

Livestock for Sale: Animal Husbandry in a Roman Frontier Zone

THE CASE STUDY OF THE CIVITAS BATAVORUM

MAAIKE GROOT

AMSTERDAM UNIVERSITY PRESS

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Below: A Batavian farmer taking his cow to market (Illustration: Mikko Kriek)

Cover design: Kok Korpershoek, Amsterdam

Lay-out: Bert Brouwenstijn, ACASA Amsterdam

ISBN 978 94 6298 080 8

e-ISBN 978 90 4853 028 1 (pdf)

NUR 682/683

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FOREWORD

The idea of writing a synthesis of animal husbandry in the Roman Dutch River Area arose early in my research project *Livestock for sale: the effect of a market economy on rural communities in the Roman frontier zone*. At the time, it seemed a good idea, probably because I had no idea of the time and work that would be involved. As it turned out, time ran out in the first project and I needed a second research project in which to finish the manuscript (*Sustaining the Empire: farming and food supply in two Roman frontier regions*). Over five years later, the work is finally finished. I could not have written this book without the help of a number of colleagues, who I would like to thank here. My zooarchaeological colleagues, especially Joyce van Dijk, Kinie Esser, Frits Laarman and Bill Whittaker, provided primary data and unpublished reports. Sabine Deschler-Erb, Joyce van Dijk, Laura Kooistra and Nico Roymans commented on an earlier version of the manuscript, followed by two anonymous reviewers who also provided useful comments. Finally, I would like to thank the Netherlands Organisation for Scientific Research and the Gerda Henkel Foundation for financing the two research projects that led to this book.

EXTRA TABLES AND ILLUSTRATIONS

The number of tables and illustrations I originally included in the manuscript was too large for a printed book. I therefore selected those that were essential to the text; the others are preceded with an 'E' in references in the text, and can be accessed online: <http://dx.doi.org/10.17026/dans-zth-dgam>

1. Introduction

I. I. FRAMEWORK, SCOPE AND RESEARCH QUESTIONS

I. I. I. INTRODUCTION

Little is known about the way in which previously self-sufficient rural communities responded to market demand for agrarian products in the past, or about the resulting changes in agrarian strategies.

This topic will be studied through a case study of animal husbandry in the Lower Rhine area in the Roman period. With the arrival of the Romans to the southern and central part of what is now the Netherlands, a substantial group of consumers was introduced into what was basically a subsistent agrarian society. In earlier periods, with the exception of perhaps a small minority of religious or craft specialists, everyone was involved in agrarian production. The arrival of the Roman army constituted a large group of people that depended on others for their food. Moreover, in the town of Nijmegen, we find administrators, traders and craftsmen, most of whom did not or only to a limited extent produce their own food. The Roman occupation thus introduced a separation between producers and consumers.

The Roman army and administrators, as well as an influx of traders, stayed in the southern half of the Netherlands for nearly four centuries. While some products were imported, other foodstuffs were of local origin. The presence of imported material culture in rural sites is an indication that local people participated in trade. With farming as their economic basis, an agrarian surplus is the most likely form of goods that could be traded for imported products such as pottery. This means that the local farmers managed to produce more food than they needed for themselves. How they managed this is the main question of this study. The aim is to trace developments in animal husbandry from the Late Iron Age to the Late Roman period, investigate whether these developments can be related to market demands, and gain an understanding of the impact of the Roman occupation on the agrarian economy.

Although this is a case study, it is expected that the results will be of wider relevance to other researchers with an interest in agrarian societies faced with major economic changes or in the organisation of food supply to towns and army.

I. I. 2 RESEARCH AREA AND TIME FRAME

This study focuses on the Roman period (12 B.C. – A.D. 350) in the Dutch River Area (fig. 1.1). This region not only covers a distinct geomorphological area, but also roughly coincides with the *civitas Batavorum*, which was an administrative unit within the Roman Empire and the home of the ethnic group of the Batavians. The southern part of the *civitas Batavorum* is excluded. Because of its sandy soils, there are very few sites with animal bones from this region.¹ Just as important is that the difference in geomorphology may have resulted in different agrarian regimes. Therefore, the Pleistocene

¹ An exception is Oss-Ussen. Lauwerier/IJzereef 1994.



Fig. 1.1. Location of the research area.

sandy soils form the southern border of the research area. In the north, the river Rhine forms the frontier of the Roman Empire. To the east, the border of the Netherlands with Germany is used to define the research area. This is also the point where the river Waal splits off from the river Rhine, creating an area enclosed by rivers – with the Meuse coming from the south – rather than an area with a river running through it. To the west, a change in geology from river clays to peat and sea clays forms the final boundary of the research area. While the chronology of the individual sites was respected in this study, in order to make meaningful comparisons the

commonly accepted chronology for the Roman Netherlands was used to study developments over time. This chronology consists of three periods: the Early Roman period: 12 B.C. – A.D. 70; the Middle Roman period: A.D. 70-270; and the Late Roman period: A.D. 270-350.

1.1.3 AIM, RESEARCH QUESTIONS AND APPROACH

The aim of this study is to examine the zooarchaeological data set from the Roman Dutch River Area for evidence that sheds light on the interaction between farmers and urban and military consumers, and for developments in animal husbandry that can be related to market production. Interaction would have taken place if the army camps and the town of Nijmegen were supplied with food and products that were produced by the farmers in the research area. In order to understand agrarian production and consumption, data from producer sites (rural settlements) and consumer sites (military camps, town and temples) need to be included, since they provide different parts of the puzzle. For the rural settlements, I will characterise the agrarian economy and trace developments in farming, especially in animal husbandry, that occurred during the Roman period. I will then try to answer the question whether developments can be related to production for the Roman market. An important question is who controlled the process of agrarian production. Did the demand from consumers drive production, or did producers decide what was sold? While I am also interested in variability in production strategies between and within rural communities, the focus in this study will be on general patterns that can be identified in the agrarian production of the rural settlements. A previous study focused on individual households in order to find out the role of the individual in agrarian production.² While such an approach can give new insights into the functioning of rural communities, the lack of suitable data sets meant that it could not be taken further in the current study. For the consumer sites, consumption patterns will be investigated, and also whether animals supplied other products. Data from rural and consumer sites will be compared in order to establish what products could be and were supplied from local sources, and to trace the origin and movement of agricultural products.

This study will take a regional approach to reconstruct farming and food supply for the *civitas Batavorum*. The research area is unique in the extent to which it is known archaeologically: not only is there a long academic tradition of archaeological research into the Roman period,³ but in the last fifteen years rescue archaeology has increased the number of excavations enormously. The quality of the data set, particularly with regard to rural settlements, is high: it includes several sites that cover the entire Roman period and have been excavated completely. Lauwerier published his regional study on animal husbandry in 1988 (including 12 sites);⁴ since then, the number of sites with zooarchaeological data has grown to 72 (this study). Although the number of consumer sites for which data are available is smaller than the number of rural sites, it includes some large assemblages. By concentrating on producers as well as consumers, we can investigate the effect of market production on local communities.

The study has two sides: first, it is a synthesis of animal husbandry and the consumption of animal products in the Roman Dutch River Area. To that end, it will bring together all zooarchaeological data from the last decades, and reconstruct farming and dietary patterns. Second, it addresses questions of wider relevance for farming, food supply and the Roman economy. What strategies were used in the provisioning of the Roman army and town in the research area? How did local farming communities respond to the increased demand for agrarian products? How did they achieve a move from subsistence farming to market production? What strategies did they employ to increase their production? Roman society and economy were strongly based on farming, and a good understanding of farming is therefore crucial if we want to understand the Roman Empire. Similar developments in animal husbandry occur throughout the Roman provinces, as will become clear from the parallels that will be mentioned. However, regional differences can be noticed.⁵ Each region had its own history, culture and environment, which meant that each region had to find its own solution to deal with the Roman occupation and the challenges this provided for animal husbandry and food supply. This study will reveal what the solution was in the Dutch River Area.

To achieve the objectives, a number of smaller research questions will be addressed. Animal bones form the basis of this study, and the questions below can directly be linked to certain aspects that are commonly investigated in zooarchaeological studies: species proportions, age and sex, skeletal elements, butchery and measurements. While the main focus is on animal husbandry, as evidenced by animal remains, some information from archaeobotanical research is also included. After all, arable farming is inextricably linked with animal husbandry in a mixed farming system. This subdivision will be followed throughout this study.

1.1.3.1 *Species proportions*

The proportions in which the four main domestic mammals (cattle, sheep/goat, horse and pig) contribute to the animal bone assemblages form the basis for interpreting their importance in agrarian production and as food. Apart from the domestic mammals, wild mammals, fish and birds provided another source of food. Animal species that did not occur naturally in the research area provide evidence for trade. Chicken was introduced in the research area by the Romans, and its presence in rural settlements is an indication for connections between rural inhabitants and the Roman army or town. Species proportions will be examined to answer the following questions:

- What was the relative importance of the four main domestic mammals? Are there any developments over time in species proportions? Can any differences be observed between individual sites,

² Groot 2011b; 2012b.

Vos 2009; Willems 1984; Willems/Van Enckevort 2009.

³ E.g. Aarts 2014; Heeren 2009; Lauwerier 1988; Nicolay 2007; Roymans 1996; 2004; Van Driel-Murray 2003;

⁴ Lauwerier 1988.

⁵ E.g. Groot/Deschler-Erb 2015; 2016.

and between rural and consumer sites? What do these species proportions say about meat provisioning in consumer sites?

- To what extent did hunting and fishing contribute to the diet? Is there any evidence for trade in animal foods, such as seashells?
- How important was chicken in rural and consumer sites?

1.1.3.2 Age and sex

Together with species proportions, data on slaughter ages and the sex of livestock form the main information on animal husbandry. Mortality profiles of livestock can be used to reconstruct exploitation strategies, with meat, milk and traction (in the case of cattle) all leading to different profiles. In the case of consumer sites, mortality profiles provide indirect information on production, as only those animals selected for the market are represented. In that sense, they may give insight into what this selection was based on, and thus into who actually selected the animals (the farmer or the consumer). Data on age and sex will be used to answer these questions:

- What can we say about the exploitation of livestock? How important were secondary products? At what ages were animals slaughtered for meat?
- Are there any developments over time in the mortality profiles for the main species?
- How do slaughter ages for livestock from rural and consumer sites compare? What does this say about exploitation of animal herds and decisions about selection?

1.1.3.3 Skeletal elements

Investigating which skeletal elements are present or absent, or under- or overrepresented gives insight into butchery and processing of animals and into the production and consumption of certain animal products (such as hides and smoked meat). The questions related to skeletal element distribution that will be addressed in this study are:

- Can any patterns be identified in skeletal element distribution, such as developments over time or differences or similarities between sites, and if so, how can they be explained?
- Is there any evidence for the production of cattle hides in rural sites? If so, at what scale did this take place?
- Are there indications that certain meat products, such as smoked shoulders or brawn, were produced in rural sites?
- Do consumer sites show evidence for processed meat and industrial processing of animals?

1.1.3.4 Butchery

Butchery marks on animal bones provide information on whether meat of livestock was consumed, and on how an animal was processed from carcass to meat. Butchery practices vary between cultures, and are also dependent on the tools that are available. Changes in butchery practices can thus tell us about cultural changes. Butchery marks also provide insight into the scale and efficiency of butchery. Large-scale processing of livestock for meat involves professional butchers and standardisation of butchery practices. Butchery marks are included in this study to answer the following questions:

- Did butchery practices in rural sites change during the Roman period, and if they did, in what way?
- Is there evidence for the use of new tools in rural sites?
- Do butchery marks provide evidence for the consumption of horse meat?
- What is the evidence for large-scale butchery and processing of cattle in urban and military sites?

1.1.3.5 Biometrics

Measurements of animal bones can reveal changes in size and shape of livestock. These can reflect changes in exploitation or nutrition or genetic changes. Genetic changes are caused by the import of

new stock or by interbreeding with animals outside the local population. Comparing measurements from different rural sites can say something about the interaction between different rural communities, in the form of exchange of breeding stock. Comparing measurements of livestock from rural settlements with those of livestock in consumer sites and between military and urban sites can tell us whether animals were supplied from local sources or imported, and whether army and town were supplied from the same sources. Measurements can also be used to reconstruct withers height. The focus in this study will be on cattle, but data on withers height from the other main domestic animals will also be included, in order to answer the following questions:

- What do bone measurements say about the development in the size and shape of cattle over time? Can size increases be dated? Was size increase a uniform process, or did it occur at different times in different sites? Was it a gradual or a sudden transformation?
- What was the variety within the rural cattle population in the Dutch River Area? What does this say about the interaction between rural sites?
- Is there a difference in size and shape between cattle from rural settlements and cattle from consumer sites? What does this say about the interaction between rural and consumer sites?
- Is there a difference in size and shape between cattle from military and urban sites? What does this say about the supply to army and town?
- Are there any developments in withers height of cattle, horse and sheep? Are there any differences in withers height of these animals between rural and consumer sites?
- Is there any evidence for the import of livestock from outside the Dutch River Area?

1.1.3.6 Archaeobotany

In the Roman Dutch River Area, mixed farming was practised. In this system, the growing of crops and the keeping of animals is complementary and interdependent. Animals provide manure, pull ploughs and are used for threshing, while arable farming provides fodder for livestock. Although this study focuses on animal husbandry, archaeobotanical data were included in the study to some extent, to achieve a more complete picture of agrarian production and consumption. Furthermore, these data also provide information on consumption patterns and trade. Archaeobotanical data will be examined to answer the following questions:

- What species of cultivated and wild food plants are present in rural and consumer sites?
- Is there any indication for imports from outside the research area?

1.2 THE DUTCH RIVER AREA IN THE ROMAN PERIOD

This paragraph focuses on aspects and developments in the region that are relevant to agrarian production and trade. These include the possibilities and limitations of the landscape, the presence of the army, infrastructure, the construction of the *limes*, the development of the town of Nijmegen and the administrative and political framework.

1.2.1 THE DYNAMIC LANDSCAPE OF THE RIVER AREA

Since agriculture is dictated to a large extent by the local landscape, it is important to understand the landscape of the Dutch River Area. This Holocene landscape was defined by river channels and their sedimentations. The meandering rivers changed their course over time and often flooded their banks in winter. The river banks or natural levees were higher than the surrounding land and composed of sandy-silty clay, whereas the flood basins were low-lying, with soil consisting of clay

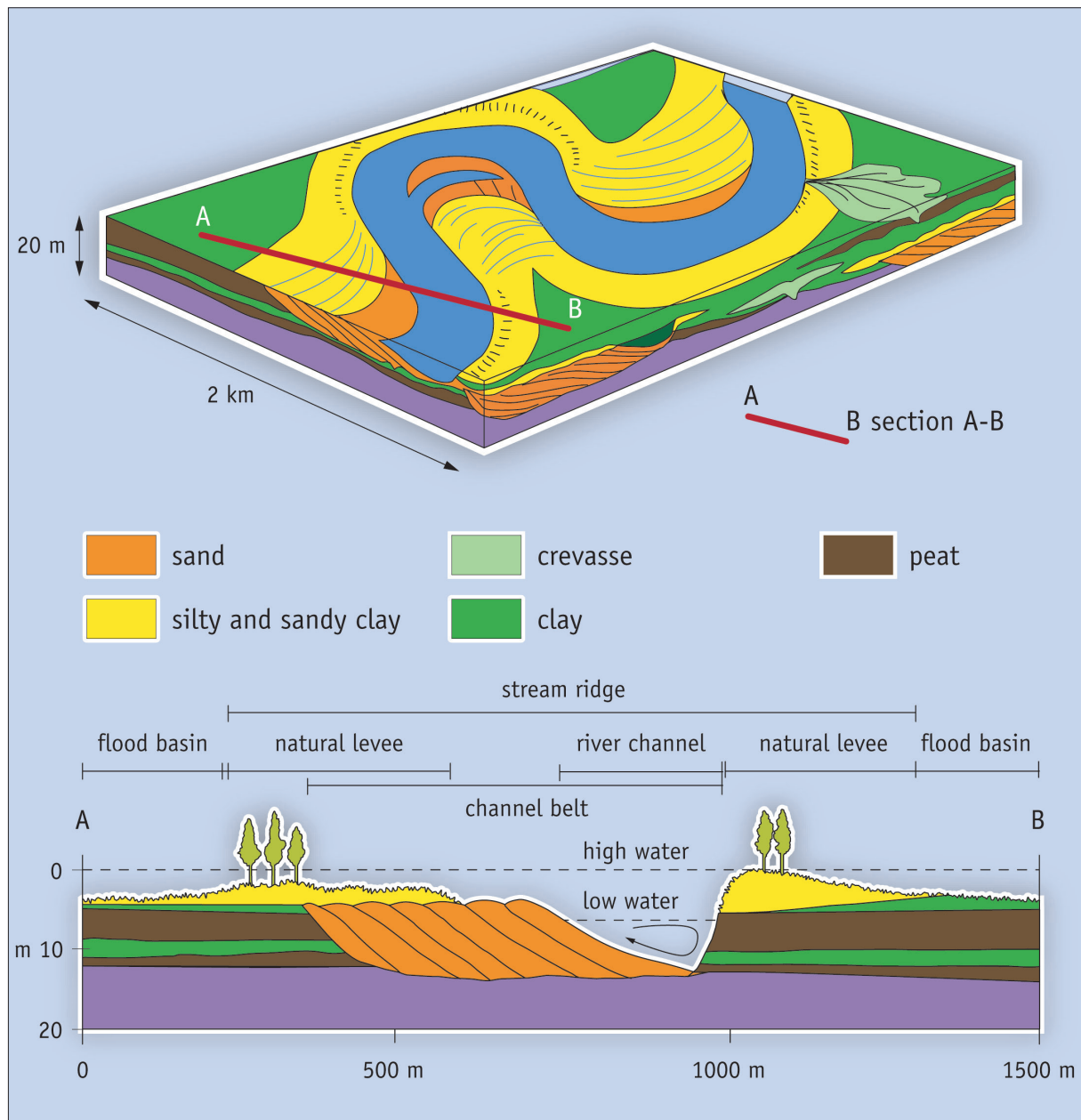


Fig. 1.2. A cross-section through an active river, with the river channel, streamridge and flood basin (after Berendsen and Stouthamer 2001, fig. 3.4).

sediment.⁶ When a river was no longer active the river bed silted up. A stream ridge consisted of the old river bed with its sandy deposits, possibly with a residual channel, and the former river banks. A stream ridge remained a higher feature in the landscape. Active river channels, stream ridges and flood basins formed the main elements of the landscape of the Dutch River Area (fig. 1.2).

Banks of active rivers were originally covered by forest consisting of willow, alder, ash, oak and elm. Fossil river banks, so-called stream ridges, were covered by oak, ash, elm, and a variety of bushes and herbs. The flood basins were mainly covered by marshy vegetation such as reed and sedge, with alder and willow growing in the higher parts, which were dry in the summer. Riverine forest was cleared

⁶ Berendsen/Stouthamer 2001, 23-24.

from the Bronze Age onwards to make land available for settlements and arable agriculture. Cutting of trees and grazing of marsh vegetation in the flood basins allowed grassland to be established.⁷

The stream ridges were most suitable for habitation and arable agriculture. The amount of produce that could be grown was limited by the surface area of the stream ridges. We should, however, be careful not to define a landscape in a negative way, focusing on the restrictions.⁸ The variations in the landscape of the Dutch River Area offered plenty of opportunities, especially for a people adapted and used to the dynamic character of the landscape. The flood basins offered plentiful grazing in summer. Livestock would thrive on the rich grassland. Although the surface area was limited, the drier and sandier stream ridges offered fertile ground for arable agriculture. The use of crops adapted to the local environment ensured successful harvests. Rivers could be used as channels for quick and easy communication and transportation of goods. Rivers and natural ponds were inhabited by various species of fish. The flood basins and what remained of the riverine forest offered a good habitat for wild mammals, although as we shall see this source of food was only used in a limited way.

1.2.2 ROMANS AND BATAVIANS

The Batavians first arrived in the eastern part of the Dutch River Area in the second half of the 1st century B.C., after the local tribe, the Eburones, had been decimated by Caesar. Motives behind this move could have varied from demographic pressure to promises made by the Roman authorities. For the Roman authorities, the settling of friendly tribes on the southern bank of the Rhine would give them tighter control of the frontier zone. The Batavian immigrants almost certainly fused with the remaining Eburones to create a new ethnic group.⁹

A vital factor in the development of this region was the system of ethnic recruitment by the Roman army. Exempt from taxation, the Batavian tribe that inhabited the Dutch River Area was obliged to supply soldiers for auxiliary units as well as the Imperial Guard.¹⁰ Around 5,000 men served in the Roman army at any time. The extent of recruitment was such that every community, and perhaps even every family, had a member who was serving in the army.¹¹ The substantial drain of men to the army would have had a big effect on the small rural communities.¹² Based on the belief that the region was poor and offered very limited potential for agriculture, Van Driel-Murray proposes a system of intensive horticulture, in which women produced vegetables, cheese and eggs on a small scale for nearby markets. Cattle were primarily kept for manure.¹³ In such a system, the men serving in the army would not be missed, and even brought in army pay, which would have been spent on clothing and food.¹⁴

After a period of 25 years, soldiers were released from the army, and were free to return to their families and homes. While not every soldier returned to the *civitas Batavorum* – some may have married and preferred to settle down elsewhere, while others failed to survive army service – enough did so to have a large effect on Batavian communities.¹⁵

While temples and towns were built in a Roman style and people started to adopt Latin names, most Batavians continued living in traditional farmhouses.¹⁶ New identities were constructed in which both the old warrior and pastoral values and the new values connected with Roman civilisation were represented. The Batavian elite served as officers in the Roman army and were mediators between

⁷ Lange 1990, 18–19.

⁸ Van Driel-Murray 2003, 205.

⁹ Roymans 2004, 19, 25–27, 55.

¹⁰ Tacitus, *Germania* 29; *Historiae* 4.12, 5.25; Roymans 2004, 55–58.

¹¹ Willems 1984, 235.

¹² Van Driel-Murray 2003, 207.

¹³ Van Driel-Murray 2003, 205–206.

¹⁴ Van Driel-Murray 2003, 208.

¹⁵ Derks/Roymans 2002, 100–102; Heeren 2009, 157–160; Nicolay 2007; Vos 2009, 243–247.

¹⁶ Roymans 2004, 252–253.

their fellow Batavians and Roman military culture. The Batavians who served in the army may have facilitated trade contacts between the Roman army and the rural settlements in the Dutch River Area. Recent research has identified a relation between developments in animal husbandry and veterans, suggesting that their influence was not just cultural, but also economic.¹⁷

1.2.3 EARLY ROMAN PERIOD: 12 B.C. – A.D. 70

The Roman army first reached this region around the middle of the 1st century B.C.¹⁸ A more permanent military presence did not exist until the reign of Augustus. In 19 B.C., a legionary camp was built on the Hunerberg in Nijmegen because of its strategic location on a high ice-pushed ridge. Nijmegen was one of the operating bases for the planned conquest of *Germania*.¹⁹ The camp was abandoned between 15 and 12 B.C. It was succeeded by another large fort on the Kops Plateau in Nijmegen, which was built around 12 B.C.²⁰ Early in the 1st century A.D., a few strategically located forts were built: Meinerswijk, Vechten and Velsen.²¹ Attempts to conquer *Germania* were abandoned by Tiberius in A.D. 16–17, after which the Rhine marked the edge of the Roman Empire. In the 40s, a series of auxiliary forts was built on the southern bank of the river Rhine, expanding the existing military infrastructure and forming a permanent line of defense. In the research area, new *castella* were built in Vleuten–De Meern and Utrecht. The function of the *castella* built at this time seems to have been directly related to the river, either in preparation for the conquest of Britain or to control pirates.²² After the Batavian revolt, *castella* were added in Kesteren and Maurik.²³

The civilian settlement *Oppidum Batavorum* was situated in modern Nijmegen, on and around the Valkhof, on the southern bank of the river Waal. This was the capital of the Batavians, founded c. 10 B.C., at the same time as the fort on the Kops Plateau. The urban centre *Oppidum Batavorum* was designed and built by the Romans, with the purpose of controlling the new *civitas*. Evidence has been found for a planned lay-out. Most of the buildings were built in wood, although some stone foundations have been found. During the Batavian revolt, a fire destroyed most of the budding town, and development was halted. Few Batavians lived in the town; inhabitants were mostly craftsmen, officials, retired soldiers and immigrants.²⁴ The absence of public buildings or a town wall means that this cannot be called a proper town, but for this study it should be regarded as such, as it was very different in character from the rural settlements in the region, and inhabited by non-agrarian people.

The exact year in which the administrative district of the *civitas Batavorum* was founded is uncertain. This moment was long believed to have taken place in the late 1st century A.D., but recently Panhuysen has interpreted a victory pillar dating to A.D. 17–19 as marking the foundation of the new *civitas*.²⁵ More evidence for the early formation of the *civitas* is found on the altar stone from Ruimel, which mentions a *summus magistratus* of the *civitas Batavorum*, and dates to the first half of the 1st century A.D.²⁶

In A.D. 43, eight Batavian cohorts were sent to *Britannia*. The movement of 4000 men out of their home region must have had social consequences.²⁷ In the late 60s, heavy recruitment took place among the Batavian population. Until they abandoned Nero, the imperial body guard also consisted of Batavian soldiers. A.D. 69 was the year of the Batavian revolt. The increasing pressure on the Bata-

¹⁷ Groot 2011b; 2012b.

¹⁸ For a comprehensive account of the early military occupation of the region, see Polak/Kooistra 2015.

¹⁹ Bechert/Willems 1995, 24–25.

²⁰ Haalebos *et al.* 1995.

²¹ Bechert/Willems 1995, 24.

²² Polak 2009.

²³ Bechert/Willems 1995, 15, 25.

²⁴ Willems/Van Enckevort 2009, 70–72.

²⁵ Panhuysen 2001 in Willems/Van Enckevort 2009, 71; Willems/Van Enckevort 2009, 22, 71.

²⁶ Willems/Van Enckevort 2009, 22, 72.

²⁷ Willems/Van Enckevort 2009, 23.

vians, a confusing political situation and the person of Julius Civilis all led to the revolt, which was not intended to win independence, but rather to re-establish the old alliance. At the end of 69, the new emperor Vespasian sent a large army north to suppress the revolt. In the autumn of 70, *Legio II Adiutrix* came to Nijmegen, but left for *Britannia* soon after. The revolt was ended by a treaty between Julius Civilis and Q. Petillius Cerialis, renewing the old alliance.²⁸

1.2.4 MIDDLE ROMAN PERIOD: A.D. 70–270

The years between A.D. 70 and 270 were a period of economic prosperity and development. The frontier zone was incorporated into the Empire when it was converted into the province *Germania Inferior* somewhere between 82 and 90.²⁹ The second half of the 80s saw the construction of the *limes* road. This road was located on the southern bank of the river Rhine. Recent research has not only led to a later construction date, but also to a different function: a short and fast route through the *limes* zone rather than protection of the river frontier.³⁰ The existence of secondary ditches is interpreted as an indication that the zone adjacent to the *limes* road was used for transport of livestock.³¹

In the late 1st century, *Legio X Gemina* had replaced *Legio II Adiutrix* and built a legionary fortress on the Hunerberg. The support of Germanic tribes from across the Rhine to the Batavian revolters had highlighted the lack of loyalty and the military potential. The legion had to defend against attack, guard the loyalty of local tribes, and improve the infrastructure in the province by constructing roads and building forts.³² The *castra* on the Hunerberg was surrounded by *canabae* on three sides. A large *forum* has been excavated in the eastern *canabae*. The square inside was almost entirely filled with postholes, many of which were organised in a linear way. The postholes have been interpreted as the remains of a livestock market, with the postholes representing the remains of enclosed areas or posts to which animals were tied.³³ Constructions of tiles found within and just outside the *forum* have been suggested to be snack bars,³⁴ which would certainly fit with the congregation of a large number of people at a livestock market.

After the destruction of *Oppidum Batavorum* by fire during the Batavian revolt, a new urban centre was founded to the west. With a bathhouse, temples and a *forum*, this can be considered a proper Roman town. Not long after A.D. 100, market rights were granted to the town by Trajan, and the town received its name: *Ulpia Noviomagus*. It is possible that this was done to give the town an economic boost to make up for losing the legion; on the other hand, it may also be part of a general strategy to further integrate the *civitas*. In the later 2nd or early 3rd century, the town received town privileges, when it was formally named *Municipium Batavorum*.³⁵ Urban habitation is characterised by long plots perpendicular to the road and wooden buildings. The pottery produced in Nijmegen was partly for domestic use (sold on local markets), but the majority was used as containers for food produced in Nijmegen. This production may have been connected to the supply of the legionary fortress, but could also be a sign of an economic relationship with the surrounding countryside. In the last quarter of the 1st century, imported pottery is mostly lacking (apart from tableware and *amphorae*). After the town had received market rights, the effects are visible by large quantities of imported pottery. Catastrophic events at the end of the 2nd century are reflected in burned layers, but the cause is not certain. Parts

²⁸ Tacitus, *Historiae* 5.26; Roymans 204, 209, note 466.

²⁹ Willems/Van Enkevort 2009, 25, 75.

³⁰ Luksen-IJtsma 2010.

³¹ Luksen-IJtsma 2010, 65, 67.

³² Willems/Van Enkevort 2009, 24.

³³ Driessen 2007, 130–135.

³⁴ Willems 1990, 55–56. An interpretation as ovens for

smoking meat seems less likely, considering their location and the lack of similarity with smoking ovens found elsewhere. Similar structures have been found in Bad Wimpfen, where they were interpreted as grills; evidence was also found for grilled cattle muzzles. Filgis 1988; Kokabi/Frey 1988.

³⁵ Willems/Van Enkevort 2009, 74–79.

of the town were rebuilt, but not the temples. The main indications at this time are for the activity of butchers and potters. Germanic raids put an end to the town in 260/270.

The countryside reached a peak in its population density in the Middle Roman period, with large numbers of settlements scattered around the region. Most of these settlements were small, consisting of one to five simple farms. A few sites show evidence for buildings in stone or the use of Roman building materials, and are interpreted as *villae*.³⁶ An important development is the digging of ditches, which form field systems dividing or marking the countryside. The role of these field systems is still debated, and variously interpreted as related to taxation, drainage, leading water to the settlement, or extension of arable land to increase production.³⁷

1.2.5 LATE ROMAN PERIOD: A.D. 270–350/450

Chaos ruled in the last decades of the 3rd century A.D., with frequent invasions from people living north of the river Rhine into the *civitas Batavorum*. The Germanic immigrants started to control the countryside. The presence of these people is traced through typical house plans and pottery.³⁸ There was an increasing contrast between the Roman urban and military centres and the countryside.

During the 4th century, some but not all of the forts along the Rhine were rebuilt.³⁹ Until the middle of the 4th century, the Lower Rhine Area remained intact in an organisational and defensive sense. Around A.D. 350, this all changed. There was a struggle over the Empire, and Germanic tribes used this opportunity to cross the river Rhine. This meant the end of the *civitas Batavorum*. The frontier was rebuilt by Valentinian shortly after, and some stability returned. Salian Franks had settled in the region in the early 5th century, probably in return for military support. The end of the Late Roman period is arbitrary: either the end of the *civitas Batavorum* or the year 454, when Cologne fell into Frankish hands. Despite the dramatic developments of this period, habitation in Nijmegen continued. A *castellum* was built on the Valkhof, surrounded by heavy fortifications. Some civilian habitation was present on the Waalkade and south of Trajanusplein (St. Canisiussingel).⁴⁰

Soil exhaustion has been suggested as a possible explanation for the decline in population and the economy.⁴¹ Van Driel-Murray suggested that there may have been a relation between the economic collapse and population decline in the region and changes in recruitment practices.⁴² The agricultural base was vulnerable because of the large population size and the dependence on the army for employment. While she is talking about the later 2nd century, it would have taken some time before the effects would be visible archaeologically. Indeed, the decline in the number of rural settlements starts around the turn of the 2nd/3rd centuries.⁴³ Vos does not see any evidence for famine or large-scale movement of people away from the region, and believes that the decline in rural sites can be attributed to a combination of factors: Chaucian raids in the later 2nd century, the change in recruitment, a pest epidemic and a rise in the water level in the Kromme Rijn area.

³⁶ Examples are Druten-Klepperhei and Ewijk-Keizer-shoeve. Blom *et al.* 2012; Hulst 1978; 1980.

³⁷ Heeren 2009; Groot/Kooistra 2009; Vos 2009. A similar development is found in the western part of the Roman Netherlands. Van Londen 2006.

³⁸ E.g. in Tiel-Passewaaijse Hogeweg and Geldermalsen-Hondsgemet. Heeren 2006, 90; 2009, 72–73; Van Renswoude 2009b, 472.

³⁹ Bechert/Willems 1995, 27.

⁴⁰ Willems/Van Enkevort 2009, 27–28.

⁴¹ Groenman-van Waateringe 1983.

⁴² Van Driel-Murray 2003, 213–215.

⁴³ Vos 2009, 259–260.

1.3 ECONOMIC NETWORKS AND FOOD PROVISIONING

1.3.1 THE ECONOMIC NETWORK OF THE DUTCH RIVER AREA

Several agents can be identified in the economic network of the Dutch River Area: the inhabitants of the rural settlements, the Roman army, inhabitants of the town of Nijmegen, traders or middlemen and the Roman authorities. They would have met in markets in towns and rural centres, or traders or middlemen could have come directly to the rural settlements to buy produce. These agents can roughly be divided into consumers and producers.

Producer site here means a rural settlement where agriculture was the main means of existence, and most food was produced locally, as well as an agrarian surplus. Of course, producers also consumed part of the food they produced, which complicates matters. To ensure continuity of production, it was also necessary to maintain the herds of livestock and to reserve sowing seed for next year's crop.⁴⁴ This means that only a small part of the produced food may have been available as a surplus. Agrarian production sites in the Roman period are mostly consumption sites with regard to pottery, metal etc.

Consumer sites are sites where the majority of people were not involved in agriculture. However, some food may have been produced by consumers: vegetables could be grown in small plots in the town, and especially pigs and chickens can be raised in towns. Moreover, producers of food were consumers of other products, such as pottery and textiles, which were produced in town (table 1.1). Textiles are an indirect agricultural product, since in complex societies the processing of wool often takes place in a different place from its production. Hides may also have been processed into leather in towns, and boneworking is another activity that requires raw sources deriving from agriculture. So the division into consumers and producers is clearly a simplification and only relates to agrarian products, such as animals and crops. Nevertheless, this division has been used to structure this study, and, despite its shortcomings, is useful to study food supply and agrarian production.

consumers			producers	
produced:	consumed locally produced products:	acquired from outside the region:	produced:	consumed:
pottery	meat	pottery	meat animals	pottery
leather goods	wool	wine/olive oil/fish sauce	wool	leather goods
textiles	hides	imported livestock	hides	textiles
other non-food products ⁴⁵	horses	salt	horses	other non-food products
	eggs	seashells	eggs	wine/olive oil/fish sauce? ⁴⁶
	cereals		cereals	salt
	vegetables		vegetables	seashells
	other plant foods		other plant foods	

Table 1.1. Some of the products that were produced and consumed in typical consumer and producer sites in the research area, illustrating the complementary functions of town and countryside. Raw materials such as timber, stone and clay were of course also important but have not been included here.⁴⁷

⁴⁴ Stallibrass/Thomas 2008, 151.

⁴⁵ Such as glass, tiles and metal objects. Raw materials were gathered or acquired from inside or outside the research area.

⁴⁶ *Amphorae* sherds are found in rural sites, but it is uncertain whether these reached the rural sites complete with their contents.

⁴⁷ Carrington 2008, 19.



Fig. 1.3. Reconstruction of the rural settlement Tiel-Passewaaijse Hogeweg (from Groot/Kooistra 2009; illustration Mikko Kriek).

Consumers in the research area include the Roman army, townspeople and people visiting temples. The Roman army required food and other necessities. The size of the army in *Germania Inferior* varied. It started to decrease after A.D. 16–17, from a maximum of 42,000 men to 20,000 men from the early 2nd century onwards.⁴⁸ There were very few towns or urban centres in the Roman Netherlands. The most important one, and the only one in the research area, was the capital of the *civitas Batavorum* in modern Nijmegen. The population of Nijmegen in the late 1st century A.D. has been estimated at 5,000 civilians and 5,000 soldiers.⁴⁹ Between 71 and 102/104, the Tenth Legion was quartered in Nijmegen, which explains the large number of soldiers. Civilians not only lived in the town but also in the camp settlement or *canabae* surrounding the legionary fortress. *Canabae* were inhabited by merchants, shopkeepers, craftsmen, veterans, farmers and the wives and children of soldiers. All these people had close links with the Roman army. The *canabae* ceased to exist after the Tenth Legion left Nijmegen. From the early 1st century A.D. onwards, Nijmegen must have been an important market place for the surrounding region. Temples would not just have been focal points for religious activities, but also housed markets.⁵⁰ Cattle, sheep and pigs were frequently sacrificed on the temple site. Part of the animal was offered to the gods, but most of the meat was consumed by priests and members of the community.⁵¹ The use of sacrificial animals in the temples meant that livestock had to be supplied from the surrounding settlements.

⁴⁸ Alföldy 1968, 137–143, 149–152, 160–162; Polak 2009.

⁵⁰ Van Es 1981, 194.

⁴⁹ Willems 1990, 71; Willems/Van Enckevort 2009, 74.

The producers are the farmers living in the countryside. The rural settlements in the Dutch River Area were usually small, with only one to a handful of farmhouses (fig. 1.3). The typical farmhouse found in these settlements was the byrehouse, housing man and livestock under one roof.⁵² Farmhouses were constructed from wood and wattle-and-daub, with thatched roofs. Despite the sporadic incorporation of Roman-style building materials, the native type of farmhouse stayed recognisable.⁵³ Apart from houseplans, other features typically found in rural settlements are granaries, wells, pits and ditches. A characteristic aspect of the Dutch River Area is the lack of Roman-style *villae*. Although some rural settlements have been labelled ‘proto-*villae*’, they were very different from the *villae* in other regions such as the loess area in the south of the Netherlands. The Roman *villa* was an agrarian operation with a stone main building built in Roman style. Arable agriculture and the production of a surplus for the urban market were the basis of the Roman *villa*. The rarity of *villae* in the Dutch River Area has been seen as a reflection of the poverty of the local people or of environmental constraints, but it has also been related to cultural values.⁵⁴ Instead of spending surplus wealth on stone-built houses, money was spent on pottery, bronze brooches, textiles, food and livestock. It is also possible that the Roman-style *villa* – being strongly associated with grain production – was not an obvious choice for a community with limited possibilities for producing surplus cereals.⁵⁵ A lack of impact on material culture has also been related with certain characteristics of the Batavians that made them suitable as soldiers: an emphasis on cooperation, sharing and conflict avoidance did not naturally lead to the accumulation of wealth by a few.⁵⁶ Since rural communities produced most of their own food, any surplus may have formed only a small part of the total agricultural production. The size of the rural population in the Batavian *civitas* has been estimated between 20,000 and 40,000 for the Early Roman period, and over 50,000 for the Middle Roman period.⁵⁷

1.3.2 FOOD SUPPLY AND PROVISIONING

One of the basic needs of the army and the town was to arrange adequate food supply. There are different ways of procuring food. First, crops and livestock can be requisitioned directly from farmers. From the perspective of the rural settlements, this is not good news, since they would not receive anything in return. If not done sustainably, it could lead to food shortages. Archaeologically, requisition is difficult to detect in the rural sites, since there would be no traces of foreign material culture that is associated with trade. Age profiles of livestock in military sites can provide some insight, with a wider range of ages indicative of the army rounding up herds, and more restricted ages indicative of focused surplus production.⁵⁸

A second way of food provisioning is through taxation. While the treaty between the Romans and Batavians exempted the Batavians from regular taxation, this situation may have changed after the Batavian revolt in A.D. 69.⁵⁹ The Batavians were now probably taxed not only for recruitment,

⁵¹ Roymans/Derks 1994, 31; Seijnen 1994, 171.

⁵² The style and construction of the byrehouse are not static, but develop during the Roman period. There were also some houses without a byre section. Vos 2009; Heeren 2009.

⁵³ Roymans 1996, 74–76.

⁵⁴ Roymans 1996, 73.

⁵⁵ In the loess area, which is the *villa* zone closest to the research area, the production of high-quality cereals (mainly spelt) formed the agrarian base of the *villae*. Bakels 2009, 167; Kooistra 1996, chapter 4; Kreuz

2005; Roymans 1996. However, there are also *villae* where meat production formed the agrarian base, such as in the *villa* of Neftenbach, Switzerland. Deschler-Erb/Schröder Fartash 1999, 260–261.

⁵⁶ Van Driel-Murray 2003, 209.

⁵⁷ Vossen 2003; Willems 1984, 234–237.

⁵⁸ Cool 2006, 186; Thomas 2008, 32; Thomas/Stallibrass 2008, 9.

⁵⁹ Aarts 2014; Heeren 2009, 248; Vos 2009, 257, note 281.

but they had to pay taxes like any other people living in the Roman Empire. An agricultural surplus needed to be produced; this could be sold at the market for money to pay taxes or the surplus itself could be used to meet tax demands in kind. In this respect, taxation stimulates agrarian production.

Next, agrarian produce could be exchanged directly for other products, without the involvement of money. It is also possible that products were exchanged for labour, for example that soldiers of the Roman army assisted in harvesting crops in exchange for part of the crop. In this case, we would find no archaeological evidence for the exchange. Food, livestock and other agrarian products could also have been bought directly or indirectly (through tradesmen or markets).⁶⁰ The need for food in the town and army camps created an opportunity for the local inhabitants to sell their produce. Some foods were traded over long distances – such as wine and olive oil – or first processed before being sold, such as cuts of meat, whether preserved or not. However, military supply in the northwestern provinces mostly relied on local production.⁶¹ In the context of this study, exchange or trade amount to the same thing: agrarian produce leaves the rural site, and imported material culture comes back in return, whether money is involved in the transaction or not (fig. 1.4).

Finally, it is possible that consumers produced some of their own food. Food may have been grown on military land, some animals may have been raised by soldiers, and the military diet was supplemented by hunting.⁶² Urban people may have grown vegetables, kept a few pigs and chickens, gone hunting and fishing or collected wild fruits. While this certainly happened, it is likely to have been small-scale, and only covered a small part of the required food. Strategies may have differed between the army and the town, and over time. They could also have existed next to each other at the same time.⁶³

While requisition and taxation offer one-sided benefits and leave little or no trace in rural sites, trade and exchange offer mutual benefits and result in a flow of imported material culture into rural sites. It is important to know how food supply was organised, since this affects how we perceive the rural people. Were the rural people self-sufficient and independent producers or entrepreneurs? Or were they tax-burdened slaves of the Roman occupation? Wells proposed that the indigenous people in the northwestern provinces were active participants in trade and the supply of goods to the Roman army.⁶⁴ The reliance of the army on local production for many goods implies that negotiation and interaction were more important than power in relationships between the army and local people.⁶⁵ Plenty of imported material culture has been found in rural sites in the research area, and coins of all denominations are common, so we can be certain that market transactions existed. However, this does not prove that the other strategies did not also take place.

In her study of early city states in the Middle East, Zeder investigated the mode of distribution of meat.⁶⁶ While far removed in time and space from our research area, there are some similarities in economic system, mainly the complexity and degree of specialisation. Her main concern was the degree to which the state controlled production and distribution of meat. She differentiated between direct and indirect distribution, explicitly described her predictions for the effects of the different modes on animal species, slaughter ages, skeletal elements and butchery patterns,⁶⁷ and then tested these predictions in her case study. In direct distribution, the distance between consumer and producer is small, farmers are in control of supply and herd security is the priority: the result is a diversity in products, similarity in species proportions between town and countryside, a combination of young,

⁶⁰ Military contracts, with or without fixed prices, are a special type of direct purchase. Davies 1971, 123; Thomas/Stallibrass 2008, 1.

⁶¹ Thomas/Stallibrass 2008, 9.

⁶² Davies 1971, 123–124, 126, 128, 141.

⁶³ The overwhelming impression of the Roman economy and food provisioning is that of complexity. The Vin-

dolanda tablets are a good example. Grønland Evers 2011.

⁶⁴ Wells 1996.

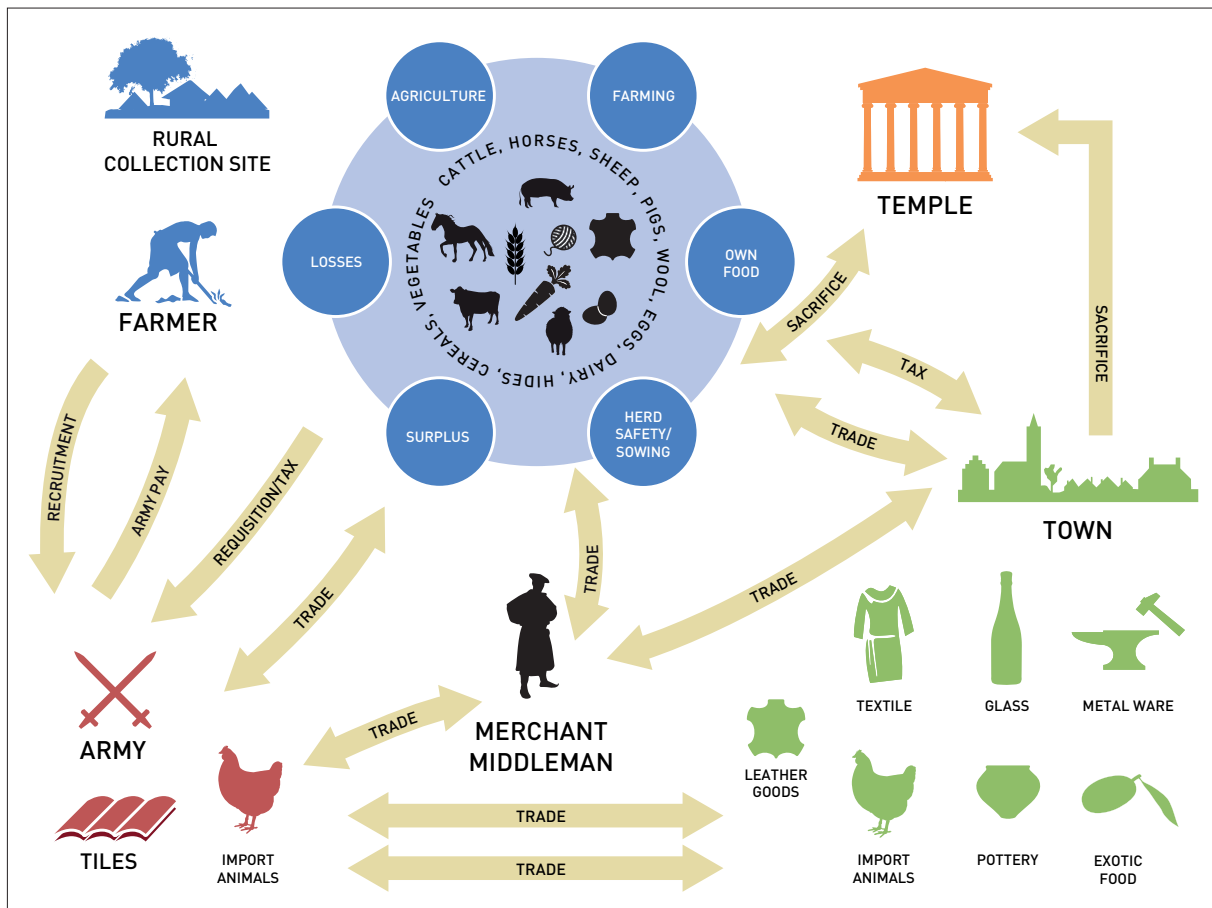
⁶⁵ Wells 1996, 8.

⁶⁶ Zeder 1991.

⁶⁷ Zeder 1991, 36–43.



Fig. 1.4. The Roman market as a black box: we know that agrarian products went to the market, and we know that imported material came back in return, but we are not sure whether there was always money involved in these transactions.



surplus males and older animals, presence of all body parts and diversity in butchery practices. In indirect distribution, the distributor is in control and aims for maximum efficiency: the expectation is less diversity, animals with the most meat per animal, different species proportions in town and countryside, an emphasis on young adult animals, selection of body parts and standardisation in butchery practices. This model can also be used to investigate how meat was supplied to town and army in the Roman period,⁶⁸ specifically whether the farmers controlled supply or whether this was regulated by the Roman authorities. Indeed, it has already been used in an earlier study of the region.⁶⁹

Unless goods were exchanged directly for other goods, knowledge of the use of money was necessary for a market system to develop.⁷⁰ The first half of the 1st century A.D. was a period during which both this knowledge and money itself spread rapidly through the Dutch River Area. Batavian soldiers and ex-soldiers played a crucial role in this process. At this time, Batavian troops were stationed in *Germania Inferior*. During visits to their home villages, part of their army wages would be left behind. Roman coins dating to this period are frequently found in rural settlements. More crucial is that the soldiers would pass on their knowledge about how money could be used. The low amounts of import-

⁶⁸ A link between religion (sacrifice) and meat has been claimed for the Roman period, but the evidence for abattoirs and meat markets in Roman towns suggests that not all meat derived from sacrificial animals. Belayche 2008; De Ruyt 2008; Scheid 2008; Van

Andringa 2008.

⁶⁹ Filean 2006. Filean considers age and sex the most promising indicators for direct or indirect distribution. Filean 2006, 132.

⁷⁰ This paragraph is based on Aarts 2014.

ed pottery in the first decades of the Roman period suggest limited trade between the rural settlements and the army. At this time, the civilian settlement in Nijmegen may not yet have had a significant market function. A substantial increase in imported pottery in rural settlements in the Dutch River Area in the Flavian period implies the existence of trade, and with it, an increasingly monetised society.

Fig. 1.5 is a simple model of the main agents in the economic network of the Roman River Area, the nature of the interactions between them and some of the products that may have been involved. Each farmer may only have produced a small surplus, but considering the population density, this could have amounted to a large total agrarian surplus.

I.4 FARMING IN A MARKET ECONOMY

I.4.1 FACTORS INFLUENCING FARMING STRATEGIES

There are many different factors that influence farmers' decisions. Some may have been relatively constant, while others changed during the Roman period. First, the potential of the landscape and climate for farming (soil, temperature, rainfall, danger of flooding) determined to a large extent what crops could be grown and what animals could be raised, and also where. In the river landscape, crops were grown on the higher areas, while livestock was grazed in lower-lying areas, which flooded when the rivers burst their banks. The lack of forest is often cited as an explanation for the low importance of pigs,⁷¹ while in a similar way the regeneration of forest in the Late Roman period can be seen to explain the increase of pigs at this time. However, a warning against environmental determinism is found in the high proportions of sheep in the Iron Age and Early Roman River Area. Low proportions of sheep in wet areas have been explained by the susceptibility of sheep to foot rot, but clearly this did not prevent sheep from being kept in the River Area.⁷² Second, the amount of land that was available, and the ratio between the land suitable for arable farming and as pasture (stream ridge or flood basin) determined how many crops could be grown and how many animals could be kept. This also depended on a third factor, the amount of labour that was available. Labour supply has a larger effect on arable farming, since this is more labour-intensive than animal husbandry. Next, demand also influenced what was produced. Without external demand for food or other products, farmers only had to consider the needs of themselves and their families. Reasons to produce more than required would be to avoid risks of bad harvests or epidemics,⁷³ or to produce food for communal feasts.⁷⁴

The proximity to a market forms another factor, together with the infrastructure. If it is not possible to transport food to market before it spoils, then there is no point in producing it. For most livestock, which would have been walked to market alive, or cereals, which keep well, markets in the immediate proximity of the farm would not have been necessary. There is also a cost factor involved here: the cost of transport must be less than the proceeds. Connections and networks may also have been important, especially when selling products directly to the army. Veterans would have an advantage here, as they had connections and knew what the army required. Next, technology and know-how played a role in agrarian production. This includes the farming tools that were available, ways of storing crops, ways of draining land and improving soils, and knowledge on providing the best care and fodder for livestock.

⁷¹ E.g. Cavallo *et al.* 2008, 74 ; Kooistra 1996, 124; Lauwerier 1988, 127-128; Prummel 1979.

⁷² E.g. Lauwerier 1988, 128; Peters 1998, 237; Prummel 1979; Thomas 2008, 36; but see Kooistra 1996, 124 for a contrary opinion. In some cases, wet areas have been

assumed to be unsuitable for sheep rearing, despite evidence to the contrary. Van Driel-Murray 2003, 208.

⁷³ Halstead/O'Shea 1989.

⁷⁴ Dietler 1996; Hayden 1996.

Indeed, the increase in cattle size during the Roman period has been attributed (in part) to improved animal husbandry techniques.⁷⁵ Finally, it is likely that farming decisions were not just influenced by economic concerns, but also by social and ideological factors.⁷⁶

1.4.2 RESPONSES TO INCREASED DEMAND

When farmers are faced with an increased demand for food, they can respond in different ways to accommodate this demand and increase their production.⁷⁷ Their first option is agricultural intensification, in which the yield per unit is increased. For arable crops, this can be achieved by manuring fields and weeding and watering crops, while for livestock, better nutrition and selective breeding of larger animals will achieve higher yields of meat. The second option is agricultural expansion, in which the number of units is increased. For arable crops, this means putting larger areas of land under cultivation, while for animal husbandry it means having larger herds. The last option is specialisation, which often leads to a higher degree of efficiency in production. Which option is chosen depends on the limits of the local landscape, the available labour and the available technology and knowledge.

For the Roman period, all three responses have been observed. Intensification of arable farming is deduced from higher slaughter ages of cattle – providing traction and manure – and intensification of animal husbandry can be seen in the increase in size of livestock.⁷⁸ There is some evidence for fodder, but the information is so scarce that it cannot be established whether this reflects an improvement in nutrition.⁷⁹ Expansion of arable farming is seen in Roman Britain, where pollen evidence for woodland clearance suggests an increase in arable land.⁸⁰ In the Netherlands, field systems laid out in the late 1st century A.D. could reflect an expansion of arable land, although this is just one of several explanations.⁸¹ Evidence for expansion of animal husbandry is found for instance in Feddersen Wierde, where the number of cattle stalls increased from 98 to 443,⁸² and in Wijk bij Duurstede-De Horden, where an increase in grassland was observed.⁸³ The larger granaries found in the Dutch River Area indicate an increase in the production of cereals,⁸⁴ but provide no information on how this was accomplished. Examples of specialisation in animal husbandry, although relative, are found in the research area, where wool production and horse breeding have been identified.⁸⁵

1.4.3 THE METHODOLOGY OF MARKET PRODUCTION

Studying agricultural production for the market is not without its problems. First of all, the rural sites included in this study are producing food for their own subsistence in the first place. Surplus production for a market came second, and was carried out next to subsistence production. This means that the evidence for farming that we find is a mix of subsistence and surplus production. Food or animals produced as a surplus may only have been a fraction of what was produced for subsistence. A consequence of this is that it is unlikely that we will find clear signatures that indicate surplus production.

⁷⁵ E.g. Lauwerier 1988, 168; Teichert 1984, 99.

⁷⁶ Roymans 1999.

⁷⁷ Groot/Lentjes 2013, 12–13. See also De Hingh 2000.

⁷⁸ Groot 2008a, 74, 91–93; 2009a, 368, 384–385; Lauwerier 1988, 166–167. Larger cattle could also have been desirable for traction, in which case they would reflect intensification of arable farming.

⁷⁹ Lange 1990, 118–122; Kooistra 2009a, 442, 447.

⁸⁰ Dark 1999, 264.

⁸¹ Groot/Kooistra 2009, 3.2.2.

⁸² Wells 1996, 10.

⁸³ Lange 1990, 146.

⁸⁴ Groot *et al.* 2009.

⁸⁵ Groot 2008a, 70–73, 77–91; 2008b; Laarman 1996b, 377.

Second, while one of the signs of market production is specialisation in certain animals or products, we would expect specialisation to be limited in extent. The reasons for this are that specialisation occurred next to subsistence production, and that it makes more sense from a risk management point of view to spread surplus production over different products. In that case, if disease strikes a herd, or a crop fails, all is not lost. Third, most livestock would have been transported alive, which means that they leave no trace in the rural site. While there are ways in which the origin of animals can be studied, such as stable isotopes, prevalence of non-metric traits, hornlessness in sheep and cattle, difference in dental wear and differences or similarities in size and shape,⁸⁶ these remain largely unexplored for the research area. Next, it is very difficult to quantify the amount of surplus that was produced. Quantitative models can give an indication of the possibilities for and limits of surplus production, but cannot prove what was actually produced.⁸⁷ Finally, if we want to compare data from rural settlements with their markets, then we need to know where the agricultural surplus was going. Large towns may be supplied from a large area, with different farms or settlements supplying different products.

1.4.4 EVIDENCE FOR SURPLUS PRODUCTION IN THE DUTCH RIVER AREA

Several studies have investigated surplus production in the Roman Netherlands. Kooistra looked at the Kromme Rijn Area in the central River Area.⁸⁸ Types of evidence Kooistra used as indicators for surplus production are storage capacity (exceeding local requirement), the predominance of one species (indicating local specialisation), the underrepresentation of young animals, and the presence of imported items (bought with money earned by selling farm produce). Two granaries in Houten-Tiellandt with storage capacity exceeding local requirements, and the underrepresentation of cattle horncores in combination with a high average age, are interpreted as indicating surplus production of some cereals and cattle. The high proportion of horses suggests horse breeding for the military market.⁸⁹ A quantitative model was developed to estimate the possible extent of surplus production. This led to the conclusion that in the Early Roman period – when the population was small –, any ratio of meat to cereals in the diet is possible, as well as surplus production. With a large population size (Middle Roman period), the proportion of cereals has to be at least 65 %, and there is little room for surplus production. Kooistra concluded that although a substantial surplus may have been produced in the Kromme Rijn Area in the Early Roman period, the area was never able to feed the entire non-agrarian population. Local food supply for the non-agrarian population may have been marginal, especially in the Middle Roman period. Instead, surplus production focused on horses.⁹⁰

A later study looked at different kinds of archaeological evidence from two rural settlements (of which Wijk bij Duurstede-De Horden is located within Kooistra's Kromme Rijn Area), and concluded that an agrarian surplus could have been produced, but that the nature and extent varied over time.⁹¹ This confirmed the conclusion reached for Tiel-Passewaaijse Hogeweg that changes in species proportions and animal exploitation were a sign of relative specialisation, which was an adaptation to market demand.⁹²

⁸⁶ E.g. Bendrey *et al.* 2009; Berger *et al.* 2010; Maltby 1994; O'Connor 2000a; Thomas 2008; Viner *et al.* 2010.

⁸⁷ E.g. Van Dinter *et al.* 2014; Groot *et al.* 2009; Kooistra 1996; Kooistra *et al.* 2013.

⁸⁸ Kooistra 1996.

⁸⁹ Kooistra 1996, 66–67; Laarman 1996a, 354, 356; Laarman 1996b, 377.

⁹⁰ Kooistra 1996, 71–73.

⁹¹ Groot *et al.* 2009.

⁹² Groot 2008a; 2008b.

A recent study focused on the peat and coastal part of the *limes*, to the west of the research area.⁹³ Quantifying the needs of the army for wood, cereals and meat and comparing this to the possibilities for local production led to the conclusion that a combination of local and extra-regional provisioning was practised.

An important point to keep in mind when discussing surplus production is that this is likely to have been small-scale, and always came second to providing for the rural community's subsistence needs.

⁹³ Van Dinter *et al.* 2014; Kooistra *et al.* 2013.