

# The Evolution of Cattle Husbandry Practices in the Roman Period in Gallia Belgica and Western Germania Inferior

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*This article examines and compares the evolution of animal husbandry practices in several civitates of Gallia Belgica and western Germania Inferior, as documented by archaeozoological data. It focuses on two neighbouring civitates, those of the Nervii and the Tungri, its aim being to explore the factors that influenced diversity in husbandry practices. In general, it appears that cattle played an important role in the Early Roman animal economy of these civitates. There is evidence that large cattle were primarily bred for use as draught animals. At the same time, the intensive processing of cattle on professional butchery sites, and indications of cattle-related craft activities in urban environments, demonstrate that within the market economy animal exploitation was focused on cattle. Nevertheless, several aspects of animal husbandry practices exhibit geographical differences. Evidence of surplus production of pigs in the countryside of Gallia Belgica suggests that different kinds of agricultural specialization existed within the loess belt. There are also differences in the adoption of Roman agricultural innovations in terms of morphological changes in cattle.*

**Keywords:** archaeozoology, domestic livestock, Early Roman period, northern Gaul

## INTRODUCTION

After Iron Age Gaul was incorporated into the Roman Empire, it experienced changes in socio-economic organization, including a profound transformation of the agro-pastoral system of production. Indeed, it is assumed that the food supply to the segments of the population not involved in primary production (such as military personnel, civil servants, and craftspeople) depended on the agrarian surplus produced by the rural population. The emergence of larger agricultural estates and changes in land-use strategies, equipment, and storage structures reflect this change (e.g. Roymans, 1996; Ferdière et al., 2006; Roymans & Derks, 2011). New structures relating to the

transformation and redistribution of agro-pastoral products also emerged in the network of market places that was set up within the territory of Gaul.

Previous research has shown that major changes in husbandry practices that occurred after the Roman conquest are related to the intensification or expansion of agricultural production, relative specialization in some agro-pastoral products, as well as morphological changes in the animals (e.g. Lepetz, 1996; Lepetz & Matterne, 2003; Albarella et al., 2008; Bakels, 2009; Duval et al., 2012, 2013; Groot & Deschler-Erb, 2015). However, transformations were not uniform throughout the territory, and there was therefore considerable regional diversity. Factors commonly cited to explain these



**Figure 1.** Map of Gallia Belgica and Germania Inferior with the civitates and sites mentioned in the text (based on Raepsaet-Charlier ©CReA-Patrimoine 2011).

differences include environmental characteristics and soil quality, local populations with different traditions who varied in their acceptance or resistance to Roman innovations, and the exchange networks in which these populations were involved.

In order to explore the influence of these factors on the evolution of husbandry practices during the Early Roman period, I use archaeozoological evidence to examine and compare breeding strategies in several *civitates* of Gallia Belgica and the western part of Germania Inferior

(Figure 1). First, an overview of the existing literature attempts to set changes in breeding practices between the Iron Age and the Roman period in several *civitates* of Gallia Belgica. Then, I focus on two neighbouring *civitates*, namely, the Civitas Nerviorum, located in Gallia Belgica, and the loess area of the Civitas Tungrorum, which was initially part of Gallia Belgica and later became part of the province of Germania Inferior. The Roman period in these territories started in 58–50 BC, with the invasion by Caesar's troops. Contacts

with Romans before the conquest were very limited in both areas (Brulet, 2008). The capitals of the two *civitates*, Bagacum (Bavay) and Aduatuca Tungrorum (Tongeren or Tongres), are creations *ex nihilo*, and proto-urbanization is unknown in these territories in the Iron Age. Both study areas are located in a region covered with Pleistocene loess, where most of the soils are fertile and very suitable for agriculture. These territories were part of the 'villa landscape' with a hierarchy of large and medium-sized villae, and single farmsteads (Brulet, 2008; Roymans & Derks, 2011). However, the two *civitates* have different cultural backgrounds, were part of different administrative entities, and were involved in different exchange networks. Their material culture shows that there were differences in their assimilation of Roman culture in terms of intensity, timing, and the way in which the Roman model spread (Lepot & Espel, 2010; Lepot, 2014a, 2014b). The *civitas* of the Tungri became quickly and profoundly acculturated, with a clear influence from the Rhine *limes*, while that of the Nervii was more influenced by the Belgium of Caesar and by the Atlantic coastal area.

## MATERIAL AND METHODS

The number of archaeozoological datasets from Roman settlements in northern Gaul has substantially increased in recent decades, mainly through the growth of developer-funded archaeological investigations. However, the corpus varies from region to region, and not all areas are equally well covered. For this research, I selected regions containing balanced datasets of rural sites, *civitas* capitals and small towns in order to examine both 'producer' and 'consumer' sites and to investigate the network of production and exchange of animal products (Pigière & Lepot, 2013).

A large archaeozoological dataset is available for the western part of Gallia Belgica, in particular for the *civitates* of the Ambiani, Atrebatas, Bellovaci, Suessiones, and Viromandui (Figure 1). In addition, several syntheses on animal husbandry in the Late Iron Age (Méniel, 2001; Malrain et al., 2006; Méniel et al., 2009) and the Roman period (Lepetz, 1996, 2007, 2009; Lepetz & Matterné, 2003; Duval et al., 2012) cover the western part of Gallia Belgica. For the eastern part of the province, published data about husbandry practices are scarce (Oelschlägel, 2006; Bernigaud et al., 2016). Regarding the Civitas Nerviorum, the data I have gathered for this study consists of faunal assemblages from the town of Bavay, five small towns, and four rural sites (Table 1 and Figure 1). For the Civitas Tungrorum, the data come from the core area of the *civitas*, in the loess area, in particular from the town of Tongeren, five small towns, and eight rural sites (Table 1 and Figure 1). In the northern, sandy area of the Civitas Tungrorum, the villa of Hoogeloon is the only site to yield a large enough dataset for inclusion here (Kooistra & Groot, 2015). Some of the data were recorded by the author, and some were taken from the literature (Table 1). The compilation of archaeozoological analyses conducted by different researchers inevitably results in problems of comparability due to differences between researchers and the use of different methodologies. However, the effects of these problems appear to be minimal in the context of the current approach, which is to search for broad trends (Groot & Deschler-Erb, 2015, 2016).

The focus of this article is on cattle husbandry regimes, for which a large amount of data is available. Various types of archaeozoological data have been used in combination: relative frequencies of

**Table 1.** Sites of the *Civitates Nerviorum* and *Civitas Tungrorum* used in this research

<i>Civitas</i>	Site	Site type	Date	NISP (pig-cattle-caprines)	References
<i>Civitas Nerviorum</i>	Bavay-rue des Remparts	Town	Second century AD	1628	Merkenbreack, 2013
	Tournai-Saint-Brice	Small town	First-third century AD	105	Gautier, 1990
	Tournai-Cathédrale	Small town	First-third century AD	1073	Pigière, 2009, 2012b
	Waudrez	Small town	Third century AD	5870	Gautier & Ingels, 2003
	Velzeke	Small town	First-third century AD	427	Ervynck et al., 1999
	Asse-Nervierstraat	Small town	Second-third century AD	1841	Ervynck et al., 2013
	Famars-Technopôle	Small town	First-third century AD	-	Clotuche, 2013
	Bruyelle-Haute Eloge	Rural site	First-third century AD	2611	Pigière et al., in press
	Merbes-le-Château	Rural site	Second century AD	290	Pigière & Wouters, 2015
	Meslin-l'Évêque	Rural site	First-third century AD	832	Pigière & Boffin, 2015
	Erps-Kwerps	Rural site	First-third century AD	1271	Verbeeck et al., 1991
	<i>Civitas Tungrorum</i>	Tongeren-Momberstraat	Town	Mid first century AD	381
Tongeren-Elisabethwal		Town	First-second century AD	1100 MNE	Vanderhoeven & Ervynck, 2007
Tongeren-Veemarkt		Town	First-third century AD	233	Vanderhoeven et al., 1993
Tongeren-Kielenstraat		Town	First-third century AD	4035	Vanderhoeven, 2007; Vanderhoeven et al., 1987, 1991, 1992; Van Neer, 1994
Braives-central habitation		Small town	End second-early third century AD	585	Cordy, 1981
Braives-potters' quarter		Small town	Second-third century AD	112	Cordy & Stassart, 1983
Braives-western habitation		Small town	First-second century AD	611	Cordy & Rapaille, 1985
Braives-west-central habitation		Small town	First-third century AD	1037	Trabert, 1990
Braives-habitation below fort		Small town	First-third century AD	1926	Yernaux et al., 1992; Lentacker et al., 1993
Tienen-Grijpenveld		Small town	First-third century AD	399	Kooistra & Groot, 2015
Tienen-Zijdelingsstraat		Small town	Second century AD	3968	Vanderhoeven et al., 2001
Maastricht-MAVP.9		Small town	Second-fourth century AD	609	Pigière, 2009
Namur-Rue des Bouchers		Small town	Mid first century AD	553	Pigière, 2015a
Namur-Hospice Saint-Gilles		Small town	First-third century AD	580	De Cupere & Van Neer, 1993
Namur-Pl. Marché-aux-Légumes		Small town	First-third century AD	526	Van Neer & Lentacker, 1994; Pigière, 2009
Namur-Rue d'Harscamp		Small town	First-second century AD	584	Pigière, 2009
Liberchies-sector G		Small town	First-third century AD	2768	Lentacker & Vilvorder, 1997
Liberchies-sector H		Small town	First-third century AD	15580	Lentacker et al., 2001
Liberchies-sector I		Small town	First-third century AD	3485	Pigière, 2002; Udrescu et al., 2008
Liberchies-sector J		Small town	First-third century AD	2983	Pigière, 2015c
Jodoigne-Dongelberg		Rural site	First-third century AD	929	Pigière, 2012a
Broekom		Rural site	Second-third century AD	166	Van Neer, 1988
Latinne		Rural site	First-third century AD	115	Cordy, 1984
Piringen		Rural site	End first-early second century AD	122	Van Neer, 1990
Velroux		Rural site	First-third century AD	892	Pigière, 2014
Verlaine		Rural site	Second-third century AD	2504	Pigière, unpublished
Froidmont		Rural site	Second-third century AD	598	Tromme et al., 2008
Liège/Place Saint-Lambert	Rural site	Second-third century AD	1911	Gautier & Hoffsummer, 1988	

NISP, number of identified specimens. MNE, minimum number of elements.

species, age profiles, sex ratios, pathologies related to the use of cattle as draught animals, and osteometric data (for a detailed presentation of methods, see Pigière, 2009). To assess the relative importance of the main domesticated mammals (pig, cattle, and sheep/goat), percentages were calculated on the basis of NISP counts, and the results are presented in ternary graphs that allow us to present individual assemblages from the different sites and highlight broad patterns. The data are classified according to the type of site (rural settlement, small town, or urban site). The chronological span ranges from the end of the first century BC to the end of the third century AD. Age-at-death of cattle was established on the fusion of bone epiphyses and/or the eruption and attrition of mandibular teeth. It should be noted that raw data about age-at-death are not always provided in the literature. The results of these analyses are therefore summarized here into three broad age categories designed to reveal the main trends in cattle exploitation. We use the term 'young', for individuals younger than 2–3 years; 'sub-adult' for animals between 2–3 years and 3–4 years; and 'adult' for cattle older than 3–4 years. Bone measurements follow the guidelines of von den Driesch (1976). Sex identification relies on osteometry of the metapodia and the first anterior phalanx (Pigière, 2009). The study of pathologies related to traction relies on the method described by Bartosiewicz et al. (1997), which focuses on the bones of the feet.

The osteometric analysis employed the log-ratio method. The log size index (LSI) is the logarithm of the ratio between a measurement 'X' and its standard 'S', calculated as  $\log(X/S)$  (Meadow, 1999). The standard used here is a female aurochs from Ullerslev (Denmark) dating from the Boreal period (De Cupere & Duru, 2003: 116, table 9). Because Iron

Age evidence is scarce for the territories covered by the Nervii and Tungri, a Late Iron Age osteometric dataset derived from sites in the western part of Gallia Belgica was used as a reference for the study of the evolution of cattle morphology (Méniel, 1984). In order to examine more precisely when changes in cattle morphology first occurred, we opted for a fine chronological division at the beginning of the Roman period; the data are therefore grouped into Augusto-Tiberian (5/1BC–AD 15/20) and Claudio-Neronian (AD 40/45–65/70) periods. As for the remainder of the Roman period, the dataset do not allow such fine chronological subdivision, the data are grouped into larger time periods: first century AD, first–second century AD, second–third century AD, third century AD. The Mann-Whitney U test was employed to determine the level of statistical validity of the observed biometrical differences.

#### ARCHAEOZOOLOGICAL EVIDENCE FOR HUSBANDRY PRACTICES IN WESTERN GALLIA BELGICA

Major differences are observed between the Late Iron Age and the Roman period in the faunal assemblages from the western part of Gallia Belgica, which covers the *civitates* of the Ambiani, Atrebatas, Bellovaci, Suessiones, and Viromandui. In terms of the relative importance of the three main domesticates, pigs and to a lesser extent cattle are predominant in the faunal assemblages of the Late La Tène period (Méniel, 2001; Malrain et al., 2006; Méniel et al., 2009). From the first century AD onwards, a continuous increase in cattle and a decrease in caprines (sheep/goat) has been recorded in the assemblages from fifty-one rural sites in the area (Lepetz, 1996, 2009; Lepetz & Matterné, 2003). It is during the Late

Roman period that cattle frequency is at its highest. It has been suggested that agriculture was moderately developed in this loess area during the Roman period (Lepetz & Matterné, 2003), with production focused mainly on hulled wheats (emmer and spelt), and that a relatively large proportion of the land was dedicated to pasture.

The emergence of large-scale butchery and craft activities centred on cattle products are strong indications of the importance of cattle to the animal husbandry in the Roman period (Pigière & Lepot, 2013). Mass production of beef and of cattle-related craft products have been identified on urban sites (Arras, Amiens, Soissons, Beauvais) and small towns (Noyon, Estrée-Saint-Denis; Figure 1) (Oueslati, 2005; Lepetz, 2007, 2009). Large deposits of thousands of fragments of butchery waste attest to the carcass processing of numerous cattle at these settlements (Oueslati, 2005: 182). New butchery techniques that are clearly distinguishable from Late Iron Age techniques also appeared during the Roman period. These have been linked with the need to process many animals slaughtered on professional butchery sites over a short period (Lepetz, 1996, 2007; Seetah, 2006). This Roman butchery technique has been described for several parts of the northern provinces, and it appears to have been quite homogenous throughout the territory, even if some local variations are recorded (e.g. Maltby, 1985, 2010; Lignereux & Peters, 1996; Oueslati, 2005; Seetah, 2005, 2006; Lepetz, 2007). In the Iron Age, people used a knife for cutting up the carcass and for filleting, whereas the Roman technique mainly used a cleaver for these tasks, which made it possible to process the carcass more quickly. Roman butchery involves the dismembering of the carcass by systematically chopping into the articulations of the legs and

extracting the vertebral column by means of longitudinal chops on either side of the vertebrae. Filleting with the blade of a cleaver also produces distinctive butchery marks. Data from Amiens attest to the existence of a professional butchery in western Gallia Belgica from the mid-first century AD onwards (Lepetz, 2007). In a fourth-century butchery at Arras, a study of age-at-death showed that most of the cattle slaughtered were adults older than four years (73 per cent) and that, among them, many cattle were 'senile', older than eight years (38 per cent). These animals were not bred in the first instance for their meat; they would have been killed at a younger age, at the latest when they had reached the optimum meat-bearing age, at around three years old. These adult cattle were likely to have been used as draught animals and/or for milk production. Unfortunately, no sex-ratio data are available to further investigate what these animals were bred for. At the same time, the breeding of cattle for their meat is evidenced by the food remains excavated in the civilian occupation deposits from the same period at Arras.

A major increase in the size of cattle and other morphological changes have been documented for northern Gaul, which includes the western part of the Gallia Belgica (Duval et al., 2012, 2013). Duval et al.'s studies, based on a dataset of around 12,000 bones, shows a slow and continuous increase in the size of cattle as early as the Middle La Tène period, but in the Augustan period it grows dramatically and at very different rates compared to previous centuries (Duval et al., 2012, 2013: fig. 7). During the first century AD, the mean reconstructed withers height of cattle increases markedly from 1.12 m to 1.2 m, with some individuals reaching 1.52 m. By the end of first century AD, larger animals are dominant and the smallest cattle have disappeared. From the

mid-second century onwards, there is only a slight increase in cattle size (mean withers height from 1.26 to 1.32 m) and in general the size of the new population appears to have stabilized. But the slenderness indices begin to increase, reflecting selection for stronger animals.

Regional comparisons have shown that the dynamics, nature, and scale of the morphological transformations vary greatly between different areas in northern Gaul (Duval, et al., 2012: fig. 26). Two main trends are encompassed in this diversity. In some *civitates*, alongside the development of herds of medium size cattle, a group of larger animals also appears. The larger cattle show new morphotypes, which suggests that very large individuals were imported into Gaul, perhaps for breeding. In other *civitates*, a slow and continuous increase in size is recorded and it appears to be the result of the amelioration of indigenous herds.

Within these general patterns, there were cattle of different sizes in the various *civitates* of the western part of the province of Gallia Belgica throughout the Roman period. Larger cattle are present in the *civitates* of the Atrebatas, Bellovaci, and Remi, while smaller cattle are recorded in the *civitas* of the Ambiani. The greatest mean withers heights for cattle are recorded from rural sites rather than urban sites in most *civitates*. This suggests that the function of cattle is related to morphotype, with a predominance of large, working beasts on rural sites, linked to their use in agricultural activities. In addition, a correlation between cattle size and type of rural site in the *civitates* of the Atrebatas and Menapi has shown that large cattle are more frequent on villae, while smaller cattle are more abundant on farms (Oueslati, 2015). It therefore appears that villae, being highly Romanized places, were at the pinnacle of zootechnical innovations to produce powerful draught animals (Oueslati, 2015).

In the eastern part of the province, the few rural faunal assemblages from a micro-region in the Moselle area in the *civitas* of the Mediomatrici are also dominated by cattle (based on six sites, NISP = 882; Bernigaud et al., 2016). Because remains of pig dominate in the food refuse of the nearby town of Divodurum (Metz), Bernigaud et al. (2016) argue that surplus production in the surrounding countryside was geared towards pigs. However, because faunal evidence shows that large-scale cattle butchery also took place at Divodurum (Lepetz, 2009), I would argue that the possibility of surplus production based on cattle cannot be overlooked. Moreover, because the processing of cattle took place in professional butcheries, their remains will be underrepresented in the domestic refuse dumps of the town, and this difference in disposal between the remains of pigs and cattle makes it difficult to compare their relative importance. Pig remains also dominate in domestic dumps at other urban sites in Gallia Belgica, namely Amiens, Saint-Quentin, Arras, and Boulogne (Lepetz, 2010).

Among the small towns in the eastern part of Gallia Belgica, the proportions of the main domesticated animals differ. At the *vicus* of Wallendorf, cattle and pigs are dominant, while at Bliesbrück, pigs and caprines predominate (Oelschlägel, 2006). Close to Bliesbrück, at the villa of Reinheim, pigs are the main meat provider of its rich inhabitants. The data collected in the *pars rustica* of that villa, which should better reflect the production of the villa than the *pars urbana*, indicate that both pigs and caprines are prevalent. At the villa of Borg, in the Moselle valley, the same consumption patterns as Reinheim are recorded for the inhabitants of the *pars urbana*. However, in this case, cattle are the most frequent species in the *pars rustica*.

**ARCHAEOZOOLOGICAL EVIDENCE FOR HUSBANDRY PRACTICES IN THE CIVITAS NERVIORUM**

In the north-eastern part of Gallia Belgica, in the Civitas Nerviorum, cattle appear to be important in the animal economy during the Early Roman period, as shown by the presence of large-scale butchery and craft activities involving cattle products in the town of Bavay and the small towns of Asse, Waudrez, and Famars (Figure 1). At Bavay, several deposits of butchery waste attest to this activity from the first century AD onwards (Oueslati, 2005; Merkenbreack, 2013). At Asse, huge quantities of butchery remains (in the form of cattle horn cores and foot bones) dated to between the end of the first and the third

centuries AD were used in the foundation of a road (Ervynck et al., 2013). At Waudrez, an accumulation of trimmed scapulae and split bones in a well indicate that smoked ham and glue were being produced in the second half of the third century AD (Gautier & Ingels, 2003). Finally, at Famars, a refuse dump with an estimated surface area of 200 m<sup>2</sup> contained the same kind of waste from glue production (Clotuche, 2013). Other large rubbish deposits from Famars are currently being investigated and are expected to provide evidence about other craft activities based on cattle products (R. Clotuche, pers. comm.).

Cattle are also largely dominant in the consumption refuse of the inhabitants of all small towns (40–80 per cent) and one villa (49 per cent) (Figure 2) in the Civitas

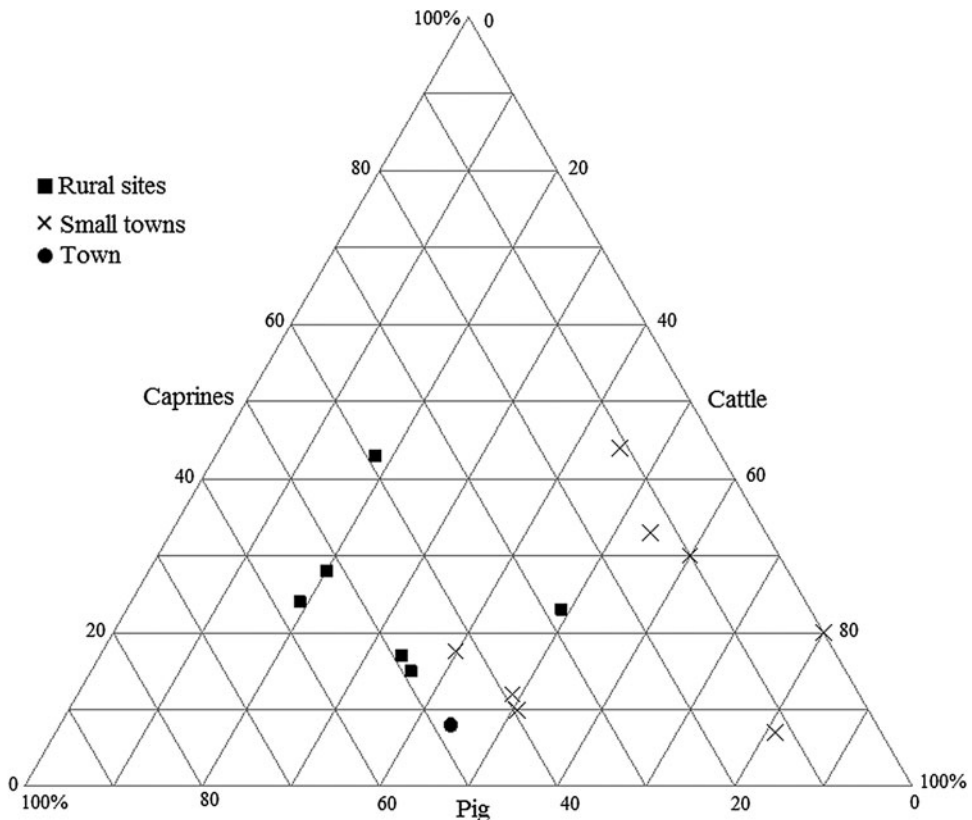


Figure 2. Relative proportions of pigs, cattle, and caprines in the Civitas Nerviorum (NISP = 9.400).



Nerviorum. Cattle are also abundant (44 per cent) in the assemblages of a rich *domus* at Bavay, where they are nearly as frequent as pig (48 per cent), in line with the consumption pattern of rich inhabitants, which is usually characterized by a higher proportion of pig than cattle. The food selection of the wealthy inhabitants of the southern villae of the *civitas* is also reflected in the high proportion (47–57 per cent) of pig recorded there, as most of the data come from the *pars urbana*. At Bruyelle, data from the *pars rustica* show the importance of pig (39 per cent) and of caprines (43 per cent) in the production of the villa. A relatively high proportion of pigs (39–43 per cent) is also recorded in the small towns of Waudrez and Tournai, which could confirm that pig husbandry was significant in the southern part of the *civitas*.

Although the data are still limited, it seems that cattle husbandry regimes directed towards different products were practised in the Civitas Nerviorum (Table 2). For small towns (Asse, Famars, Tournai), the age-at-death of the cattle indicates that mainly adult cattle were consumed. These would have been bred as draught animals or for milk production. In some villae, some of the cattle were also adults, and the rest were sub-adults presumably bred for meat (Bruyelle and Meslin). At the villa of Erps-Kwerps, a majority of sub-adults points to meat production.

So far, no information had been available about the morphological changes in cattle in the Civitas Nerviorum between the Iron Age and the Roman period. The dataset I have assembled for the territory of the Nervii makes it possible to compile the width measurements of cattle bones and thus provide the first substantive information documenting size changes in this *civitas* (Figure 3). A sharp increase in width measurements is recorded in the first century AD compared with the Late

Iron Age. A further increase is visible in the third century, which suggests a progressive and continuous increase in the size of cattle in the *civitas* throughout the Early Roman period. These changes are statistically significant (Table 3).

#### ARCHAEOZOOLOGICAL EVIDENCE FOR HUSBANDRY PRACTICES IN THE CIVITAS TUNGRORUM

Most archaeozoological data available for the *civitas* of the Tungri comes from the central area. In this region, cattle played an important role in the animal economy in the Early Roman period, as shown by the occurrence of large-scale butchery and craft activities related to cattle in several small towns and at the urban site of Tongeren (Figure 1 and Table 4). At Liberchies, a professional butchery site and several craft activities—producing smoked ham, making glue, tanning, and probably horn-working—were present in a craft area where features dedicated to tannery activities have been excavated (Lentacker et al., 2001). At Tongeren, the location of such activities in the backyard of a rich *domus* suggests that the élite were involved (Vanderhoeven & Ervynck, 2007).

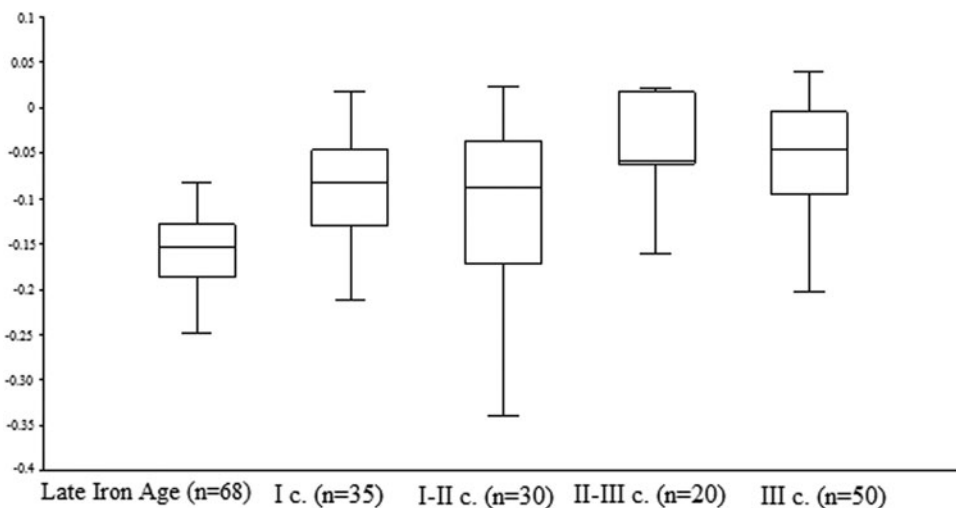
The importance of cattle in the meat provisioning of urbanized sites is also reflected in the food refuse of the inhabitants of the town of Tongeren and all small towns where cattle are largely dominant (urban centre: 49–73 per cent; small towns: 41–76 per cent; Figure 4). In addition, faunal assemblages associated with wealthy inhabitants in urban centres are distinguished by a high proportion of pigs (Pigière, 2015b). The dominance of cattle is also recorded in the rural sites, where we see more of an emphasis on cattle (37–72 per cent) compared to pigs (13–41 per cent) and caprines (13–33 per cent) during

**Table 2.** Summary of information about age-at-death at the Civitas Nerviorum and Civitas Tungrorum.

Civitas	Type of site	Site	Cattle
<i>Civitas Nerviorum</i>	Small town	Asse-Nervierstraat	Mainly adults
	Small town	Tournai-Cathédrale	Mainly adults
	Small town	Famars-Technopôle	Mainly adults
	Rural site	Bruyelle	Sub-adults and adults
	Rural site	Meslin-l'Evêque	Sub-adults and adults
	Rural site	Erps-Kwerps	Mainly sub-adults
<i>Civitas Tungrorum</i>	Town	Tongres-Momberstraat	Mainly adults
	Town	Tongres-Kielenstraat	Young and adults
	Town	Tongres-Veemarkt	Mainly adults
	Small town	Liberchies sector J-habitation	Young and adults
	Small town	Liberchies sector H-craft activities	Sub-adults and adults
	Small town	Liberchies sector H & I-craft activities	Mainly adults
	Small town	Liberchies sector G-habitation	Young and sub-adults
	Small town	Braives-potters' quarter	Young and sub-adults
	Small town	Braives-habitation below fort	Young and adults
	Small town	Braives-west-central habitation	Young and adults
	Small town	Namur-Pl. Marché-aux-Légumes	Mainly adults
	Small town	Namur-Rue d'Harscamp	Mainly adults
	Small town	Maastricht-Mavp.9	Mainly adults
	Rural site	Jodoigne/Dongelberg	Young and sub-adults
	Rural site	Velroux	Mainly adults
	Rural site	Piringen	Mainly adults
	Rural site	Froidmont	Sub-adults and adults

the first and second centuries AD. Cattle are also dominant in the faunal assemblage from the villa of Hoogeloon (57 per cent), located in the northern, sandy area of the *civitas*. It has been suggested that this site functioned as a central collecting point for

surplus cattle produced by the rural sites of the region (Kooistra & Groot, 2015). During the third century there is an increase in pig (42–54 per cent) and a decrease in cattle (12–34 per cent) in the rural sites of the central loess area (Figure 4).



**Figure 3.** Chronological changes in width measurements of cattle bones (LSI) in the Civitas Nerviorum.

**Table 3.** Width measurements of cattle bones (LSI) at the Civitas Nerviorum, length and width measurements of cattle bones (LSI) at the Civitas Tungrorum: results of Mann-Whitney U-test.

<i>Civitas Nerviorum</i>	Width	
		p value
Late Iron Age/ First century AD	***	<0.0001
Late Iron Age/ First–second century AD	**	0.0016
Late Iron Age/Second–third century AD	***	<0.0001
Late Iron Age/Third century AD	***	<0.0001
First/First–second century AD	N	0.4457
First/Second–third century AD	***	0.0008
First/Third century AD	**	0.0042
First–second/Second–third century AD	**	0.0061
First–second/Third century AD	**	0.005
Second–third/Third century AD	N	0.4634
<i>Civitas Tungrorum</i>	Length	
		p value
Late Iron Age/5/1 BC–AD 15/20	N	0.4023
Late Iron Age/AD 40/45–65/70	N	0.0564
Late Iron Age/Second half of first–first half of second century AD	***	<0.0001
Late Iron Age/Third century AD	***	<0.0001
5/1 BC–AD 15/20/AD 40/45–65/70	N	0.3914
5/1 BC–AD 15/20/ Second half of first–first half of second century AD	***	<0.0001
5/1 BC–AD 15/20/Third century AD	***	<0.0001
AD 40/45–65/70/ Second half of first–first half of second century AD	***	<0.0001
AD 40/45–65/70/Third century AD	***	<0.0001
Second half of first –first half of second century AD /Third century AD	***	<0.0001
<i>Civitas Tungrorum</i>	Width	
		p value
Late Iron Age/5/1 BC–AD 15/20	N	0.4407
Late Iron Age/AD 40/45–65/70	*	0.0395
Late Iron Age/ Last quarter of first century AD–first half of second century AD	***	<0.0001
Late Iron Age/Second century AD	***	<0.0001
Late Iron Age/Third century AD	***	<0.0001
5/1 BC–AD 15/20/AD 40/45–65/70	*	0.0204
5/1 BC–AD 15/20/ Last quarter of first century AD–first half of second century AD	***	<0.0001
5/1 BC–AD 15/20/Second century AD	***	<0.0001
5/1 BC–AD 15/20/Third century AD	***	<0.0001
AD 40/45–65/70/ Last quarter of first century AD–first half of second century AD	***	<0.0001
AD 40/45–65/70/II century	N	0.0798
AD 40/45–65/70/III century	***	<0.0001
Last quarter of first century AD–first half of second/Second century AD	*	0.0214
Last quarter of first century AD–first half of second/Third century AD	**	0.0057
Second/Third century AD	***	<0.0001

N, not significant; \* significant at 95 per cent confidence interval; \*\* significant at 99 per cent confidence interval; \*\*\* significant at 99.9 per cent confidence interval.

**Table 4.** *Large-scale butchery and craft of cattle products in the core area of the Civitas Tungrorum.*

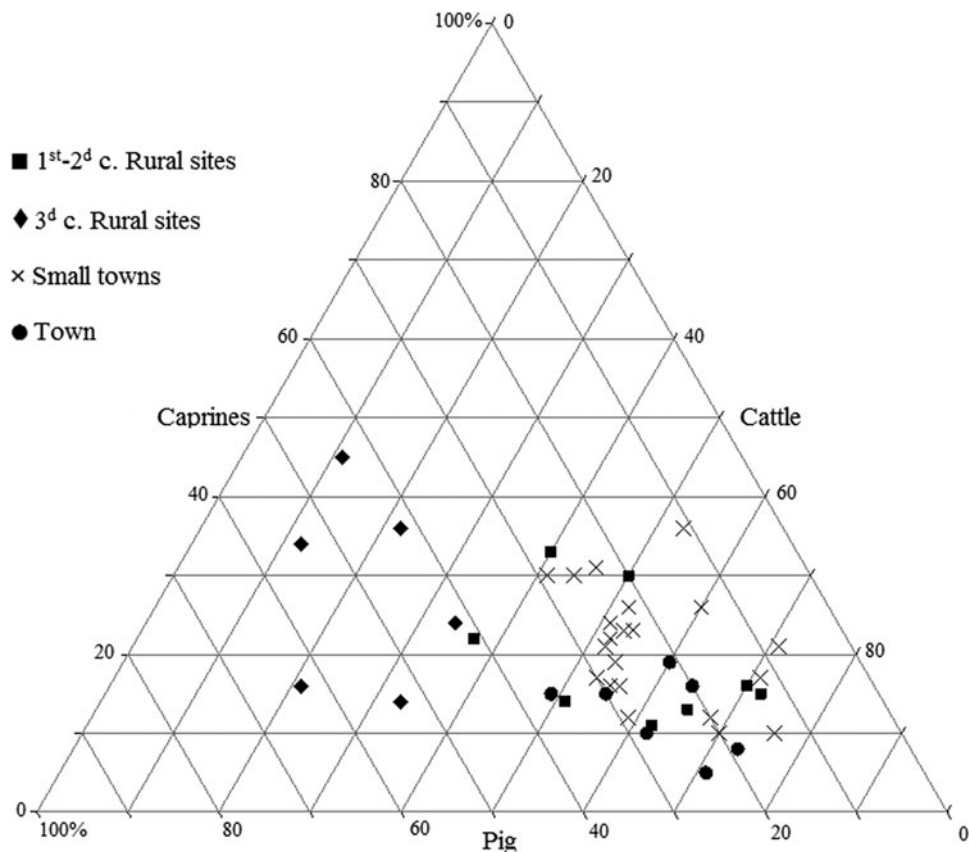
Sites	Date	Skeletal elements	NISP	Craft from cattle products
Tongeren	Last quarter of first century AD– first half of second century AD	Split long bones	10750	Marrow, grease, glue
	Last quarter of first century AD– second century AD	Horn cores	1100 MNE	Horn-working/tannery
	Second half of second century AD	Cranium frag., thor- acic vertebrae	1052	Butchery
Liberchies	Early Roman	Metapodia	–	Bone-working
	AD 85/90–110/120	Horn cores	57 (42 MNE)	Horn-working/tannery
	AD 85/90–110/120	Scapulae	191 (36 MNE)	Smoked ham
	AD 110/120–165/175	Scapulae	–	Smoked ham
	Second–third century AD	Split long bones	2412	Marrow, grease, glue
	Second–third century AD	Split long bones	<i>circa</i> 12000	Marrow, grease, glue
	Second half of third century AD	Cranium frag.	962	Butchery
Tienen	Second half of third century AD	Scapulae	58 (48 MNE)	Smoked ham
	First half of second century AD	Split long bones	2932	Marrow, grease, glue
	First half of second century AD	Scapulae	935	Smoked ham
	First half of second century AD	Horn cores	–	Tannery?
Namur	II–III century	Split long bones	2335	Marrow, grease, glue
Braives	End second–early third century AD	Rib bones, scapulae	504	Butchery
	End second–early third century AD	Split long bones	81	Marrow, grease, glue
Maastricht	Around AD 265	Rib bones, scapulae	–	Butchery

*NISP; number of identified specimens; MNE; minimum number of elements.*

A similar shift is not recorded in the urbanized sites (urban centre and small towns) in the third century, where cattle are still dominant, but it did take place in the Late Roman period, from the fourth century onwards, while at the same time cattle butchery sites are no longer recorded (Pigière, 2009). A possible decrease in cattle and an increase in caprines may be related to the economic crisis of the third century, as has been postulated for the *vicus* of Tienen (Ervynck et al., 2013), but this trend needs to be confirmed with more data.

Cattle breeding seems to have had several purposes in the core area of the Civitas Tungrorum in the Early Roman period. On both rural and urban sites,

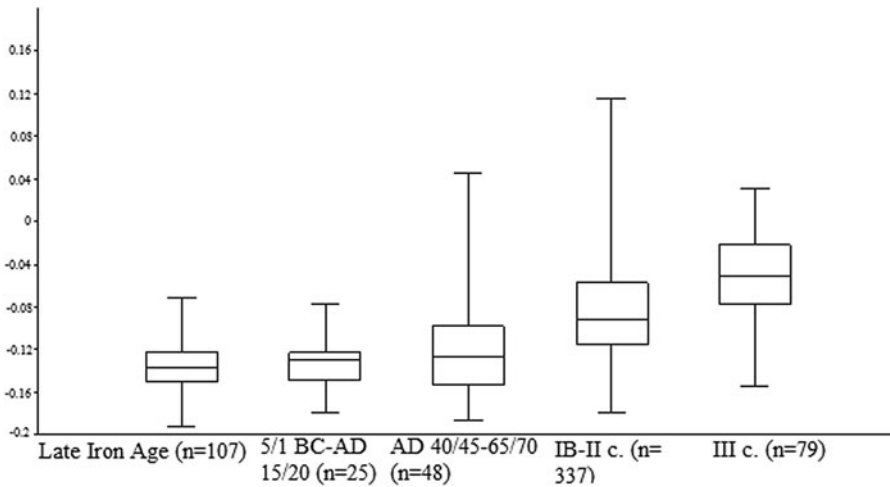
young and sub-adult animals bred for meat, and adult animals bred for use as draught animals, or possibly for milk, are attested (Table 2). In order to further investigate the purpose for which adult individuals were used, the sex-ratio of the large bone assemblages from Namur and Maastricht and from the material linked to craft activities at Liberchies has been analysed (Table 2). These assemblages comprise a high proportion of males (68–74 per cent), and among them numerous large oxen castrated at a young age (Pigière, 2015b). The kill-off patterns and the high frequency of males suggest that a majority of adult cattle were bred for use as draught animals. To determine the extent to which these animals were used



**Figure 4.** Relative proportions of pigs, cattle, and caprines in the Civitas Tungrorum (NISP=20.289).

for traction, mean pathological indices (PI) have been calculated for the first anterior phalanges of cattle in these assemblages (Pigière, 2015b). Compared with a modern population used exclusively as draught animals (PI=100 per cent), a relatively high mean index has been recorded for Roman cattle at the three sites (per cent PI between 54 and 66). This suggests a relatively intensive exploitation of cattle as draught animals. The pathological indices have also been calculated separately for the large individuals identified as oxen. The indices of these individuals are even higher (per cent PI between 53 and 73), suggesting an intensive use of these oxen as draught animals.

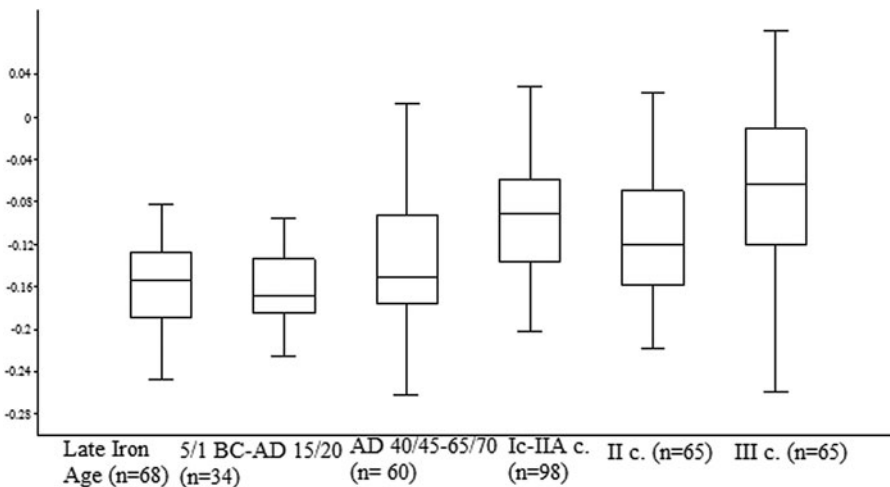
On the basis of the dataset I collected for the core area of the Civitas Tungrorum, it is possible to follow changes in cattle size throughout the Roman period (Figure 5). No morphological changes are detected between the Late Iron Age and the Augusto-Tiberian period (5/1 BC–AD 15/20), although it should be noted that larger cattle are represented in slightly greater quantities in the later assemblages. The first changes appeared during the Claudio-Neronian period (AD 40/45–65/70), when very large individuals occur alongside a majority of smaller individuals. A dramatic increase in the mean size is recorded during the second half of the first century and second



**Figure 5.** Chronological changes in length measurements of cattle bones (LSI) in the Civitas Tungrorum. IB, second half of first century AD.

century AD, and a further increase is visible in the third century. Therefore, there appears to have been a steady development, characterized by a general increase in stature and a growing proportion of larger animals, although small cattle did not disappear completely. When we examine the width measurements, we can detect the same trend (Figure 6). An increase in width measurement values is

recorded from the Claudio-Neronian period onwards, and herds with larger body sizes emerge. This trend intensified at the end of the first century and first half of the second century AD, and once again during the third century. Small-sized cattle are maintained throughout the period, although in lower numbers. All changes are statistically significant (Table 3).



**Figure 6.** Chronological changes in width measurements of cattle bones (LSI) in the Civitas Tungrorum. Ic, last quarter of first century AD; IIA, first half of second century AD.

## DISCUSSION

Cattle play an important role in the Early Roman animal economy of the western part of Gallia Belgica and in the *civitates* of the Nervii and Tungri. Several indices suggest that the emergence of the breeding of large cattle is a response, in the first instance, to the need for powerful draught animals for agricultural activities. The breeding of large animals may also be a response to the requirement for more meat and other by-products in a context of increasing demand from ‘consumer’ sites. In Gallia Belgica, however, the higher frequency of large cattle on rural sites compared to those found on urban sites suggests that larger animals were kept on farms for use in agricultural activities, while the smaller ones were sent to feed the urban population (Duval et al., 2012). Moreover, in the Civitas Tungrorum, the demographic data combined with the study of pathologies related to traction show the specialized use of large cattle as draught animals and not primarily as beef cattle. The need for more powerful animals that can plough heavier soils matches other evidence—changes in land use, more specialized crop production, developments in equipment and storage structures (Roymans, 1996; Kooistra, 1996; Bakels, 2009; Roymans & Derks, 2011)—of an intensification of agricultural activities in the fertile loess region in the Early Roman period. In addition, data about age-at-death in several *civitates* demonstrate the existence of cattle breeding for meat production, with animals mainly slaughtered when they reached the optimum meat-bearing age. The intensive exploitation of cattle in professional butcheries and in craft activities in the urban sites and small towns of Gallia Belgica and western Germania Inferior suggests that market economy was focused on cattle. This provides an indirect indication

of the surplus produced by the countryside to supply cattle to the urbanized sites. Moreover, several *civitates* of Gallia Belgica have yielded evidence that the supply of meat to urban sites also relied on the rural surplus production of pigs. At the other end of the spectrum, in the capital of the Tungri, a high proportion of pigs appears only in the diet of wealthy inhabitants, whereas cattle are dominant in the city’s general food waste deposits.

In the western part of Gallia Belgica, cattle grow in importance on rural sites during the Late Roman period. The territory of the Tungri follows a different trend, with cattle seemingly decreasing while the proportion of pigs increases in the countryside from the third century AD onwards. During the Late Roman period, the proportion of cattle also drops dramatically and pigs become predominant in the urbanized sites of the Civitas Tungrorum (Pigièrè, 2009). The decrease in importance of cattle in the Late Roman period is further suggested by the absence of evidence for professional cattle butchery. Indeed, cattle butchery has so far not been identified after the third century AD in the Civitas Tungrorum, whereas several Late Roman butchery sites are known from western Gallia Belgica (Oueslati, 2005; Lepetz, 2007, 2009).

The emergence of large cattle is documented in all geographical areas considered in this study. However, patterns of cattle size increase differ between western Gallia Belgica and the Civitas Tungrorum. Changes in cattle morphology occur later in the Civitas Tungrorum than in western Gallia Belgica: in the latter, a major transformation already occurs during the Augustan period, whereas in the former changes only begin to appear in the Claudio-Neronian period. Moreover, there are variations in the timing of morphological changes throughout the Early Roman period. Cattle withers height

increased continuously until the third century AD in the Civitas Tungrorum, while in the western *civitates* the tallest herds existed during the second century and there are no significant size changes after this time. Finally, a significant proportion of smaller-sized cattle was maintained throughout the Early Roman period in the Civitas Tungrorum. In the Civitas Nerviorum, the same continuous increase in height is recorded through the Early Roman period.

### CONCLUSION

In the fertile loess area of Gallia Belgica and western Germania Inferior, cattle breeding developed during the Early Roman period to respond to a growing demand for powerful cattle for traction and transport and for supplying ‘consumer’ sites with meat and other by-products. Despite these common trends, several aspects of animal husbandry differ between the *civitates* of western Gallia Belgica and those of the Nervii and Tungri. Several *civitates* in Gallia Belgica, including that of the Nervii, appear to be distinguished from the Civitas Tungrorum by more intensive pig husbandry during the Early Roman period. Food patterns were more orientated towards pork in the towns of Gallia Belgica, whereas the capital of the Tungri shows stronger beef consumption patterns. These patterns reflect differences in the surplus production of the countryside in these two areas, which suggests that different types of agricultural specialization existed inside the loess area.

The sharp decrease in cattle in the Civitas Tungrorum during the Late Roman period appears to reflect a reduction in the demands of the market on rural production and could reveal the major role the market played in the orientation of agricultural production. A

different trend is visible in western Gallia Belgica, where cattle husbandry seems to increase during the Late Roman period.

The process of integrating Roman agricultural innovations related to morphological changes in cattle appears to start earlier in western Gallia Belgica than in western Germania Inferior. However, it should be stressed that so far there is no evidence of a difference in the extent and timing of cattle size increases between the Civitas Nerviorum and the Civitas Tungrorum. In contrast to other material culture, this aspect of husbandry practices reveals no differences in how the two *civitates* assimilated Roman culture.

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### BIOGRAPHICAL NOTES

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## L'évolution des pratiques d'élevage des bovins à l'époque romaine en Gaule belge et dans l'ouest de la Germanie inférieure

*L'évolution des pratiques d'élevage des animaux domestiques dans plusieurs territoires (civitates) de Gaule belge et de Germanie inférieure occidentale constitue le sujet de cet article. Cette étude comparative, basée sur le dépouillement des données archéozoologiques, examine deux territoires voisins, celui des Nerviens et celui des Tongres, dans le but d'identifier les facteurs qui ont influencé les diverses pratiques d'élevage. Dans l'ensemble, il en ressort que les bovins ont joué un rôle majeur dans l'économie agro-pastorale de ces territoires au début de l'époque romaine. Un nombre d'indices révèle qu'on élevait les grands bovins en premier lieu pour servir d'animaux de trait. De plus le traitement intensif des bovins dans des boucheries professionnelles et les données concernant l'artisanat en milieu urbain de produits provenant de ces animaux démontrent que l'économie de marché se focalisait sur l'exploitation des bovins. Cependant on observe aussi des différences géographiques dans certains aspects de la pratique de l'élevage. Les données concernant la production de porcins dans les campagnes de Gaule Belgique laissent penser que diverses formes d'exploitation spécialisée étaient pratiquées à l'intérieur de la « ceinture laessique européenne ». On constate aussi des différences dans l'intégration des innovations agricoles introduites par les Romains au niveau des changements dans la morphologie des bovins.* Translation by Madeleine Hummler

*Mots-clés:* archéozoologie, élevage, Haut-Empire romain, Gaule du nord

## Die Entwicklung der Viehzucht in der Römerzeit in Gallia Belgica und in der westlichen Germania Inferior

*In diesem Artikel wird die Entwicklung der Tierhaltungspraktiken in einigen civitates in Gallia Belgica und in der westlichen Germania Inferior untersucht und aufgrund der archäologischen Angaben verglichen. Zwei benachbarte civitates, die Gebiete der Nervier und Tungerer, stehen im Mittelpunkt der Untersuchung, dessen Ziel es ist, die Umstände, welche die verschiedenen Tierhaltungspraktiken beeinflusst haben, zu erforschen. Im großen Ganzen ergibt sich, dass Rinder eine wichtige Rolle in der frühromischen Landwirtschaft dieser civitates gespielt haben. Mehrere Angaben deuten darauf hin, dass man größere Rinder vor allem als Zugtiere gezüchtet hat. Gleichzeitig zeigen die Schlachtung und Verarbeitung von Vieh in spezialisierten Schlachtereien und das Vorhandensein in den Städten von handwerklichen Tätigkeiten, die mit Tierprodukten verbunden sind, dass Rinder den Mittelpunkt der Tiernutzung innerhalb der Marktwirtschaft bildeten. Jedoch gibt es einige Eigenschaften der Tierhaltung, die sich geografisch unterscheiden. Die Aussagen über die Überschusserzeugung von Schweinen in Gallia Belgica weisen auf verschiedene landwirtschaftliche Spezialisierungen in den lössigen Gebieten hin. Schließlich gibt es auch Unterschiede in Hinsicht auf Veränderungen in der Morphologie der Rinder in der Aufnahme von römischen Innovationen im Bereich der Landwirtschaft.*

Translation by Madeleine Hummler

*Stichworte:* Zooarchäologie, Viehzucht, frühromische Zeit, Nordgallien