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The RBINS Quaternary charcoal collections : the example of three neolithic sites of Hesbaye (5150-4950 BC, Belgium).

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Abstract: Remicourt "En Bia Flo" II, Fexhe-le-Haut-Clocher "Podrî l'Cortri" and Waremme "Longchamps" are early neolithic sites (5300-5000 BC) situated in Hesbaye (Belgium). The sites present the same kind of organisation: a village *stricto-sensu* and a distant house. The charcoal analyses have shown, among others, that the distant house correspond to a pioneer occupation. The environment around the sites was composed by typical wooden taxa. After, the villages were occupied. At that time, the environment was more opened and diversified because of man activities.

Key Words: Charcoal analyses, Early neolithics, Belgium, man activities, tree community

Résumé: Remicourt "En Bia Flo" II, Fexhe-le-Haut-Clocher "Podrî l'Cortri" et Waremme "Longchamps" sont des sites du néolithique ancien (5150-4950 av. J.-C) situés en Hesbaye (Belgique). Les sites présentent le même type d'organisation : un village *stricto-sensu* et une maison distante. Les analyses anthracologiques, entre autres, ont montré que l'habitation éloignée du village correspond à une occupation pionnière. L'environnement autour des sites était composé de taxons typiquement forestiers. Le village a été occupé par la suite. L'environnement était alors plus ouvert et diversifié à cause des activités humaines.

Mots-Clefs: Analyses anthracologiques, Néolithique ancien, Belgique, impact anthropique, assemblage forestier

Introduction

The charcoal analyses of three neolithic sites aim at the understanding of relations between Man and environment in Hesbaye (around 5000 BC). The charcoal analysis of such contexts are rare (Buydens 1999, Deligne 2005). This paper includes results obtained at Fexhe-le-Haut-Clocher "Podrî l'Cortri" by F. Deligne (Deligne 2005) and the ones obtained by myself on two additional sites which are Remicourt "En Bia Flo" II and Waremme "Longchamps". We try to answer three main questions : what where the resources exploited by the LBK people, which kind of environment they lived in, and what was the impact of their activities on it.

The sites

The neolithic sites are located in Hesbaye on the west part of the loess belt in the north of Europe which lies on Upper Cretaceous substrate. The archaeological sites are on the right bank of Geer and Yerne Rivers which are a Meuse tributaries (fig. 1). Today, the area is exploited for intensive agriculture and the residual vegetation is composed, for the best, of an oak-ash forest.

The three sites were occupied around 5000 BC by the first sedentary farmers in Belgium and belonged to the Linearbandkeramic culture (LBK). At this moment, man passes from a hunter-gatherers economy to a production one. This culture stretches on a large zone of 2000 km long from west Ukraine to the Paris Basin (fig. 2). The LBK culture has regional particularities but a common cultural background (Jadin 2003 ; Lüning 1998). We can imagine how important was the impact of these social, economic and cultural deep changes on the environment.

Remicourt "En Bia Flo" II and Fexhe-le-Haut-Clocher "Podrî l'Cortri" have been discovered on rescue excavations of the Région wallonne realised in collaboration with the Royal Brussels Institute of Natural Sciences along the High Speed Train line (TGV) between Brussels and Liège at the end of the 90's (Bosquet *et al.* 1997, 1998, 2004 ; Bosquet et Preud'Homme 1998). The excavations are limited to the width of the TGV line so the view of these settlements remained partial. Waremme "Longchamps" has been excavated at the end of the 80's and in 2005 (Cahen *et al.* 1990 ; Keeley *et al.*, 2005; Quick *et al.*, 2005). The excavations have been conducted by a team of the Royal Belgian Institute of Natural Sciences (RBINS) and of the University of Illinois in Chicago .

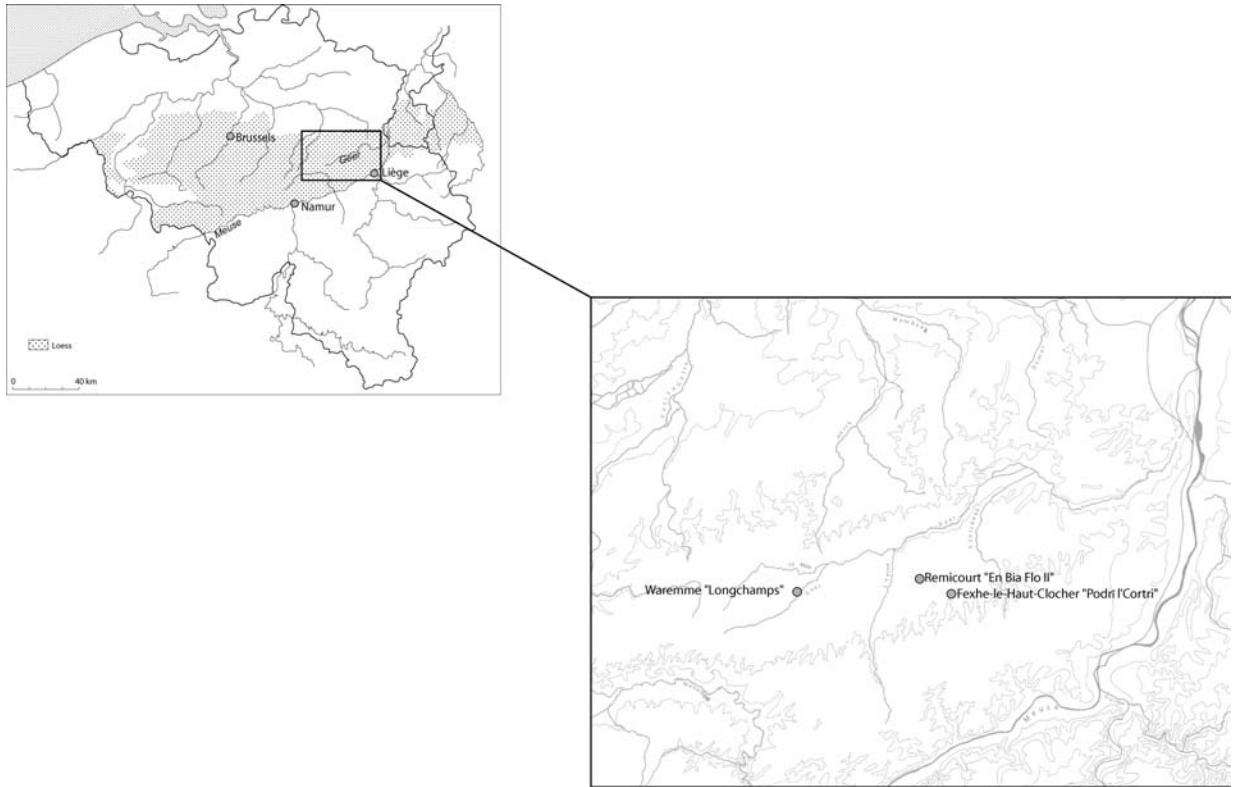


Figure 1: Location of studied area and topographic situation of the 3 sites cited in the text.



 LBK extension

Figure 2: Extension of LBK culture (from Lüning 1992).

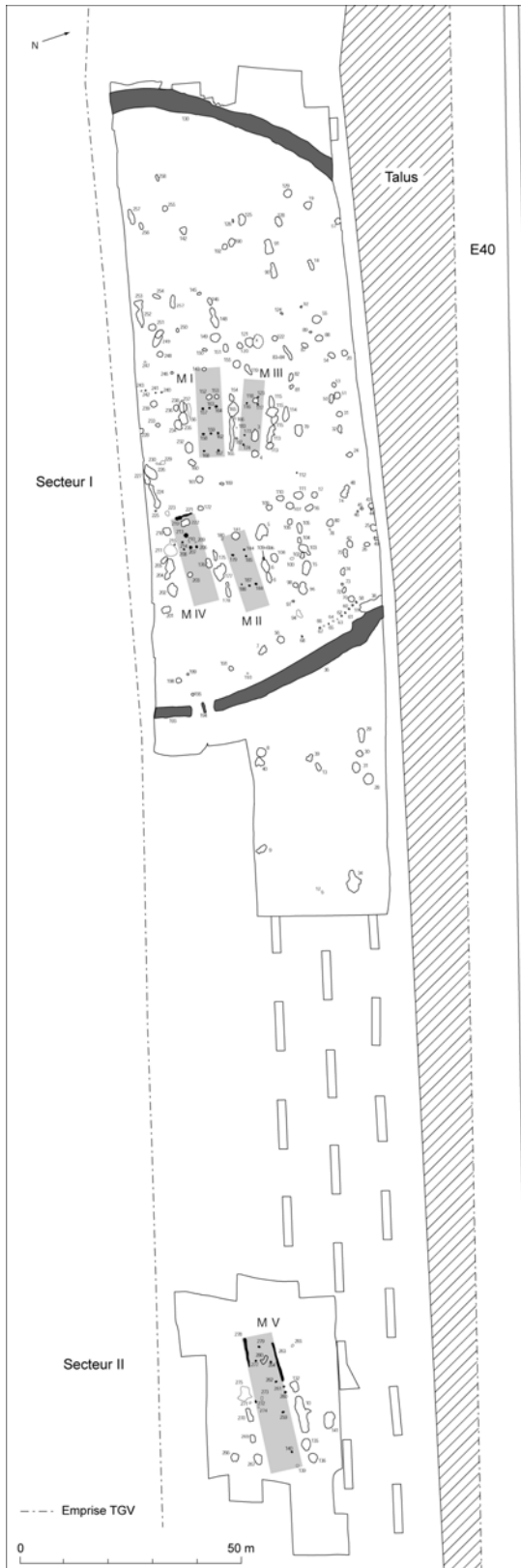


Figure 3 : Plan of Remicourt "En Bia Flo II".



Figure 4 : Plan of Fexhe-le-Haut-Clocher "Podrî"

Remicourt has been excavated on a surface of 6.847 m². The west part of the site comprises 4 houses surrounded by a ditched enclosure. Further to the east, we can find an out-of-the-wall installation (fig. 3). This house seems to be isolated but, in regards to the partial excavation, it's possible that other houses have been localised around (Bosquet *et al.*, 2006). Fexhe has been excavated on a surface of 8.900 m² (fig. 4). There is no surrounding wall, but there is also a house isolated some 50 m further to the east from the village composed by six houses at least. In Waremme, there is a house inside the village and another one outside which is situated at 20 m

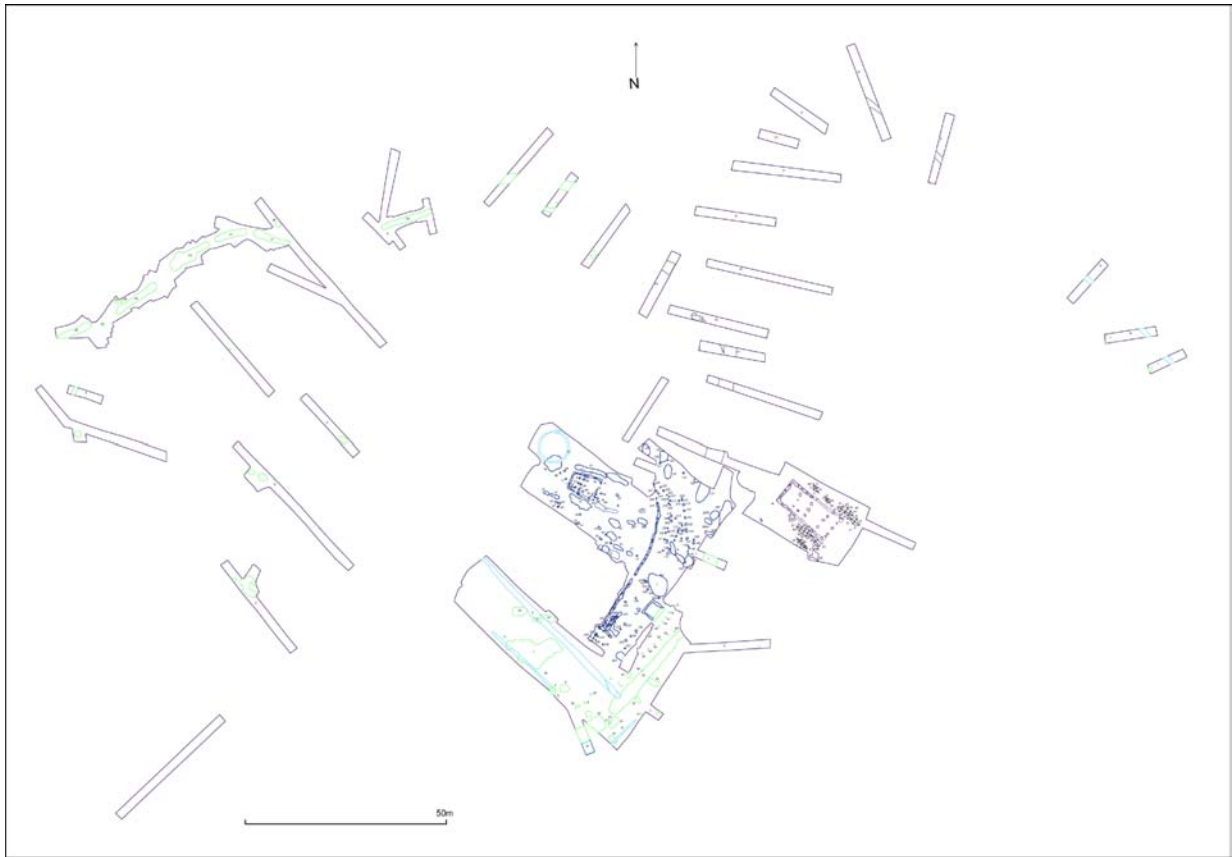


Figure 5 : Plan of Waremme "Longchamps".

from the east gate (fig. 5). In this case also, we have a partial view of the settlement which extends hundred meters to the west, as shown by the mag maps obtained during 2002-2005 surveys (Quick *et al.*, 2005).

So, the particularity of these three sites is that they are composed by two areas that can be distinguished : a group of house and a isolated one at Fexhe and a group or one house inside the wall with a house outside of it in Remicourt and Waremme. This situation asks two main questions: was the distant house contemporaneous than the ones found in the village and, if this is the case, do they correspond to specific activities ? As we will see, charcoal analysis realised on the three settlements bring answers at least to the first question, showing that these houses correspond to a pioneer installation.

Material and methods

The samples were taken from infill ash layers in lateral and isolated pits which are dispersed all over the sites (fig. 6). Among other uses, these pits provided clay for the mud-and-daub walls and probably for pottery and where used as dumps as secondary use. So, everyday life wastes – pottery sherds, flint tools, burned hearth, charred seeds and charcoals – were wiped out in it.



Figure 6 : Ashy layers of isolated pit 96 at Remicourt.

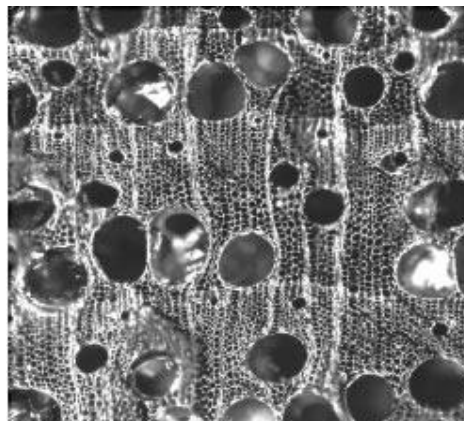


Figure 7 : Transversal face of *Fraxinus* sp.

Once collected on the site, the charcoal are separated from the sediment by sieving in water through a 250 µm mesh. Then the samples are submitted to a microscope analysis following several steps. First, the charcoals are broken to allow us to see it on three plans: transversal, tangential and radial. Each tree species have anatomic characteristics which allow the identification of the taxa (fig. 7). To help us, we consult modern burnt woods collection and a comparison atlas (Schweingruber 1990).

At Remicourt, a total of 160 kg of sediments has been sieved (42 samples, 21 pits). At Fexhe, a total of 47, 5 kg of sediments has been processed (20 samples, 14 pits). The analyse of Waremme is in progress. Until now, charcoals which come from 5 kg of sediments have been observed (26 samples, 11 pits).

First results

At Remicourt, a little more than 3600 charcoal fragments have been observed and 12 taxa recognized. The global assemblage spectra is dominated by *Quercus* sp. (37 %), followed by Pomoideae (25 %), *Fraxinus* sp. (16 %) and *Corylus* sp. (13 %). The next taxa are *Ulmus* sp., *Prunus* sp. and *Salix-Populus* sp. (2 % each) as well as *Sambucus* sp. (1 %). The minority taxa are *Tilia* sp., *Frangula* sp., *Ligustrum* sp. and *Acer* sp. (less than 1 %), (Salavert 2006).

At Fexhe, almost 2900 charcoals have been analysed and 6 taxa identified. Among them, *Fraxinus* sp., *Corylus* sp. and *Quercus* sp. dominate (respectively 45 %, 24 % and 17 %). Pomoideae are identified too (5 %) as well as *Prunus* sp. (4 %) and *Ulmus* sp. (3 %). *Sambucus* sp. is rare (0,03 %), (Deligne 2005).

At Waremme, a total of 2100 charcoal pieces have been observed and 12 taxa identified. We recall that Waremme analyse is in progress. *Quercus* sp. dominates (57 %) followed by *Corylus* sp. (9 %) and *Fraxinus* sp. (8 %) as well as Pomoideae and *Ulmus* sp. (7 % each). *Salix-Populus* sp. and *Sambucus* sp. are also identified (4 %). The others species are *Prunus* sp. and *Tilia* sp. (respectively 1, 5 % and 1 %). The minority taxa are *Ligustrum* sp., maybe *Cornus* sp. and *Betula* sp. (less than 1 %).

Thus, *Quercus* sp., *Corylus* sp. and *Fraxinus* sp. are the main taxa in the 3 sites. However, their percentages are not the same. *Quercus* sp. is dominant at Remicourt, where the percentage of Pomoideae is significant, and at Waremme. At Fexhe, the percentage of *Fraxinus* sp. is important (fig. 8).

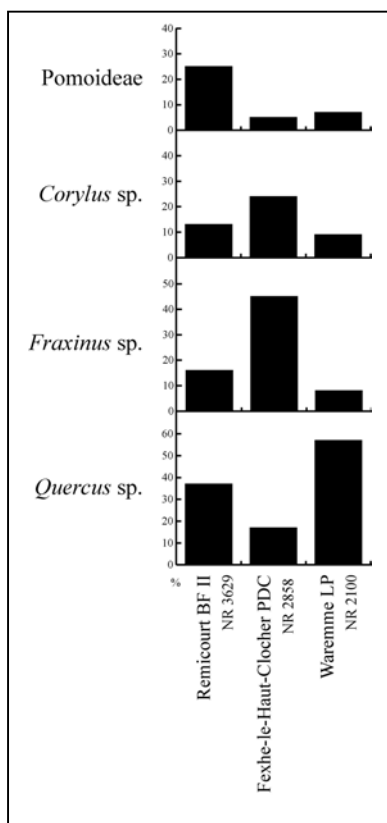


Figure 8 : Comparison diagram represented the pourcentage of 3 main species of the 3 sites and Pomoideae.

A difference in the charcoal assemblages from an area to another is observed.

At Remicourt, we notice that only 4 species are identified in the pits around the extra-wall house. There are *Quercus* sp., *Corylus* sp., *Fraxinus* sp. and *Ulmus* sp. On the contrary, Pomoideae, which represent an important part of the global assemblage of the site, are absent from the out-of-wall settlement (tabl. 1).

<i>Taxa</i>	Usual names	In-wall pits N=18	Out-of-wall pits N=3	Total N=21
<i>Quercus</i> sp. (fc)	Oak	18	2	20
Pomoïdeae		17		17
<i>Corylus</i> sp.	Hazel	11	3	14
<i>Fraxinus</i> sp.	Ash	11	3	14
<i>Prunus</i> spp.		9		9
<i>Ulmus</i> sp.	Elm	7	2	9
<i>Salix-Populus</i> sp.	Willow/Poplar	6		6
<i>Cf Sambucus</i> sp.	Elderberry	5		5
<i>Cf Frangula</i> sp.	Buckthorn	5		5
<i>Tilia</i> sp.	Lime	2		2
<i>Cf Ligustrum</i>	Privet	1		1
<i>Acer</i> sp.	Maple	1		1

Table 1 : Remicourt "En Bia Flo" II – Occurrence of *taxa* in each pits of the two areas (in-wall and extra-wall area).

Furthermore, the percentage of *taxa* is changing from an area to another (fig. 9). *Fraxinus* sp. (63 %) and *Corylus* sp. (31 %) widely dominate the assemblage of the out-of-wall area, whereas *Quercus* sp. (42 %) and Pomoideae (29 %) characterise the inside-the-wall assemblage (Salavert 2006).

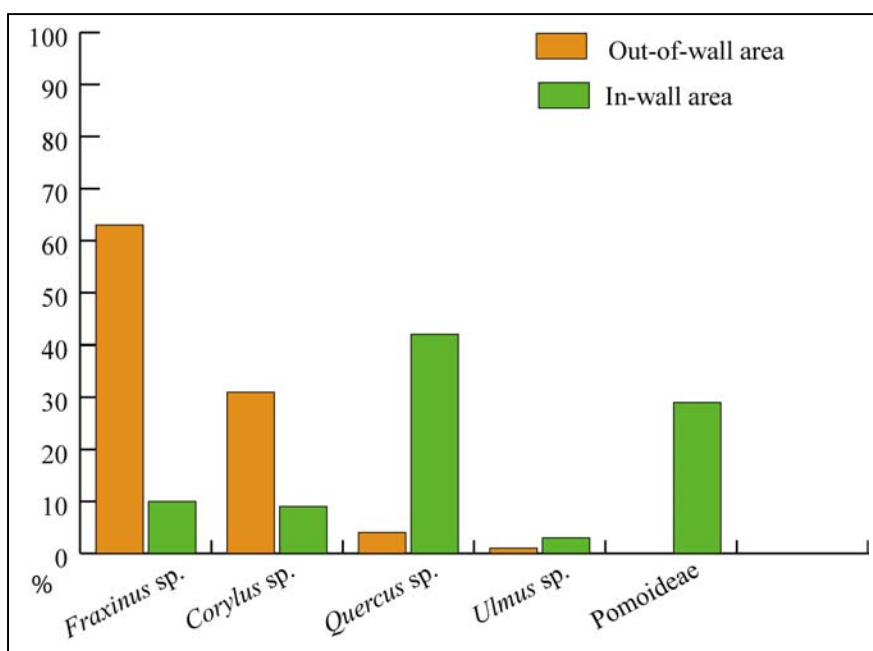


Figure 9 : Remicourt "En Bia Flo" II – Pourcentage of main *taxa* in both area.

At Fexhe, we observe once again a slight difference of the Pomoideae percentages between the two zones. The pits around the distant house area provided only 0,2 % of Pomoideae charcoal against 6 % in the pits linked to the group of houses. Moreover, an evolution of the charcoal spectra is observed inside the pit 61 (1). In this pit, the percentages of *Fraxinus* sp. decrease whereas the ones of the Pomoideae clearly increase up to the top of the pit (fig. 10). The bottom of the pit 61 (1) is marked by the presence of only 3 taxa which are *Fraxinus* sp., *Quercus* sp. and *Corylus* sp. Just like for the bottom of pits 154 and 61 (3), the last including *Ulmus* sp.. Clearly, such assemblages come from typical forest taxa. Most probably, the bottoms of pits correspond to the first occupations of the site. Deligne (2005) considers that there is a change in the forest composition from the bottom to the top of the filling.

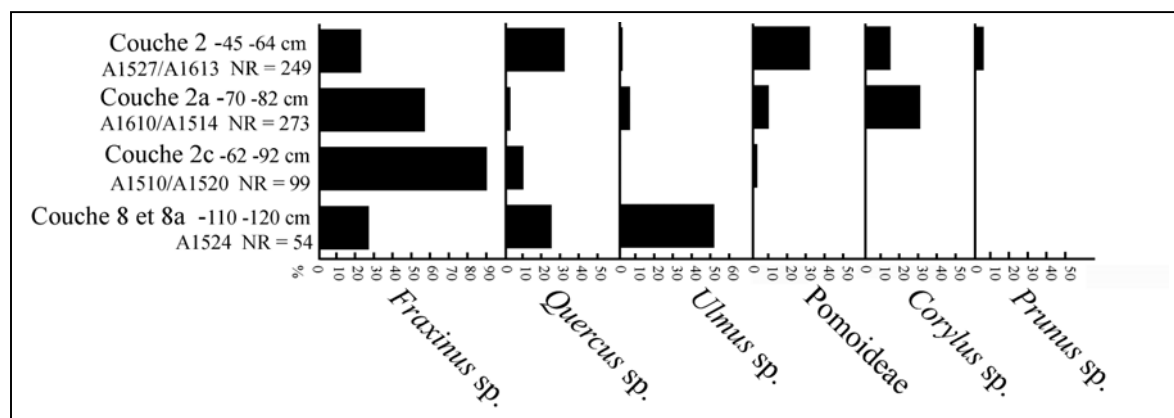


Figure 10 : Fexhe-le-Haut-Clocher "Podrî l'Cortri" – Charcoal diagram of pit 61 (1)

At Waremme, the first results indicate, once again, that there is no Pomoideae in the extra-wall area and a poor number of taxa as well (*Fraxinus* sp., *Quercus* sp., *Corylus* sp., *Ulmus* sp. and *Tilia* sp., tabl. 2).

Taxa	Usual names	In-wall pits N=12	Out-of-wall pits N=8	Total N=20
<i>Quercus</i> sp.	Oak	12	8	20
<i>Corylus</i> sp.	Hazel	10	2	12
Pomoideae		9		9
<i>Fraxinus</i> sp.	Ash	7	3	10
<i>Ulmus</i> sp.	Elm	7	1	8
<i>Tilia</i> sp.	Lime	2	2	4
<i>Prunus</i> (type <i>avium</i>)		3		3
<i>Salix-Populus</i>	Willow/Poplar	3		3
<i>Sambucus</i> sp.	Buckthorn	3		3
<i>Betula</i> sp.	Birtch	1		1
Cf <i>Cornus</i> sp.		1		1

Table 2 : Waremme "Longchamps" – Occurrence of taxa in each pits of the two areas (in-wall and extra-wall area).

On the site, the taxa percentages are slightly changing from an area to an other (fig. 11). We observe the highest percentage of *Quercus* sp. in the pits linked to the distant house. However, the charcoal come from the areas excavated in 80's. So we have to take into account that they don't come from substantial quantity of sediment as this is the case at Remicourt and Fexhe. More often, samples weigh few grammes. Given the local sampling at Waremme, the interpretation should be cautious. Anyway, the preliminary results of Waremme seem coherent with the general tendency observed at Remicourt and Fexhe.

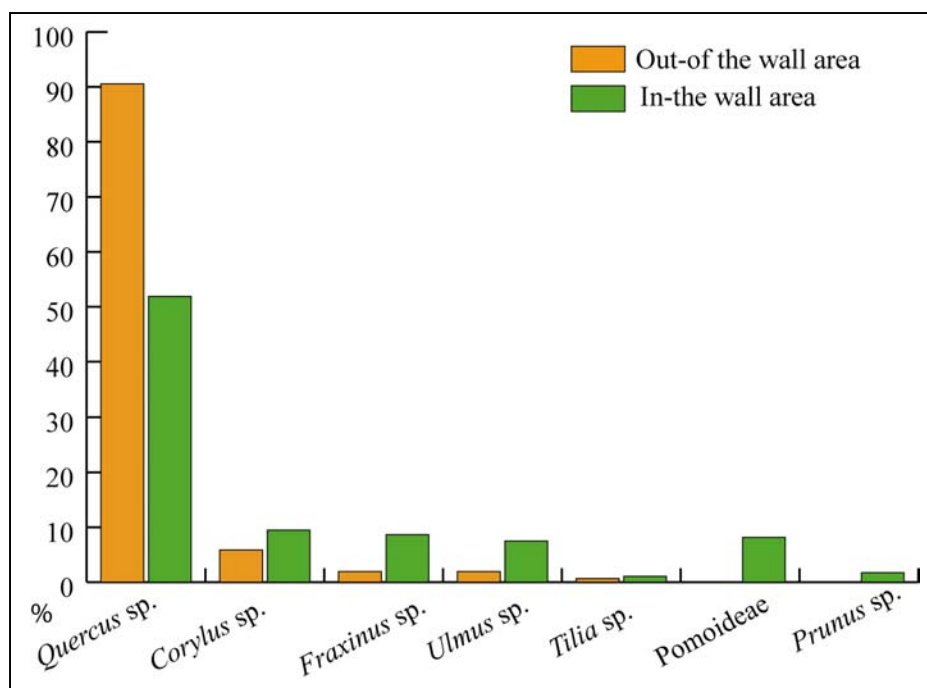


Figure 11 : Waremme "Longchamps" – Pourcentage of main taxa in both area.

Discussion

Charcoal, which come from archaeological contexts, are the reflect of human activities. The ones found in the pits can be considered as the cleaning out of fire places. We can admit that the wood for fuel was collected just around the sites. Their analysis will give us an idea of the woody environment of the village. Moreover, if the charcoal layers correspond to a long term deposit, it is possible to obtain an image of the evolution of the environment around the site and, therefore, to evaluate the impact of man activity on it (Chabal 1997 ; Bakels 1978 ; Asouti et Austin 2005 ; Dufraisse 2005). However, we have to interpret the charcoal assemblages in terms of environmental reconstitution carefully. Man could have chosen some species among all available species that they had at their disposal. Pollen investigations can be complementary to charcoal analyses to understand the environment around sites without the man filter. Unfortunately, no pollen investigations in natural contexts have been carried out nearby Remicourt, Fexhe and Waremme. The pollen diagram of Wange-Neerhespenveld, situated on the right bank of the Kleine-Gete, tell us that, a few kilometers northward up to the Geer river, oak and hazel were the main components of the forest during the Early Neolithic. The ash was also present (Lodewijckx and Bakels 2005). The dominant taxa of Remicourt, Fexhe and Waremme are coherent with these results. The general charcoal spectrum shows that *Quercus* sp., *Fraxinus* sp. and *Corylus* sp. were mainly exploited. The presence of heliophilous taxa (*Corylus* sp., Pomoideae, *Prunus* sp.) points to open areas such as forest or field edges. Bushes species show that a wide range of woody vegetation was collected for fuel by LBK people. We note that "birch tar" has been identified at Fexhe (Bosquet *et al.*, 2001) but charcoal of *Betula* sp. is absent on this site. This absence of birch in charcoal assemblage of Fexhe doesn't necessarily mean that there was no birch around the site and that it had not been exploited and collected by people.

With regards to the interpretation of differences between the village *stricto sensu* and the distant house's spectra, many hypotheses can be drawn.

-The deposit linked to the distant house corresponds to a low number of fires and is the result of one or two collection of wood for fuel. The spectrum could represent a short-term use of the fire. The surrounded vegetation is not well represented.

-The deposit is linked to particular activities. Probably, a selection of some taxa could have occurred in the out-of-wall area.

-The neolithics people didn't collect fuel at the same place.

-There was a change in the forest composition around the site in the course of the occupation.

The last hypothesis could be favoured by the first ceramic observations at Remicourt (Bosquet 2006) which indicates that the distant house had been occupied during the middle to later LBK while the in-the-wall village had been occupied from the later to final LBK.

We suggest that the distant occupation has been occupied first. The assemblages linked to these areas are composed of tall trees like oak and ash. At this moment, LBK people exploited an environment on which the impact of man was low. After that, the group of houses was occupied. Indeed, the assemblages linked to this area are not only composed of tall trees. Bushes, like *Sambucus* sp. and *Frangula* sp., are present as well as the Pomoideae which grow preferentially in open areas such as forest edges. This family appears favoured by man action (Damblon 2003, Pernaud 1997). In this scenario, the area, where man activities took place during the village *stricto-sensu* occupation, is more opening and diversified.

A charcoal investigation, carried out at Langweiler 8 on the Aldenhoven plateau, shows that a changement of tree community is also visible in the course of occupation. The site is localised at around 150 km from Remicourt, Fexhe and Waremme (Boelicke *et al.* 1988). This analyse show that the charcoal assemblage of the north part of the site is dominated by the oak whereas in the south-east part of the site, Pomoideae dominate the assemblage. In the same way, the chronological evolution of Langweiler 8 follows a north-south dynamic (Castelletti, 1988 ; Castelletti, Stäuble 1997).

Moreover, the evolution from closed forest to opened one can be observed into the infill layers of the pit 61 at Fexhe. As we have seen, the bottom of the pit (layers 8 and 8a) is only composed of *Quercus* sp., *Fraxinus* sp. and *Ulmus* sp. whereas a change in the forest composition is clearly visible since the layer 2c (Deligne 2005). This fact can also be observed at Remershen-*Schengerwis* in the Grand-Duché de Luxembourg (Damblon and Hauzeur *in press*). Damblon and Hauzeur (*in press*) suggest that the bottom of pits should correspond to activities linked to the construction of houses whereas the top of the infill corresponds to domestic activities. So the hypothesis of a change in the forest composition in the course of occupation does not necessarily exclude the one of the particular activities. Indeed, why are there only 4 or 5 taxa in the out-of-wall assemblages and in the bottom of some pits of Fexhe. Other species were at the disposal of Neolithics in their environment. The charcoal belonging to the distant house and the bottom of pits could correspond to remains obtained during the woodwork required for the building of houses and other installations such as fences. The remains could have been used as fuel (Bosquet *et al.* 2006). In this way, neolithics should have exploited mainly woody species such *Quercus* sp., *Fraxinus* sp., *Corylus* sp. and *Ulmus* sp. to build their dwelling place. Afterwards, Neolithics have not collected wood with particular selection and gathered species in the vicinity of the village where their economic activities took place.

Is there a relation between the two areas distinguished on the 3 sites ? We consider that first inhabitants have chosen the place where they built their settlement (Bakels 1978). We could think that the distant house could be the pioneer installation to check the place before the arriving of the entire village. Why didn't they build the village near the pioneer settlement ? Was there a special purpose for the house to be isolated far of the village (Bosquet *et al.* 2006) ? We have already talked about the possibility that the distant house was not isolated and that the excavation has given only a partial image of the distant dwelling. In this case, the fact that the house was isolated is not to be taken into account. But we do not questioned the fact that the out-of-wall installation is older than the village *stricto sensu*. The out-of-wall house and maybe the out-of wall village is sometimes very close to the surrounded village like in Waremme (20 m apart). How much time separates the first LBK occupation from the second one? Moreover, it is possible that we can notice different occupation phases inside the village. A pluridisciplinary research is in progress to try answering these questions (Bosquet *et al.* 2006).

Conclusion

We have shown the existence of a tree community mainly composed by oak, ash and hazel. A difference of spectra is visible between the one of the distant house and the one of the village. Many hypothesis can be formulated. Among them, there is a change in the forest composition around the village in the course of occupation and the deposit of charcoal is linked to particular activities.

A particular effort will be done to the the spatial charcoal distribution inside sites themselves as well as the spatial analyse of sites in a local and regional perspectives.

The first results exposed in this paper point to the importance of RBINS charcoal collections to understand the first sedentary farmers arrival in Hesbaye and, more largely, the comprehension of this processus in loess belt of the north of Europe. Further charcoal analyses in LBK contexts will be realised in the frame of a Ph-D Thesis.

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