethnographic studies produced rather opposing evidence: local variations in the quality of soils and in the availability of natural resources have only minor effect on the native modes of use of nature (see e.g. Descola 1992, 115). The analysis of the seed assemblages of the MDS region strongly supported the idea that manure was (systematically) used to increase the fertility of the naturally rather infertile soils; also in the Moselle region, the application of manure could be assumed, although not as powerfully as in the northerly regions.

12.4.3 CELTIC FIELDS AGRICULTURE
As described in earlier chapters, not much is known about the exploitation of Celtic fields. The discussion concentrates on the questions “intensive or extensive” (i.e. the use of manure), the number of plots simultaneously in use, and the cultivation regime applied (multiple cropping?). Celtic field systems, in my view, were part of an intensive agricultural system in the Late Bronze Age and the Early Iron Age. In the following, this assumption will be accounted for.

In the study area, evidence for Celtic fields has been recovered from the area around the Early Iron Age settlement of Riethoven (see chapters 2 and 9). We assume that the inhabitants of Riethoven agriculturally exploited plots of this system. Furthermore, it may be assumed that the other investigated Early Iron Age settlements made use of similar fields (or field systems). The evidence from the analysis of the weed seeds from the Early Iron Age samples (from the MDS region especially) indicate that we should conclude that soil working and manuring were important elements of the agricultural regime (see chapter 9). This implies that the crop husbandry in this period had, at least, some characteristics of an intensified system (following the definition *sensu stricto*):

from a given amount of land (possibly permanent family-arables) combined with a high input of resources and labour, high yields were obtained. With the use of manure, an extensive agriculture and shifting fields were rendered unnecessary (see also Fokkens 1991, Louwe Kooijmans 1995, and Brongers 1976, on the cultivation of separate Celtic field plots).

The evidence from the analysis of the crops from the Early Iron Age samples (from the MDS as well as the Moselle areas) indicate that a high number of different crops was cultivated (see above section 12.3.5). In terms of economic organisation, it may be correct to conclude that small fields were a safe way for farmers to minimise risk of crop failure, since they probably implied varied crop production and multiple cropping. Cultivation on small arable fields is not an unusual form of farming. Ample evidence of such forms of cultivation is known from several other areas (see e.g. Palmer 1999; Sarpaki 1990).

The discussion on the number of plots which would have been under simultaneous cultivation has still not come to an end. As we saw in previous chapters, opinions differ on this matter. According to Harsema (1982, 154-56), not even the plots of one whole strip (i.e. 10 plots) of a Celtic field in Hijken would have been sufficient to feed one family. He suggested that another whole strip within the field system was used by each separate family of this community. As we saw before, speculations on this subject depend strongly on speculations with regard to yield numbers in particular. As the yields from crop cultivation depend on so many variables such as soil working, manuring, sowing methods, harvesting methods (see chapter 10), it is needless to say that I believe that the number of different plots will not have been high, provided that the farming communities invested much energy and labour in the yields. It was sufficiently demonstrated that they did so in many ways.

Small and scattered fields would encourage the cultivation of varied crops depending on various soil and other conditions (see also Brongers 1976; Sarpaki 1990, 430), and besides, small fields belonging to one household would provide micro-ecological environments which would encourage this varied crop production. Even if the same crop was grown on the various plots, it would produce differently (due to soil and micro-climatic differences). Halstead (1990, 149) also mentions that this type of land tenure was, until recently, a very widespread feature of Greek farming communities, such that each household cultivated a range of soil types in a subtle variety of topographic situations. The latter explanation could be interpreted as a variant of “maslin cultivation” — not of mixtures of crops but of mixtures of land, but aimed, likewise, at risk reduction.
12.4.4 APPROPRIATION OF LAND IN THE EARLY IRON AGE

The several different developments in the transitional period from Late Bronze Age to Early Iron Age, such as the intensive agriculture and the rise of the Celtic fields, could, in my view, be related to the phenomenon of the (increasing) appropriation of land (i.e. a form of private land ownership). Not all archaeologists believe Celtic fields are the expression of (individual) land tenure. Fleming (1985, 1987, 1989a, 1989b) developed a socio-economic model of prehistoric landed property based on collectivity. His investigations of the large coaxial field systems in England especially, resulted in the conclusion that the lay-out of the fields and the enclosures, as well as the cultivation on the plots must have been in the hands of large groups of people. All this took place in an egalitarian society where land was owned by the community, and was distributed among the members of this community. According to Fleming, individual property of land was only weakly developed or did not exist at all. This implies an economic co-operation among several individual families within one region. This co-operation labour relates to decision-making on a larger scale as well as to all daily routine activities, e.g. the preparation and cultivation of the fields, the care of land and live stock, communal stalling of animals, a communal herdsman, ploughing, harvesting and storage of the crops in communal granaries or silos.

In my view however, this “communal ownership of property” model, refers to the means of groups to organize their “territory” (i.e. the arable lands) rather than to the way these groups lay claims on the land. In the definition of Ingold, this would be described as territoriality, being an aspect of the organisation of work “governing not the social appropriation of land, but the practical conduct of its exploitation” (Ingold 1986, 143). Tenure, as Ingold sees it, engages land in a system of social relations.

Still, Fleming’s model gives us a departure point from which we can work out ideas on the appropriation of land. Above, it was assumed that already from the Bronze Age society onwards, access to land is claimed by small communities, or households living in dispersed, isolated and single farmsteads. The members of these households preserved their rights to a fixed plot of land at least for one generation, but probably from one generation to the other (Barrett 1994, 149). The absence of fallow plays an important part in this model. Whereas long fallow would physically minimize the opportunity to claim certain plots of land, short fallow or continuous cropping would not. What is more, an intensive cropping system could only evolve within a society in which access to land is a right for small communities who must have been able to recognize their own distinctive histories (in a linear time perception of past, present and future), related to a specific plot of land and a clearly defined and solid community (see above Wildenbeest 1988; Barrett 1994). Although the identity of the individual may well have been derived from belonging to a group, to the communal land and also, to the economic advantage involved with participating in the system, it is only by the virtue of his/her belonging to the community that a person acquires an individual relation to a determinate portion of land (see also Ingold 1986, 137).

And finally, the occurrence of field boundaries — extremely visible in the Celtic field systems — very powerfully point to this “private ownership” of land (Palmer 1999, 300).

It was discussed above that the wide variety of new crops predominantly required intensive hoeing and horticulture-type care. The adoption of such a numerous amount of new crops generated the need to watch over and protect the cultivated gardens/fields, establishing a vital bond between the farmer and the land in which so much time and labour must be invested (Roberts 1996, 21). It is safe to conclude that a broad range of crops and the adoption of new crops (as a cultural process as well as an agricultural change) is only possible through factors like the ownership and management of land (Palmer 1999, 300). Farmers are able to adopt new patterns of cultivation and intensification of agriculture when privately “owning” agricultural land. We could conclude that the agricultural system of the Late Bronze and Early Iron Ages not only included the appropriation of land but a strong appropriation of the produce (crops) from the land as well. The intensive labour invested in the products on the land created property; the crops were individually possessed.

The relation between the settlement system, the nature of the agricultural system and private or communal ownership of land (in the Bronze Age) has been discussed above. The settlement system in the Early Iron Age does not differ much from the preceding. On the contrary, a rather strong continuity is observed from the Bronze Age onwards until the Middle and especially the beginning of the Late Iron Age (see chapter 2). Therefore, in the Early Iron Age as well, we may assume that the absence of clustered farmsteads (hamlets) points to private ownership (or private appropriation) of land. Where joint farms are present (i.e. three or perhaps more houses which develops in the Middle/Late Iron Age), elements of joint tenure could be possibly proposed (see also Roberts, 1996, 16), i.e.: where farmers share settlements, it is more obvious to assume that they would also share land. As mentioned before, communal farming and communal claims to land can be more strongly related with the nucleated settlements from the Middle/Late Iron Age onwards (cf. Gerritsen 1999).
SOIL FERTILITY AND RITUAL PRACTICES IN THE HALLSTATT-LA TÈNE TRANSITIONAL PERIOD

In archaeology, it is traditionally believed that specific activities of prehistoric communities were normally restricted to specific activity areas. Dwelling and storage are restricted in many cases to settlement areas, burial and worshipping to other areas. Their spatial discontinuity is an indication of their differing roles in the respective communities. Therefore, it may be interesting to see how, in some cases, agriculture and ritual were linked together. It was suggested above that structural links existed between agricultural regimes, settlement dynamics and aspects of social organisation, such as the appropriation of land. In this section, it will be presented that specifically for the Late Hallstatt/Early La Tène period, we also have evidence that ideology was closely connected to agriculture, i.e. agricultural storage.

As described in chapters 5 and 6, extensive spatial concentrations of storage structures regularly occurred in the Moselle region. Large batteries of underground silos, pits and granaries were found in Rémerschen-Schengerwis (Hallstatt final-La Tène ancienne, 550-450 BC) and Gondreville (Hallstatt D). As described in chapter 6, a complete human body was found in one of the late-Hallstatt silos within the large storage terrain of the site of Rémerschen.

Human sacrifices in an agricultural context are well known, e.g. from Danebury where large numbers of depositions of all kind, including human bodies, were found in underground silos, pits and granaries (Cunliffe 1992). Burial or depositions of humans in similar contexts may be interpreted as human sacrifices. It was noted by Green (1998, 177) that the apparently secular business of storing seedcorn was probably an integral part of a dynamic sequence of ritual action of which the deposition of complete human bodies in the pits was an important element.

The association between cereals (seed corn) and special burials or sacrifices argues for a link with (soil) fertility and crop protection (Green 1998, 178). It can be related to the practice of offering to the chthonic deities in view of guaranteeing or enlarging the fertility of the soil or to force a good harvest (Cunliffe 1992). People executed such a ritual at the time of the removal of the seed corn, that is, at the beginning of the growing season, or at the start of a new agrarian cycle. The use of storage pits for so many of these deposits suggests that a further link may have existed between death, regeneration and fertility, as symbolised by the storage and growing of grain (Bradley 1998, 159-160; see also Cunliffe 1992).

Human sacrifices in an agricultural context may also be interpreted in terms of the appropriation of agricultural land (Lincoln 1986) or of the harvest that came from the land, i.e. as an indication of property. As Barrett stated “it was rather a complex field of action where people reproduced relations of affinity and obligation between themselves and others, and endowed the natural world with cultural values” (Barrett 1989a, 314).

Roymans (1996) related the pattern of ritual deposition of human bodies in abandoned corn storage pits with the agrarian regime practised in the löss region. In his view, the agricultural regime in these regions — where these ritual depositions are found most often — had a separate identity compared to that of the northern regions. As described above, he believes in the sandy soils area cattle breeding was the principal activity and the cultivation of cereal crops was of minor importance, and in the löss region cereal agriculture was dominant and the role of cattle was subordinate. Roymans understands the practice of human sacrifice as a fertility rite in the context of a growing emphasis on controlling the arable production of the land. According to him, increasing emphasis comes to lie here on cereal growing in the course of the Middle Iron Age. In his view, this can be connected to the evidence found in Northern France of agricultural intensification and a more sophisticated use of the landscape. Above, the supposed contrast between the agricultural system of the löss region and that of the sandy soils region is conclusively put in perspective.

I do not believe the contrast to be as sharp as Roymans assumed (see above). I think it is correct to consider ritual human depositions as part of the agricultural system. In my view, ritual depositions in an agricultural context should, in fact, be understood in terms of a growing emphasis on controlling the arable production of the land. But in contrast to Roymans, I think they point to the threats (risks) the agricultural system underwent rather than being an element of a development toward intensified agriculture, which, in its turn, is explained by Roymans through the natural fertility of the soil. If this soil fertility could have been taken so much for granted, would this still have made human depositions necessary?

We could hypothetically assume that an increasing emphasis on the (re-)generation of soil fertility was related to the (supposed) increase of spelt cultivation. If soil fertility had become a crucial factor in later Iron Age (from the late Hallstatt/Early La Tène onwards, see chapter 10), we may relate this to changing cultivation regimes relating to this spelt cultivation (see above, van der Veen 1992; van der Veen/O’Connor 1998). This would explain why soil fertility gained increasing attention in cultural and ritual contexts in this period.
notes

1 Since the 80’s, the University of Amsterdam has conducted a regional archaeological research project in the sandy landscape of the South Netherlands. The study area was originally restricted to the Kempen region, southwest of the town of Eindhoven. Later, it expanded out to the entire sandy plateau of the Southern Netherlands and Northern Belgium, or the area between the rivers Meuse, Demer and Scheldt. Recently, the research has been carried out in a co-operative framework of the Archaeological Institute of the Free University of Amsterdam (AIVU), the Amsterdam Archaeological Centre of the University of Amsterdam and the Faculty of Archaeology of the University of Leiden.

2 Bakels (pers comm) however, pointed correctly to the possibility of storing fodder on lofts within the farmhouses.

3 The long series of overlapping interpretations of the longhouse and the ideological considerations of Lincoln have demonstrated at least one thing: the coalition of people and animal in agriculture, however it is explained. In economic terms of agrarian land use, we can summarize those interpretations and ideas as an expression of the phenomenon of a mixed farming economy (section 2.3). In this context, it is worthwhile finding out whether the botanical material indeed indicates a systematic use of manure in agriculture possibly relating to the introduction of the longhouse in the Middle Bronze Age (see chapter 9).

4 Remarkable confusion over the meaning of the term agricultural intensification manifests itself here. This confusion is probably related to the various levels of scale of perspective. The authors cited employ the long-term (multi-generation) perspective and investigate large parts of the landscape. Therefore, they finish by concluding that on that level, the landscape was extensively exploited, as large parts of land were not cultivated for many generations. Following the definition, we should observe the way in which a local group made (agricultural) use of parts of land; then the conclusion would be that a group or family used particular plots of arable land for a whole generation, which is — according to the definition — an intensive agricultural system. See for this discussion chapters 3, 9 and 12.

5 In the Boserup scheme, the possibility of (intensive) grazing of cattle which also causes a grass fallow stage, is not accounted for (Bakels, pers comm).

6 Flotation of the material from the Moselle area has shown to be highly ineffective due to the nature of the lössy or loamy sediments. This problem is known from other areas in northern France (Bakels pers comm).

7 All dates used in this study are based on calibrated dates, years BC.

8 The study of botanical material from this region would not have been possible if not for the generous co-operation of the archaeologists of the Service Régional de l’Archéologie de Lorraine. The material from more than 600 investigated samples from 20 sites constitutes the largest collection of archaeobotanical data from this region to date. As such, they form the perfect base to the study of the developments of agriculture.

9 See van der Veen who stresses the importance of using multivariate statistics to botanical data sets, but mentions a few pre-requi-
When did they begin to be his? ... And ‘t is plain, if the first gathering made them not his, nothing else could. That labour put a distinction between them (i.e. the acorns) and the common. That added something to them more than Nature ... had done; and so they became his private right”.

20 We could assume that this development indeed took place already from the Late Bronze Age onwards. Roymans (1991, 32) stressed the many indications for continuity from the Late Bronze Age to the Early Iron Age (i.e. Urnfield period) in other areas of society.

21 Ethnographic examples of shifting settlements and their related extensive agricultural regimes demonstrate that cultivation does not last longer than ten years, and is usually abandoned every few years in these systems (e.g. Stone 1994).

22 Roberts relates the moving of settlements to the need to seek water, to escape disease and to comply with the custom of abandoning a place where an adult has died and is buried (1996, 23).

23 Woltering (1999-2000) suggested that pre-Late Bronze Age pit circles discovered in the site of Den Burg (Texel, prov. of North-Holland) were connected with the reclamation or the first agricultural use of the terrain (see also Bottema 1996-1997, 399).

24 See also Palmer (1999, 300) who assumed a strong connection of the practice of fallow to communal farming.

25 See also Roberts (1996, 36) who suggested that it needs a “communality to economise”.