

The three breweries of St Gall Abbey and the beer in Carolingian times.

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Abstract: the program plan of St. Gall Abbey, drawn in the year 820, is a starting point for studying the role of brewing in the Carolingian economy. Beer was drunk by the laity and the clergy. Monks and nuns had been officially allowed to drink beer since the Synod of Aachen in 816, and to run one or more breweries within or near their abbeys. This is why the plan of St Gall abbey foresees one brewery to make the beer of the monks, one for the beer of the distinguished guests, and one for the "small beer" given to the numerous servants of the abbey, the paupers and the pilgrims.

Polyptychs, charters and cartularies complement the St Gall plan by providing plentiful data about beer brewing, and the detailed management of the many ingredients required for brewing. These Carolingian documents cover the economy of the abbeys and also the general organisation of the brewery on the scale of several agricultural estates, or even of an entire region such as the Meuse basin. These sources outline the evolution of the social status of millers, maltsters and brewers, of their trades and their techniques. Initiated under the Carolingians, many deep social and economic changes led around the 12th century to the relative emancipation of the brewing trades.

The whole dossier is imbued with the atmosphere of a Western Europe in full economic and political swing, which also stimulated the commercial brewing of beer. We will be led to question the respective roles of the laity and clerics in the growth of European brewing. What was the actual part played by the abbeys? Were Benedictine monks innovators in this technical field, as literature often repeats?

Under the Carolingians, an abbey was not only a refuge for those who wished to pray. An abbey also welcomed the mighty of this world. Equipping it with a hostelry, including kitchen, brewery, bakery, cellar, cowshed and stable was part of a political plan. Endowed with huge material advantages, abbeys were socio-economic and political power hubs in the Carolingian world. More than the palaces, the abbeys ensured a territorial meshing and a day-to-day political oversight of the vast Carolingian empire. The brewing facilities in or out an abbey were not just a convenience for the nuns or the monks. As members of the Carolingian aristocracy, they enjoyed the same privileged lifestyle.

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The plan of the St. Gall abbey (Constance Lake, Switzerland), drawn in the 820s on a parchment measuring 120x70cm, anticipates three separate buildings for brewing beer ([Diagram 1](#)): a brewery for the monks' beer, one for that of the distinguished guests (donors and patrons from the Frankish nobility, abbots, imperial or papal envoys), and finally one for the "small beer" of the numerous servants of the abbey, the paupers, the pilgrims and the sick¹. St Gall Abbey was not rebuilt according to these plans. However, it is known that this abbey was brewing beer in the 9th century, as were most of the abbeys in northern Europe, in the former Germania and in present-day Switzerland². This plan of an ideal Benedictine abbey illustrates the role of the monks in the development of brewing during the European High Middle Ages (5th-11th centuries), especially during the Carolingian Empire (8th-10th centuries).

Rather than one utopian monastery plan, this drawing is nowadays studied as a programmatic document illustrating a clergy's project to make their abbeys into socio-economic centres and hubs of political power in the Carolingian world. This had been achieved thanks to generous land donations from the Frankish nobility and the political alliance between the Roman papacy and the Carolingian imperial power. As a result of this long historical process, the church became the most powerful and wealthy landowners in Europe, alongside the Frankish aristocracy.

The plan of St. Gall Abbey perfectly pictures a key moment in the history of European brewing. It pinpoints many fascinating questions. A few issues of religious doctrine: which is the fermented beverage for the monks, wine or beer? How much beer they may drink daily? A few topics of sociology are linked to the privileged status of nuns and monks. Charters and cartularies complement this plan and provide data about the brewing of beer, the economy of the abbeys, and the global organisation of brewing on the scale of several agricultural estates, or even of an entire region such as the Meuse basin.

These data give a better understanding of the social status of millers, maltsters, brewers, their trades and brewing techniques. Initiated under the Carolingians, these far-reaching social and economic changes led to the relative

¹ According to its dedication, the plan is drawn following the guidelines given by [Haito](#) (Hatton), bishop of Basel from 803 to 823 and abbot of the monastery of Reichenau, then sent to [Gozbert](#), abbot of the [abbey of Saint-Gall](#). In 816, Haito drew up the statutes of the abbey of Murbach (*Statuta Murbacensia*), which were included in an imperial document, the *Capitulare monasticum*, in 817. Together with Benedict of Aniane, Heito was central to the negotiations and synods regarding the reform of the Carolingian abbeys. He attended the synod of 816 in Aachen and then visited the abbey of Inden reformed by Benedict ([Lesne 1920](#), 165-167, 171).

² The monk and poet Waldrammus Sangalensis (850-925) mentions the beer drunk in the abbey of St. Gallen where he was librarian (Max Nelson 2005, 101, note 54). The excerpt praises the abundance of bread, fish, milk, honey, butter, vegetables, and beer in St. Gallen: *Panis hic et piscis, lac, mel, butyr atque legumen, Hic mihi vestitus, manet hic cervisa, lyeus*; www.dmgh.de

emancipation of the brewing crafts around the 12th century. These crafts moved out of the enclosures of abbeys and imperial *villae* and flourished inside the precincts of the merchant towns of Northern Europe. This period confirms a European geography of beer already sketched out at the fall of the Roman Empire: a horizontal line across the Loire, Switzerland and Austria distributes beer in the North, wine in the South³.

This whole dossier is steeped in the Carolingian atmosphere of a Western Europe engaged in a full economic and political swing, and a historical new beginning for beer brewing. This growth of the beer trade must be put into perspective. It is not a "revival". Beer brewing did not disappear under the Merovingians, even before them, nor even during the Gallo-Roman period. Texts and archaeology bear witness to a continuity of beer brewing since the fall of the Roman empire around 476. We must therefore try to understand the nature of the boom that favoured Carolingian beer brewing. We will be led to question the respective roles of the laity and the monks in this boom of European brewing, which will fully develop at the dawn of the 12th century.

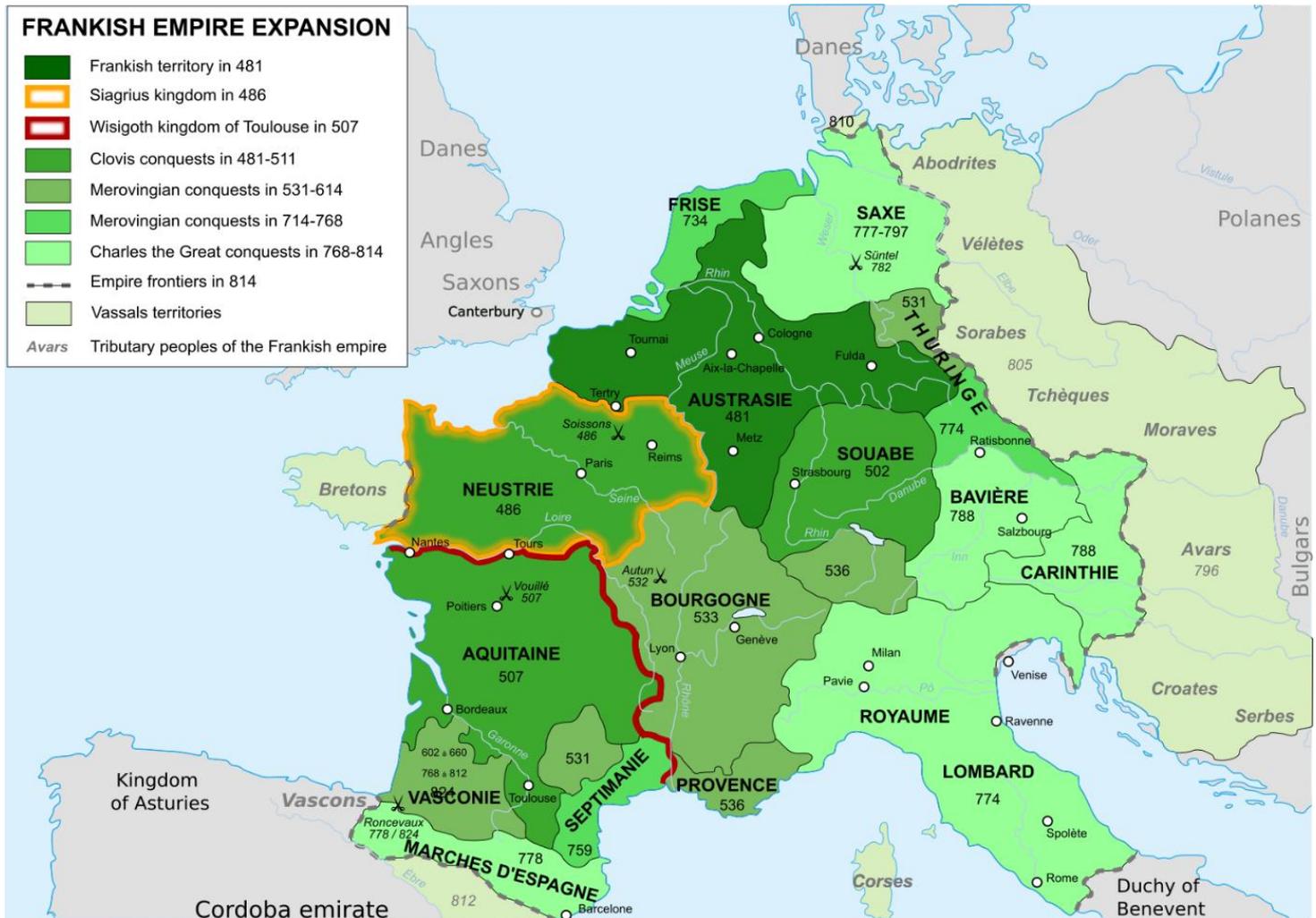
In short, the Carolingian period (700-924) is a key moment in the overall history of beer brewing in Western Europe.

Medieval beer brewing has not been the subject of systematic historical studies, unlike wine. Extensive historical studies can only be counted on the fingers of two hands. This is quite astonishing if one considers the pivotal economic and dietary role of cereals compared to those of the vine for all the populations of that time. This medieval history of brewing, barely sketched out, is still full of legends, preconceived ideas and even gross errors. We can only correct some of them and hope that studies conducted by medievalists will continue this work.

Among the misconceptions that fuel the literature of today we find such ideas: the medieval beer was a vile, sour, barely drinkable beverage; fortunately, the science of the monks remedied this sad state of affairs and gave European brewing its fame; the monk-brewers made brewing a male profession, keeping women out of this previously domestic activity; the lay brewers learned everything from the monk-brewers before becoming craft brewers organized in corporations within the merchant cities of the Middle Ages; the ephemeral existence of gruit only heralded the triumph of hops in brewing techniques; ... These fallacies are repeated over and over again, copied and even blown out of proportion.

³ This boundary is obviously schematic. The Moselle and Rhineland vineyards developed under the Carolingians were sponsored by prelates who reaped huge benefits. Conversely, some southern regions did not lose their brewing traditions (central France, Catalonia, northern Italy), this is often ignored because they were maintained by the humble part of the rural population. Similarly, the way of life of the humblest and slaves have left little imprint in the cartularies and capitularies written for the needs of the more potent and wealthier.

1 A Carolingian moment in the history of European brewing



Map 1: the expanding Carolingian empire under Charlemagne

The Carolingian dynasty established itself from the Atlantic to the Elbe between 751 (when [Pepin the Short](#) dismissed the last Merovingian king) and 987 (on the death of Louis V, the last Frankish Carolingian king, and the election of [Hugues Capet](#)). This period, wrongly described as a Renaissance (the Carolingian imperial project would fit into the continuity of the Roman Empire!), marks the transition between the Merovingians (5th century to 751) and the Middle Ages.

[Gregory of Tours](#) (538-594), abbot and chronicler of the Merovingians, came from a wealthy family in the Arverne region (centre of France of today). His uncles, fathers and grandparents were *senatores*, an ancient political title for the Roman economic elite. The Merovingian Frankish nobility had adopted some political structures handed down by the Roman Empire, while at the same time reinforcing their own social domination inherited from the traditional Germanic or Gallic world.

The [Merovingians](#) were not barbarians who reduced civilisation to nothing. On the contrary, the agricultural landscape was profoundly transformed under the Merovingians. The large latifundia of the Roman aristocracy and its villae filled with slaves were replaced by hamlets, small fields and pastures. Forests and wastelands regained ground. The merchant economy developed until the Muslim conquest of the Mediterranean, which in the 8th century considerably reduced the great North-South exchanges and the prosperity of the southern European cities. Under the Carolingians, the agricultural boom resumed. Cereal cultivation spread with the clearing of land and the work of the colonists. There was indeed a "Carolingian moment" against a backdrop of economic expansion, flourishing local and long-distance trade, less brutal social relations and Christianisation⁴.



Figure 1: sowing, weeding and ploughing according to the Stuttgart Psalter made in the abbey of St Germain-des-Prés between 820-830 digital.wlb-stuttgart.de/purl/bsz307047059

This relative agricultural prosperity stimulated the brewery. The abundance of grain makes the beer flow, this being a rule of thumb of long-term history. Who drinks it? In Western Europe during the 7th-8th centuries, beer, cider and perry are the common fermented beverages for people who can get hold of surplus grain or fruit. The people are overwhelmingly loyal to their polytheistic religions which bind their communities together and form part of their social organisations. Beer is used as a ritual beverage in a wide range of contexts: offerings to deities or to the dead, seasonal rituals linked to the agrarian cycle and the growth of plants, particularly cereals, banquets of the nobility devoted to war, apotropaic magic, etc. Beer is a beverage-symbol of polytheistic religions that have strong links with nature, its annual rhythms and the cultivation of cereals.

Beer became the fermented beverage of the nuns and monks whose abbeys covered almost the entire Carolingian Empire in the 9th century ([Map 9](#)). This raises some practical and doctrinal objections, as wine is the only possible beverage for the Eucharist. But this exclusive role has been recently assigned to

⁴ Laws and Capitularies should not be an illusion about the 'benevolence' of Carolingian power. The servile existence of the majority of people is subjected to the unrestrained brutality of the masters. Wars proliferate with their attendant massacres, looting and enslavement. In practice, these texts, which were supposed to limit the omnipotence of the aristocracy, go unheeded.

wine in a Western Europe that has been Christianised for only a few centuries⁵. Bishop [Caesarius of Arles](#) (470-542) was concerned about the 'toasts' offered at the end of the meal to the living, to angels and to « *other holy persons of the past*” by Christians *"who consider that the greatest honour is shown to them if we bury ourselves in their name in the most excessive drunkenness* ». Excusable among *"pagans who do not know God"*, these customs are inadmissible among Christians *"Because, thanks to God, you are different from them in faith, you must not be like them in drunkenness"* (sermon 47:45, quoted by [Albert Jean-Pierre 1991](#), 78-79). These toasts and collective drunkenness with beer or wine, customary of newly Christianised peoples, bear the trace of polytheistic customs and mindsets.

Apart from Carolingian documents, and hagiographies of saints miraculously exploding the beer vats of the pagans⁶, we have only rare direct testimonies on beer and its ordinary social or economic role among the peoples of the Carolingian empire. They suggest that beer remained the preferred beverage of a large part of the population, beyond its ritual uses as recorded by the clergy.

[Gregory of Tours](#) (538-594) speaks of a man who brews beer instead of celebrating with his neighbours the sanctity of a hermit: *"A man in the neighbourhood lights a fire and prepares to roast on intertwined branches grains that have been macerated in water for a long time and have swollen as they germinate, to make a beverage."* (Grégoire de Tours, [Les livres des miracles ...](#), 68)⁷. These grains are malted to make beer.

The same author relates a more instructive anecdote. In Auvergne, a group of 70 harvesters drink beer in the fields from a cask containing several muids (a Merovingian muid ≈ 34 litres). Gregory of Tours calls it *ceria*, in keeping with his Latin culture. Surprisingly, the miracle consists in praying to repeat the prodigy of the wedding at Cana. But here beer replaces wine. In the 6th century, the hunt for the symbols of paganism, of which beer is a part, was not yet on the agenda. The following anecdote reveals that beer played an important role in the rural world, for servants and harvesters: *"When I was living in the country of Auvergne, a truthful man told me something which I hold to be true, for I recognised the evidence of the things he told me. He said that the beverage prepared with grains infused and cooked in water is made for the harvesters; this same decoction is called *ceria*, according to Orose, from the word which means to cook [fanciful etymology]. When the beverage was made and put into a vessel, as the man had prolonged his delay in the city, according to the custom of the servants, most of the beverage was drunk, and only a little was left for the use ordered by the master. Nevertheless, true to the orders he had given, he sent for the harvesters*

⁵ Christianity became an imperial religion after Constantine (Edict of Milan in 313). The Christianisation of Western Europe was still very superficial around 600-700. The Carolingian period was that of the forced Christianisation of the polytheistic peoples in Europe. It was inaugurated by Pepin the Short and expanded by his son Charlemagne.

⁶ St. Gall and St. Columban, in particular, were accustomed to destroying brewing pots.

⁷ *Quidam autem de vicinis annonas diu infectas aqua ac germine producto conflatas, facto igne, super vimina contexta torrere parat ad pocula facienda.*

so as to find them busy cutting the harvest when he returned from the city. Consequently, there were already about seventy workers busy harvesting when the master of the estate arrived; he examined the quality of the beverage and its quantity, and found very little. He was ashamed and thought that he would be confused if the workers did not have enough of the beverage, of which there were not more than five muids, and he hesitated, not knowing what to do or where to turn. Finally, by the inspiration of God, he approached the barrel, leaned towards the opening, and devoutly invoked the names of the holy angels which the sacred scriptures make known to us, praying that their virtue would deign to convert this small measure into an abundant quantity, lest the workers should lack enough to drink. A marvellous thing to say! They drew from it all day without the drinkers ever lacking the liquid, and until the night ended the work, all received it abundantly.” (Grégoire de Tours, T. 2, [De la Gloire des bienheureux Confesseurs](#), 343-345).

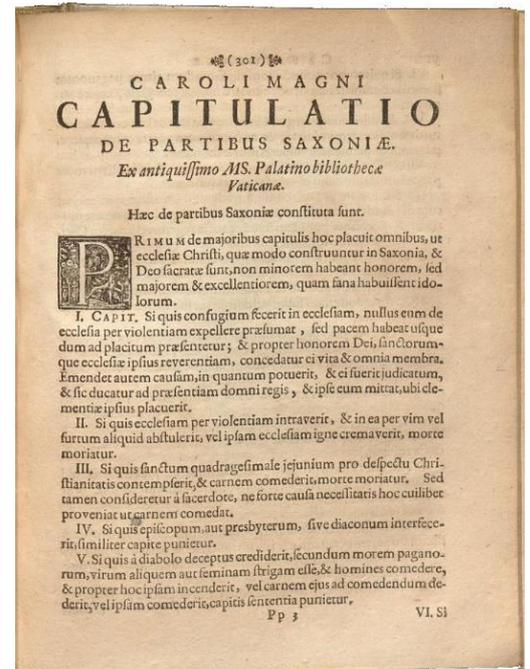
Even more surprisingly, Gregory explains that beer poured into the holes dug at the foot of the relic of Saint Benigne cures ophthalmia: *“Many of the faithful pour wine or beer [vinum aut siceram] into the small cavities in the stone where the feet of Saint Benigne were fixed with molten lead. They use it to cure themselves of ophthalmia or wounds. I myself have had the most reliable experience of this: for, being affected by a serious inflammation of the eyes, when I touched my eyelids with this sacred ointment, all pain ceased.”* (Grégoire de Tours, T. 1, [Les Livres des Miracles](#), 151).

A maple wood flask (h. 19cm) has been found in the Alemannic grave 58 dated 580 in Trossingen (Baden-Württemberg). It still contained the remains of a beer made from barley and other grasses with a high proportion of honey and some hops, a composition deduced from the proportion of pollen remains ([Theune-Großkopf 2010](#)). This is one of the earliest archaeological records of hops associated with a fermented drink.



A century after the prolific Gregory of Tours, the image of beer changed completely. In order to definitively separate beer and wine and their respective symbolic and social uses, all the Carolingian kings waged merciless wars against the ancient religions, which were also those of the peoples they wanted to subjugate. [Charlemagne](#) (742-814) was probably the most ruthless. Year after year, he led bloody campaigns against the non-Christian peoples of the north and east (Saxons, Germans, Angles, Frisians, Bretons, Bavarians, Avars, Slavs). He expanded his empire, plundered the treasures of the conquered kingdoms, and offered his warlords wealth, serfs and new lands. These conquests were carried out in the name of the Christianisation of the pagans. The question of beer, the ritual beverage of ancient customs, was settled in blood and by the sword. From then on, only wine was allowed as a sacramental beverage among these forcibly Christianised peoples.

Saxons who offered beer to the spirits of nature (springs, trees, bushes) were severely punished, as were those who attended banquets and drank toasts to their deities. The war against the Saxons (772-804) and their 32-year resistance illustrate the ferocity of the Frankish conquests. The [Capitulatio de partibus Saxoniae](#), decreed in 782 at the end of one of the last revolts, is explicit: « 7 - *The death penalty is given to those who, according to pagan custom, bury bodies by surrendering their bodies to the flames. 8 - Those who want to remain pagan and hide among the Saxons are to die, so as not to be baptized or spurned to go to baptism. 21 - Those who offer vows according to pagan custom at sources, trees or groves or who offer pagan custom offerings and hold a communal meal in honour of the idols, pay 60 as Edeling, 30 as Friling, 15 as Late. And if they don't have the money, they should work it out in the service of the Church. 22- We order that the Christian Saxons be buried in the churchyards and not on the pagan burial mounds. 23 - The fortune tellers and magicians are to be handed over to the churches and pastors.*” The backdrop is a terrible hunt for 'witches' and 'wizards' among the Saxons, carried out with the help of the clergy to break down political resistance⁸. For the clergy and the Roman Church, this was simply the pursuit of a Christianisation policy initiated in the 6th century and reinforced by the Franks.



With [Charlemagne](#) and his ally the papacy, beer lost its role as a ritual beverage in Western Europe. In the 9th century, only the Scandinavian and Slavic peoples escaped the military campaigns of Christianisation and the banishment of beer from the sacred realm. The Frankish aristocracy drank beer, wine, mead (*medam, meda, medo, or meth* in German), and *moratum* (blackberry wine) in accordance with their warrior mores which valued collective male drunkenness. But the beer of the drinking parties and Frankish banquets no longer carried any (apparent!) sacred character. This "concordat" between the two main fermented beverages was to redraw the European geography of beer brewing, which was henceforth based on two major institutions: the *villae*, the civil domains of the emperors and the Carolingian aristocracy, and the vast agricultural domains granted to the abbeys and archbishoprics.

⁸ In October 782, Charlemagne ordered the massacre of 4,500 Saxon chiefs who had come to [Verden](#) to submit after their leader [Widukind](#) had fled to the north. In 797, the [Capitularum Saxonicum](#) transformed some of the death sentences provided for in 782 by the [Capitulatio de partibus Saxoniae](#) into financial compensations.

Beer, which had been relegated to the status of a secular beverage, paradoxically took on unprecedented economic importance in Europe with the Carolingians. The monastic breweries are partly responsible for this. They own vast agricultural estates where the main cereals are grown: rye, barley, oats, wheat and spelt. St. Gallen was no exception. All the great Carolingian abbeys had their own brewing facilities or had their beers brewed by brewers working on their estates.

The brewery acquires an economic importance unheard of in Europe. It is sponsored and organised by members of the Carolingian dynasty. Around 810-812, the Capitulary on the *Imperial Villae and Courts* (*De villis et curtis imperialibus*) lists the resources, crafts, food and beverages to be provided by the royal estates in the service of Charlemagne and the queen who manages this palatial economy: « That every steward shall have in his district good workmen — that is, blacksmiths, gold- and silver-smiths, shoemakers, turners, carpenters, shield-makers, fishermen, falconers, soap-makers, brewers [*siceratores*] (that is, people who know how to make beer (*cervisam*), cider (*pomatium*), perry (*piratium*) or any other suitable beverage (*liquamen*)), bakers (*pistores*) to make bread (*similam*) for our use, net-makers who can make good nets for hunting or fishing or fowling, and all the other workmen too numerous to mention » ([Capitulare De Villis](#) 45). The *siceratores*, specialists in fermented beverages (with the exception of wine), derive their name from *sicera*, an ancient beer already attested in classical texts. « *The internal economy of the palace, especially the royal pomp, the annual gifts brought by the king's officers, with the exception of beverage, food and the maintenance of the horses, belonged in the first place to the queen and under her orders to the chamberlain [...]* As for the gifts brought by the various legations, they were the affair of the chamberlain, unless he had to decide on them together with the queen, on the king's orders. » (Quoted by [Magnou-Nortier 1998](#), 668). The beer is brewed on site. The *siceratores* come to brew it at the palace with malt sent from the royal estates. Beer is not transported from these estates like other food products, such as wine ([Devroey & Schroeder 2017](#), 365).

A page in the general European history of brewing is turned with the Carolingians. Stripped of its character as a sacred fermented beverage, beer takes on a new face. Its image as a "popular" beverage for the humblest people slowly takes shape at this time. It is built up with the birth of the *cambae*, at first simple brewing workshops for the service of the secular or ecclesiastical aristocracy, then gradually transformed from the 12th century onwards into inns-breweries (*cauponae*). Their development goes hand in hand with that of the grain trade, the rise of merchant towns and the emergence of local urban powers. The brewer and the miller, two craftsmen who join forces in their trades, freed themselves from their former personal dependencies with the Carolingian landed aristocracy and

established new ones with the urban authorities, this time based on the trade in beer, malt and hops. This transformation took place against the background of the decline of Carolingian imperial power in favour of regional or local aristocracies, a decline that was completed around 1050. When the Carolingian world had disappeared for two centuries, brewing was transformed again around 1250, becoming a proto-craftsmanship activity freed from the great aristocratic agricultural estates. Nevertheless, the *cambae/cauponae* of the 13th century do not yet resemble the medieval breweries which, during the 14th-15th centuries, will become an urban craftsmanship specialising in the manufacture and export of large volumes of beer conveyed in barrels by boats from town to town. But let's go back to the beginning of the story.

Under the Carolingians, a part of the Frankish aristocracy is involved in religious affairs, being a core of abbots and bishops loyal to the imperial policy of the Franks. This aristocracy calls for the unification of monastic rules and it wants to regulate the role of beer within the abbeys. By the middle of the 8th century, the question of beer in the daily life of monks and nuns remains open.

After the Council of Frankfurt (June 794) and the two synods of Aachen (August 816 and autumn 817), respectively requested by [Charlemagne](#) (r. 768-814) and [Louis the Pious](#) (r. 814-840), a unified monastic rule - at least in political intents - comes into effect within the Carolingian Empire in the form of the *Capitulare Monasticum* of July 817. This capitulary is amended on many points and confirmed by the synodal diet of January 819. It settles matters relating to monastic life, the economic organisation of abbeys and their political role within the Carolingian empire. It also deals with fermented beverages. Beer is one of the preferred fermented beverages of the laity at that time. Should monks be allowed to drink it? If so, how much? Should monks be allowed to brew it, or, more importantly, to have it brewed within the walls of their abbeys? These seemingly trivial questions raise essential points of monastic doctrine and, beyond that, question the place of abbeys in the economy of the empire and its policy of unification.

With its three breweries in the heart of the abbey, the plan of St. Gallen drawn around 820 confirms the decisions taken by the *Capitulare monasticum* in 817. It sheds light on five important historical aspects of the medieval history of brewing:

1 — Not only is beer allowed in the regulated daily life of nuns and monks, but its production in the heart of abbeys is encouraged. Wine, the only fermented Eucharistic beverage, gave beer, the fermented beverage of the ancient pagan cults in Europe, an important place at the table of the clerics and friars ([chap. 2](#)).

2 — Brewhouses are now located in the heart of certain abbeys, respecting their three dedicated spaces: that of the monks, that of the lay aristocrats, and that of the paupers, pilgrims and sick. The construction of abbeys, the organisation of buildings and spaces, the management of water, work and daily tasks had to take into account the brewery, whose production rhythm kept a large number of lay people busy throughout the year in the heart of the abbeys ([chap. 3](#)).

3 — Thanks to the plan of St. Gallen and the documents that list the economic resources and land holdings of the abbeys, brewing techniques can be deduced from the ingredients used, the people who produced the beer, the brewing equipment, the buildings, the various types of beer and their production ratios. This is the first time that such a rich and complete technical record is available for Europe, compared to the very patchy data from antiquity ([chap. 4](#)).

4 — Beyond the abbey walls, beer brewing is organised on the vast agricultural estates belonging to the abbeys. Unlike wine, beer requires several ingredients, technical know-how and a complex production process. The introduction of these brewing processes into the economic management of an abbey has led to the development of brewing techniques. The brewing of beer on behalf of the abbeys in the villages and the first merchant towns initiated a fundamental evolution of beer brewing towards a commercial logic from the 12th century onwards. This led to large-scale production inherited by the Hanseatic cities of Hamburg, Bremen, Wismar and Rostock around 1350 ([chap. 5](#)).

5 — The monastic hostelries and their brewhouses play a major role in the territorial network of the Carolingian Empire. Receiving distinguished guests and offering them beer was a Christian duty, but even more so an obligation for a clergy whose political power was closely linked to the imperial and territorial power of the Carolingians. The monastic hostelries served as relays for envoys of the imperial power on mission, travelling in all directions across the territories. Benedictine abbeys also served as anchor points for monitoring peoples who were barely Christianised and quick to revolt politically ([chap. 6](#)).

2 The status of beer for nuns and monks

After negotiations between the high clergy and the imperial power on the one hand, and numerous doctrinal disputes within the church on the other, the synod of 819 delivered its response: *when wine is lacking, of which one hemina is granted, [nuns and monks may drink] a ration of double hemina of good beer [cervisa bona], that is, two heminas*⁹. *Cervisa bona* refers to the beer of the brethren, which the St Gall plan calls *cervisa fratrum* (3.1). A difference was thus made between the ordinary beer of the lower classes and the beer restricted to the women and men of religious orders. An abbot or abbess is allowed to brew on the abbey premises for their religious community. They must also plan to brew to satisfy the thirst of guests from the Frankish aristocracy whom the abbey must receive, feed and quench. They can also distribute a third-rate beer to the humble people who knock on their door. The Frankish social hierarchy is fully respected¹⁰.

The rules laid down by [St Benedict of Nursia](#) (490-547) around 540 for the community of monks on Mount Cassin, which he led in Italy, were authoritative throughout Western Europe. The [Rule of St. Benedict](#) draws on the many existing rules of the 6th century, and creates a coherent and balanced synthesis of spirituality, moderate asceticism, communal life, discipline and individual capacity¹¹. The abbot retains the initiative to make adjustments according to material, geographical or cultural constraints. One of the subjects covered by these rules of monastic life is the question of fermented beverages and drunkenness. Wine is a Eucharistic beverage. Its presence within the walls of monasteries to celebrate mass is self-evident. But its consumption at the monks' table is debated. Benedict envisages one hemina of wine (about 0.8 litres) per day per monk, divided between two meals (rule no 40: the measure of the beverage).

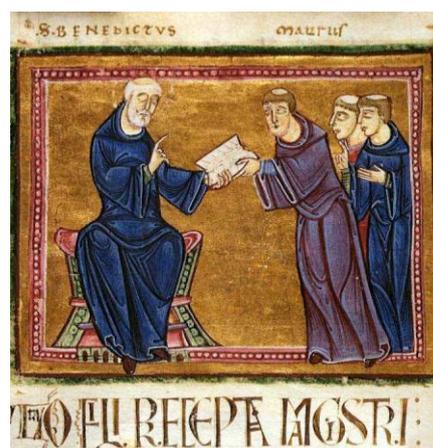


Figure 2: St Benedict of Nursia giving his rule to his disciple St Maurus. St Gilles Monastery, Nîmes 1129.

⁹ *Ubi autem vinum non est, unde emina detur, duplicem eminae mensuram de cervisa bona (Capitulare monasticum, 817).* dmgh.de/mgh_II_1/index.htm#page/201/mode/1up

¹⁰ The tripartition of beers does not exist everywhere. In England, the Benedictines brew two different beers (Slavin 2012, 209). In the Netherlands, the commercial breweries of the cities brew four qualities of beer ([Alberts 2010](#)).

¹¹ Eastern monasticism was already ancient at the time of Saint Benedict. His Rule was inspired by the monastic Rule of the Master (500-530), the Cenobitic Institutions of Cassian the Roman, St. Basil the Great, legislator of Eastern monasticism, St. Augustine, St. Leo the Great, St. Caesarius of Arles and St. Cyprian.

Benedict does not refer to any other beverage than wine; we are in Italy. He also refers to the abstinent monks who proscribe wine. From the very beginning of monasticism, in the East and then in Europe, some abbots and monastic communities have advocated total abstinence from all fermented beverages. Drunkenness is the potential source of the most serious sins for them¹².

Rule 40. Of the Quantity of Drink (Benedict of Nursia's rule)

" Every one hath his proper gift from God, one after this manner and another after that" ([1 Cor 7:7](#)). It is with some hesitation, therefore, that we determine the measure of nourishment for others. However, making allowance for the weakness of the infirm, we think one hemina of wine a day is sufficient for each one. But to whom God granteth the endurance of abstinence, let them know that they will have their special reward. If the circumstances of the place, or the work, or the summer's heat should require more, let that depend on the judgment of the Superior, who must above all things see to it, that excess or drunkenness do not creep in.

Although we read that wine is not at all proper for monks, yet, because monks in our times cannot be persuaded of this, let us agree to this, at least, that we do not drink to satiety, but sparingly; because "wine maketh even wise men fall off" ([Sir 19:2](#)). But where the poverty of the place will not permit the aforesaid measure to be had, but much less, or none at all, let those who live there bless God and murmur not. This we charge above all things, that they live without murmuring. "

Translated by Rev. Boniface Verheyen, OSB of St. Benedict's Abbey, Atchison, Kansas.
ccel.org/ccel/benedict/rule/rule.xlii.html

2.1 The measure of beverage for the clerics in 8th century

Between total abstinence from fermented beverages and the regular consumption of beer, cider or wine, the Benedictine rule is the subject of many comments regarding its adaptation. [Benedict of Aniane](#) (741-821) writes the Concord of Rules (a synthesis of St Benedict, St Columban and the so-called Free Rules) to reform his abbey of Aniane in 792. At the request of Louis the Pious, he visited the abbeys of the empire in Gothia, Aquitaine and then Francia, compiled their often divergent rules on points of doctrine or collective practice, and prepared

¹² The leitmotif of every world's great religion: Hinduism, Buddhism, Judaism, Christianity, Islam. Under the influence of alcohol, the follower breaks his or her vows, commits the most serious sins, eats animal flesh (Hinduism, Buddhism), engages in sexual acts and even commits murder.

the two synods of Aix-la-Chapelle (817 and 818). Lively debates opposed abbots and bishops from the four corners of the empire, the moderates (respect for local traditions) and the extremists who favoured an unconditional application of Benedictine discipline to all abbeys, whatever their ancient customs and institutions. The modified Benedictine rule was then imposed throughout the empire by the Carolingian authorities.

These religious affairs conceal major political issues: abbesses, abbots and bishops, members of the Frankish aristocracy, ruled vast domains, cities and governed large populations. The balance between their strong regional temporal powers and those of the Frankish imperial families was tricky. Every issue was subject to compromise between political and religious authorities. The appointment of abbesses/abbots to abbey heads crystallises these disputes: elected by their community with the pope as sole arbiter, or on the contrary appointed by the emperor who wants to control his territories? For example, the abbots obtain a freedom of election from Louis the Pious, but *missi monastici* sent by the emperor control the proper application of the *Capitulare monasticum*. The monastic organisation and the increasingly dense network of abbeys and priories are thus integrated into imperial policy. Beer brewing flourished in the imperial agricultural estates and those of the Carolingian nobility. From then on, it flourished also within the monasteries and on the agricultural land of the abbeys.

2.2 Ecclesiastical condemnation of drunkenness

Through wine, it is naturally drunkenness that is feared above all. Alcohol incites lust and anger, compromises the state of mind, removes its awareness of evil and ruins health. The history of the Franks written by [Bishop Gregory of Tours](#) is peppered with edifying examples. Cautin, bishop of Auvergne, drank so much wine that he became epileptic. Ennius, his colleague from Vannes, became practically impotent, while the enraged priest Winnoc chased people with his knife. The deacon of Paris, Theodulf, strikes a servant and kills himself by falling from the city walls of Angers. Childeric the Saxon gets so drunk that he is found dead in his bed. The clergy's mistrust of drunkenness is proportional to the morals of his contemporaries who are fond of alcoholic beverages. Chapter 14 of the *Admonitio generalis* proclaimed by Charlemagne in 789 forbids clerics and monks to enter taverns.

Conversely, the abstainers from beer or wine are already celebrated for their sanctity in the time of Gregory of Tours: "*There was in the territory of Bourges a recluse named Patroclus, raised to the dignity of the priesthood, a man admirable for his holiness, his piety and his abstinence; who as a result of his fasts often experienced various discomforts: he drank neither wine, nor beer, nor anything that can intoxicate, but only water slightly sweetened with honey. Nor did he make*

any use of stew. His only food was bread soaked in water and sprinkled with salt." (Gregory of Tours, [Histoire ecclésiastique des Francs](#) Livre V, X).

The drunkenness from wine that the clergy feared was not exactly what was dreaded with beer. The 2 litres of beer allowed per day for monks (1.2 litres for nuns) prevented excesses. The ecclesiastical authorities were wary of beer for a much deeper reason: the return of an underground paganism within popular customs that resisted a recent and superficial Christianisation. The very controlled consumption of beer inside the abbeys did not raise any problems. The same cannot be said for the vast areas of land outside the direct control of the clergy and its network of abbeys and churches (6.2). Small priories and isolated groups of monks lived in hostile regions, such as the Somme or Friesland, marshes partially populated by Saxons or Frisians who were converted by force and blood to Christianity ([Rouche](#), 1977). Here and there, ancient religions are still alive.

2.3 Can beer become the ordinary beverage of monks and nuns?

For the Roman church, beer is the beverage of the pagans used to worship their gods. Beer is an evil beverage from the Roman Church clerics' point of view¹³. There was no consensus among the Western religious authorities to bring beer inside the abbeys. On the eve of the Council of Frankfurt, the situation was as follows. The Irish monks, under the leadership of [Columbanus](#) (540-615), had made the regular consumption of beer a commonplace in the monastic communities of northern France¹⁴. The Penitential written by Columbanus stipulates days of 'dry bread and water' for errant monks. Its §2 sets out a very severe rule: « *Therefore, if any has sinned in thought, that is, has desired to kill a man, or to commit fornication, or to steal, or to feast in secret and be drunken, or indeed to strike someone, or to desert, or to do anything else like this, and has been ready in his heart to carry out these sins; let him do penance for the greater in half a year, for the less in forty days on bread and water.* »¹⁵.



Figure 3: Beer brewing scene. Upper part of a funerary stele, 3rd century. Cour d'Or Museum in Metz (France).

¹³ [Max Nelson](#) (2018) has shown that this is not the case either in Egypt or in the Eastern Church. The opposition between beer and wine is less clear-cut, even if beer is seen as an ordinary beverage for the poorest people and the slaves.

¹⁴ [St Gall or Gallen](#) (from Ireland, 550-646), founder of the Abbey of St. Gall, was one of the 12 monks who accompanied [Columbanus](#) from Ireland, landing with him on the Norman coast around 585. Columban found a well-established brewing tradition on the continent.

¹⁵ §6 from the same Penitential says: "But if any has made himself drunk and vomited, or being overfed, for this reason has vomited the sacrifice [host of the Holy Communion], let him do penance forty days. However, if he is forced by ill health to vomit the sacrifice, let

The ordinary beverage of the monks led by Columbanus is therefore not water but beer, except on days of fasting or penance.

The Life of St. Columbanus and his disciples tells of the miracle of the "overflow of beer without losing a single drop". (*De cerevisiae redundatione absque effusionis damna fluentis*¹⁶ and note 35)

On the eastern side of the Carolingian Empire, in Fulda near Kessel, [St Sturm](#) (715-779) decide to replace the monks' daily wine with small beer: « It was decided by all unanimously that among them there should be no strong drink which could intoxicate, but that weak beer should be drunk. »¹⁷. Beer is preferred because it is less alcoholic than wine. However, the monks of Fulda could dilute wine as well. The motivation, beyond in keeping with monastic moderation, is probably an economic constraint (absence of vines) or the monks' preference for beer.

[Chrodegang](#), bishop of Metz from 749 to 767, established a Rule for the Canons of Metz. Its chapter 23 allows them to drink beer ([Urien 1966](#), 137).

No great religious figures such as Columban, Sturm or Benedict of Aniane could be suspected of heresy by promoting beer at the monks' table. A few decades later, abbots no longer needed to justify the use of beer in their abbeys. Bishop [Haito](#), editor of the *Statuta Murbacensia* (816) and author of the plan of St Gall (820), observed that custom must be joined to the authority of the Rule in order to establish the same usage in all the abbeys of the empire. One of these customs is the presence of beer at the table of nuns and monks. Vowing silence during meals when listening to the reading of sacred texts, the monk must speak the language of signs: « for the sign of beer, hold your palm out in front of your mouth and, lowering [your hand], blow on it »¹⁸.

In practice, the monk-gatekeeper of the abbeys will manage the brewery supplies (grains, malt, aromatics, hops), and order the millers, maltsters and brewers. The cellarers will manage the barrels of beer stored for the monks. The provosts will ensure that all the necessary supplies (cauldrons, troughs, firewood, staves for the barrels, etc.) were regularly



Figure 4: a Gallo-Roman intaglio with the brewer's tools: shovel, fork, skimmer, two ears of corn, vat and scales (Alsace, France).

him do penance seven days. If any has lost the sacrifice itself, let him do penance for a year." <https://celt.ucc.ie/published/T201052.html>

¹⁶ The cellarer monk is watching over a barrel of fermenting beer when the call to prayer from his abbot Columbanus rings out. Discipline and piety command him to prefer prayer to material concerns. Returning to his barrel a few hours later, the monk was amazed to see a miracle of faith: not a single drop of beer had been lost!
dmgh.de/mgh_ss_rer_merov_4/index.htm...

¹⁷ [Max Nelson](#) (2005) p. 101 and note 52.

¹⁸ 'pro signo cervisie, tene palmam erectam ante os et deorsum eam trahens, suffla in eam' (*Der Liber ordinarius*, p. 128, quoted by [Xhayet 2015](#), n. 13).

transported from often distant agricultural estates so that their abbey did not run out of beer throughout the year.

Chapter CXXII of the Council of Aix in 816 (*De mensura cibi et potus*) states that if wine was in short supply it should be replaced with beer¹⁹: wine is always named first, beer is cited as a substitute beverage. This is the doctrine of the Roman Church, made official from 819 onwards. With the help of Carolingian politics and Irish influence, beer drunk by monks is officially accepted by the religious authorities of the empire after the synodal diet of 819. However, beer was to take first place in the habits of the monks in northern Europe.

In Germanic lands, beer was not only acceptable to monks but was more common than wine. The Merovingian and Carolingian Franks, originating from the Rhine regions and the former Roman province of Belgica (Belgium), were beer drinkers. What a curious historical reversal in this part of Christendom, when one remembers the esteem for wine and especially the contempt for beer showed by the elite following the Roman conquests. Beer once again took pride of place in the habits of the Carolingian political and religious elites, apart from in Christian ceremonies!

2.4 What daily measure of beer per monk and nun?

The rule of St. Benedict stipulated around 540 a hemina of wine/day, that is about 0.8 litres. What exactly the hemina contained was investigated under Charlemagne. The emperor asked Theodomar, abbot and distant successor of Benedict of Nursia between 778 and 797, to send him a copy of the hemina used at Monte Cassino with the organisation of the monks' menu²⁰. Theodomar sent two chalice bowls, one for the morning beverage, the other for the evening one, the contents of which totalled one hemina. In order to standardise and convert the measurements of food and fermented beverages, the Synod of Aachen chose a unit of weight, the imperial pound of 12 ounces, rather than one of the many units of volume deemed too heterogeneous in use within the Carolingian Empire²¹. This imperial pound is estimated to be approximately 408g.

¹⁹ Concilium Aquisgranense a. 816, ed. Albert Werminghoff, mgh, Concilia, t. ii/1 : Concilia aevi Karolini, Hanovre, 1906, c. 122 ([De mensura cibi et potus](#)), p. 401.

²⁰ The same abbot prescribed abstention from all alcoholic beverages at Monte Cassino.

²¹ Adalhard abbot: « *Because of the differences and inequalities in the measures, which in most cases are not considered equal according to divine law but according to the custom of each province, we rule that the measure of food and beverage must be given to the canons according to its weight (mensuram cibi et potu pondens ratione canonicis dandam esse), and this, because, the measures of these products being usually very varied and unequal, the public weight, which is imposed on the provinces, cities and metals, must not suffer in any way from differences and inequalities, so that, as long as the weight remains equal, the measure itself will be attributed to them equally. Let them all apply under these conditions that a pound should not consist of more than 12 ounces (noverint tamen*

The *Capitulare monasticum* prescribes in 817 to distribute at most 5 imperial pounds of fermented beverage per day and per person, 3 in the morning, 2 in the evening, i.e. about 2kg which corresponds to 2 litres of beer/day/person (beer density \approx water density). While remembering that the hemina of 0.8 litres remains the ideal daily ration of beer or wine. This maximum set at 2 litres of beer/day more than doubles the daily ration of wine recommended three centuries earlier by Benedict of Nursia (0.8 vs 2 litres). The idea that the alcohol content of beer is twice as low as that of undiluted wine guides this regulation. It seeks the invigorating effect of the alcohol, not the volume of a thirst-quenching beverage²². This stipulation given by the *Capitulare* allows for several kinds of fermented beverages on the same day: beer, cider, perry or wine. The monastic life is open to local fermented beverages. Such a daily distribution was acceptable, for example: 1.2 litres of beer in the morning and 0.8 litres of wine in the evening for the abbeys that can afford it, otherwise 0.8 litres of beer, or any other combination of cider, perry and beer²³.

In the accounting of abbeys, the management of grain and beverages used a unit of volume and not of weight, the *muid* set by Charlemagne at about 52 litres before 794. His son created a *grand-muid* of 68 litres. The abbeys' documents always use the standard 52-litres *muid* and its sub-units, unless a *maior modius* is mentioned (Table 1).

Carolingian volumetric measures (liquids and grains)						
Beverages and grains	Ratio					Value in litres
Muid maior	Grand Muid of Louis-the-Pious					68
Muid	1					50-53*
Situla (half-muid), sicla	2	1				26
Setier	16	8	1			3.25
Hemina	48	24	3	1		1
Chalice (cup)	96	48	6	2	1	0.5

* We use 1 muid = 52 litres in the following calculations.

Table 1: Carolingian capacity measures and beer rations

generaliter omnes LIBRAM NON AMPLIUS QUAM DUODECIM UNCUS Constare debere). » [Hocquet 1985](#), 664-665.

²² In fact, the monks diluted the wine. Nevertheless, between Benedict of Nursia and Benedict of Aniane, the daily drinking of fermented beverage increased from 0.8 to 2 litres in three centuries.

²³ "As regards wine, the hemina was a minimum ration fixed in consideration of the weakness of the sick, the infirm or the needs of those who did not engage in heavy work. However, the preparatory texts of the Aachen Council reminded us that 'an hemina of wine is sufficient each day, but it may be increased without provoking the drunkenness that the rule forbids'. One must therefore avoid drinking to satiety, let alone intoxication, and with this in mind the Council apparently fixed the maximum rations allowed: wine was distributed in proportion to its abundance, i.e., 5 pounds per day in well-stocked monasteries. If wine was in short supply, the monks drank beer. They were allowed to take both drinks in certain proportions, i.e., one pound of wine and four pounds of beer or any similar ratio. The daily ration allowed could not exceed five pounds and one hemina was recommended." [Hocquet 1985](#), 667.

Two cups (chalices) of beer per day are therefore worth about one litre. This is approximately half of what a monk drinks when the abbot grants the maximum daily ration of 2 litres set by the Council of Aachen. But the quality of the beer is not the same for monks, guests of an abbey, pilgrims and servants.

As confirmed by the plan of St. Gallen, an abbey is a place of prayer for the monks, but also a guesthouse for rich visitors and travellers (3.3) and a haven for the paupers and the sick (3.4). [Adalhard](#) (752-826), abbot of Saint-Peter of Corbie, sets the beer rations for the hospital's poor as follows: "*For the beverage they are given each day a half-muid of beer [cervisia], i.e. 8 setiers, in such a way as to divide 4 setiers between 12 paupers so that each receives two chalices [1 litre], the rest (4 setiers) being distributed at the rate of one cup per person to the clerics who wash their feet and their servant Vuilleranno.*" ([Hocquet 1985](#), 674)²⁴. The quality of the beer given to the sick is not specified. It is probably a "small beer" similar to the one that the St Gall plan provides for the poor, the sick and the pilgrims ([Diagram 7](#)).

The religious calendars established in the empire schedule between 13 and 50 feast days in the year. For the occasion, the abbots improve the rations of the monks, priests and novices, and also those of the "vassals" (*vasalii*) and all those, prebendaries and servants, who depend on the abbey. The rations of bread are increased by ½ pound as are those of *pulmenti* (a thick soup or porridge), and the rations of beer as well. In his Directives for Corbie, Adalhard specifies this, according to the consensual formula which cites wine in first place: "*and for each [in addition to the normal ration] a chalice full of wine, if there is any; if not, of the brethren's beer.*" (*et unicuique plenus calix, si fuerit unde, de vino; sin autem, de cervisa fratrum*, [Levillain 1900](#), 353). The beer of the brethren, i.e. the superior beer, was as good as wine, although less alcoholic (≈ 6% alcohol. Appendix 9.1, estimation of the density of beers).

These monastic regulations show that beer not only became a legitimate, daily fermented beverage for all regular and secular clergy, but that religious festivals, a special moment of collective Christian celebration, were compatible with beer. To fully appreciate this historical evolution of the status of beer in the clerical mentality, one must recall the hagiographies of the saints who converted non-Christian peoples. They tell how these missionaries fulminated at the same period against pagan cults, beer offerings, and agrarian festivals where beer abundantly flowed and provided a collective sacred intoxication. Everything that links beer to religious celebrations aroused the anger of these evangelising monks, destroyers of sanctuaries, idols, and smashers of beer barrels or vats.

²⁴ De potu autem quotidie detur cervisia[e] modius dimidius id est sextarii VIII de quibus dividuntur sextarii IIII interillos XII suprascriptos, ita ut unusquisque accipiat calices II. Ex aliis quoque quattuor sextariis, datur clericis quibus pedes lavantur a fratribus unicuique calix unus, et Vuilleranno servitori calix unus. ([Levillain 1900](#) 354-355). We can deduce that the foot-washing clerks and the servant are twice as numerous, 24 in total. They receive 0.5 litres of beer. This ration is related to their task. As clerics, this is not their only beer ration of the day.

2.5 Can beer be brewed inside the abbeys?

Once it is accepted that beer and its proper daily measure are compatible with the monastic vows, allowing its manufacture within an abbey is no longer an issue. To understand this, we need to describe what changed in Western Europe under the Carolingians. In the 8th century, an abbey looks like a miniature city inhabited by several hundred clerics and laymen, with all its social components and almost all its economic activities. It is not a convent closed to the world. It is no longer the isolated hermitage of anchorites on Mount Cassino three centuries earlier. A Carolingian abbey is not a monastery where nuns or monks live in autarky, cut off from the world, working for their own subsistence. The Plan of St Gall foresees granaries, workshops, kitchens, cellars, storerooms, hostelries for which a host of servants and domestics collectively called *familia* are working. Other surviving plans of Benedictine abbeys reflect a similar organisation (Norwich Cathedral Priory, [Slavin 2012](#), figure 2.2; Canterbury abbey [Map 4](#)). In the midst of all these technical activities, the brewhouses raise no other problem for the abbesses and abbots than that of their supply, the necessary technical know-how and the regularity of the brews to serve their daily measure of beer to the monks and nuns all year round.

The original [Benedictine rule](#) requires monks to work and provide for the needs of their community. Its purpose is religious: work forces humility and avoids idleness. It is also practical. Depending on supplies from outside implies frequent contact with the villagers, disorder and temptation. The work is organised in such a way that the sisters or brethren do not have to leave the enclosure of the monastery and run around the countryside in search of food or beverage. Benedict of Nursia prescribes that "*The monastery should, as far as possible, be arranged in such a way that all the necessities are available: water, a mill, a garden and workshops for practising the various trades within the enclosure. In this way the monks will not need to scatter outside, which is not at all advantageous for their souls.*" In 6th century Italy, this relative economic autarky suited the frugal diet of a community gathered around Benedict in Nursia. Grain, oil, cheese, dried fruit and wine are storable foods. Bread is baked for a day or a week. A drinking water source near the monastery does the rest. The first transalpine Benedictine monks saw the society around them as a world hostile to their religious project. They had to protect themselves and separate themselves from it. Their quest for material self-sufficiency and physical isolation is self-evident.

In the 8th century, the social and political order in Western Europe changed dramatically. Social relations hardened under the Merovingians and Carolingians: masters, dependents and serfs formed separate social categories with neither the same rights nor the same legal personality. Servants and serfs were treated as objects submitted to the will of their master or mistress. The abbeys administered vast agricultural estates, the *villae*, where a large workforce of free and servile

tenants worked, whom the monks called the *familia foris*²⁵. It ensured the material existence of the nuns and monks. On the estates of St Germain-des-Prés, 13,300 dependents worked for the abbey in the 9th century. At the same time, the abbeys of St. Wandrille and St. Denis had the same resources. It has been calculated that around 800-826, the work of about 112 laymen on ecclesiastical lands is needed to maintain a single monk or nun²⁶. The dream of material self-sufficiency of the monastic communities gave way to the unlimited exploitation of the most destitute in a most brutal society. The instructions of Adalhard of Corbie concerning the 150 prebendaries working for his abbey speak for themselves: "*If one of them dies, he must be replaced immediately by another, so that the number is always complete. And no one can be added to increase this number*".

The renewal of economic exchanges under the Carolingians brought its share of novelties. The abbeys could buy, sell or trade according to their needs on a vast geographical scale. The large ecclesiastical estates had a part in the general economic boom of the 9th and 10th centuries. They were both the source and the beneficiaries. The diet of the northern countries with their harsh winters required more technical preparation and greater dependence on supplies. Brewing is the best example. Brewing beer requires technical know-how, the combination of multiple ingredients (grain, malt, herbs, hops, yeast, firewood, water), the use of heavy equipment (malt kilns, ovens, millstones and water mills, cellars) and expensive utensils (vats, cauldrons, barrels) (3.1 and 3.2). Beer does not keep as well as wine and has to be brewed throughout the year. The economic organisation of the agricultural estates, owned by wealthy abbots or bishops belonging to the aristocracy, provided the abbeys with all the ingredients and services needed to brew all year long. The abbeys obtained utensils and tools by requiring the dependents to provide them by way of drudgery, cens (tax or rent), and tithes.

The final parameter of this complex economy (chap. 5), is that nuns and monks from the aristocracy do not submit to manual tasks deemed unworthy of their social status. The abbot [Adalhard](#) and his brother [Wala](#) were no less than Charlemagne's first cousins. The abbesses, abbots and all the great religious figures of the Carolingian era came from aristocratic bloodlines. This situation dates back to the Merovingians. In the [Ten Books of the History of the Franks](#) written by [Gregory of Tours](#), the abbesses, abbots or bishops who founded abbeys invariably came from the highest ranks of the reigning nobility. Gregory of Tours himself was a wealthy aristocrat from the Arverne. As a result, an abbey housed servants attached to the personal care of the nuns and monks who formed a religious nobility. These servants, who were in servile condition, had to conform to the rules of the monastic life of their masters and mistresses, to keep celibate and be subject to the discipline of a life they had not chosen.

²⁵ The 'free' and 'servile' could not own land and remained subject to the will of the landed aristocracy, of which abbesses, abbots, nuns and monks were part.

²⁶ According to the Polyptics of St Germain and St Riquier ([Horn & Born 1979](#), vol. I, 344-345).

This *familia intus* is also a technical staff working within the abbeys to serve the monks or nuns. Its numbers exceeded those of the monks by 15% to 30%. For example, the abbess of Notre-Dame de Soissons calculates the food rations for 216 nuns, 40 maids working behind the abbey wall, 30 others in the *gynecae* inside the abbey, and 130 male servants, hence a total of 416 people, 50% of whom are in the exclusive personal service of the nuns. At St-Germain-des-Prés, in addition to the 120 monks, there were about twenty guests and a hundred servants, *provendiers* (feed manufacturers), etc. (the *familia*). The abbey of St-Denis had 150 monks, about 50 guests and 100 servants. The abbey of Corbie, one of the largest and richest, used 150 *provendiers* and servants (serfs or dependants) out of an average total of 300 people, to which 50 noble guests can be added ([Hocquet 1985](#), 676), that is one servant or waiter per monk.

The St. Gallen Plan reflects this reality based on very unequal social relationships ([chap. 3](#)). There are 110 beds for monks and novices in various buildings, 2x4 beds for prestigious guests, 18 beds for their servants ([3.3](#)), and about 100 beds for the monks' servants ([Horn & Born 1979](#), vol. I 342, II 162). One servant/monk, a similar ratio found in Corbie, St Denis or Soissons²⁷. For a total of 300 people, the abbey of Corbie has only 12 beds for the sick and needy.

The original Benedictine ideal (humility, self-sufficiency, poverty, manual labour), which is constantly recalled in ecclesiastical texts, is far removed from the Carolingian reality. The insulation that a Benedictine abbey should maintain with the profane world around it is part of the legend attached to St Benedict of Nursia.

In an abbey that can be compared to a miniature city with an average population of 300 to 400 people, the monks are de facto influenced by the habits and customs of the laity who are locked up in the abbey to serve them, or who work on the abbey's agricultural land to ensure their material existence. This religious aristocracy has its cultural roots in Austrasia, Neustria, Friesland, ancient Germanic, Alemannia, and Swabia countries where beer is the daily beverage. Brewing and drinking beer is a material necessity (because the water is polluted) but also a cultural imperative in the northern and eastern regions of the empire.

In addition, the management of an abbey with rich estates, which provided abundant material resources, was also granted by the emperor to secular abbots or lay nobles. In this way, the emperor rewards his political allies, members of his own family or aristocratic clans loyal to his interests. These prince-abbots and lay bishops did not have the same reservations about fermented beverages, beer, wine or even mead, as the religious authorities of the time. The great plea convened by [Louis the Pious](#) in 819 brought together the elite of the clergy, princes and counts to negotiate the relative autonomy of the abbeys and bishoprics from

²⁷ [Horn & Born 1979](#), vol. I, 344. This domesticity does not include the large population of farmers, stockbreeders, foresters, land clearers, craftsmen, etc. who provided the abbeys with food, beverage, clothing, firewood, and all the other necessities. The economic autarky of the abbeys is a myth. The reconstruction of the social landscape of an abbey estate illustrates the extreme subjection of a working population to the service of the nuns and monks ([Diagram 11](#)).

political power. The considerable economic powers of the abbeys and the coercive social relationships on which they were based were never called into question.

This interdependence between the Carolingian political authority and the regional power of the abbeys is reflected in the obligations of hospitality for the benefit of the nobility that are imposed on the abbey or episcopal domains. The hostelries granted to lay guests were far more luxurious and better provided for than the hostelry for the paupers. The plan of St. Gallen bears witness to this. The obligation of hospitality in favour of the Carolingian aristocracy fosters the brewing of beer inside an abbey enclosure or its immediate vicinity. A different quality of beer is brewed for each social category: the best for the sisters and brethren, a second one for the noble guests and the *provendiers* (feed manufacturers), and a third one for the others (servants, poor, sick, pilgrims). This range of beers illustrates a strict respect for social hierarchies. The monastic vows of abbesses, abbots, nuns and monks do not erase their social prerogatives. Besides beer, bread is also segregated. In Corbie, there are several types of bread: the best quality white bread for the brethren, the bread of the vassals, the bread of the *provendiers*, and finally the *meslin* bread (raw flour from mixed grains) for the servants and paupers. Like beer, the quality of which varies according to its density and the nature of the grain, bread is differentiated by the quality and nature of the flour, not by the quantity, which is fixed at around 980 g/day/person, according to the example of Corbie Abbey ([Hocquet 1985](#), 670).

In order to control this social cartography, to check day after day that the monk's beer is of superior quality, and that of the impoverished is of inferior quality, it is necessary to brew inside the precincts of the abbey under the eyes of one cellarer-monk or an abbot²⁸. The ingredients for brewing (grain, malt, herbs, firewood) come from the abbey's landed estates and are brought to the abbey under the responsibility of its provost. The abbey authorities require the beer to be brewed and monitored on its estates, as well as the milling or malting of grain, the cutting of wood, etc. These works are owed by the serfs and dependents belonging to the abbey. This is the case in the Corbie estate, which has brewhouses (*cambis*) near its mills (*molinis*). The organisation of the brewery therefore remains very flexible, reflecting local economic constraints and the structure of the agricultural estates. If the abbots set up breweries in the heart of their abbeys, as St. Gallen envisaged, it was to better control the quality of the beer on the spot, a marker of the social rank of their monks and their noble hosts. Brewing beer within the premises of an abbey was more a matter of social logic rather than of technical constraints.

In conclusion, having maltsters, brewers, coopers, water and wood carriers working within the walls of an abbey no longer posed moral or doctrinal problems for abbesses and abbots at the end of the 9th century. The technical issues of brewing and storing beer also found their solutions.

²⁸ The monks' beer is not always brewed inside an abbey. Over time, this has been the least frequent case ([chap. 5](#)).

2.6 The economic significance of brewing for a Carolingian abbey

Abbesses and abbots are skilled managers. They calculate the yearly provisions (*repartitio bonorum*) of their abbeys, draw up very accurate directives (*brevia*), and make censuses of their lands, farms and workforce (charters, cartularies, [polyptychs](#)). These archives are the primary source to study the management and daily life of Carolingian abbeys. They contain lists of annual supplies of grain, malt and wood for the operation of the breweries. In 822, Abbot Adalhard calculated that an average of 400 people would consume 13,560 muids of spelt each year for bread-making alone, which was grown, winnowed and hulled on the Corbie estates and then transported to the abbey in carts, giving a total of 7,051 hl of grain per year ([Hocquet 1985](#), 673). Monks, guests and servants consume 2 litres of flour per day for bread. The abbey's bakeries and ovens are in full operation all year round. The same applies to the breweries.

What about grain and malt for brewing beer at [Corbie Abbey](#)? No account from Abbot Adalhard has come down to us on this topic. However, one of his directives (*brevia*) deals with the management of the malt received by the abbey from its neighbouring estates, and the malt that had to be made on the spot when the abbey gatekeeper ran out of it to brew beer for the visiting guests ([4.1.2](#)). The running of malt at Corbie Abbey is the focus of special attention from its abbot.

The annual volume of malt used for brewing at Corbie can be estimated on the basis of the 400 people mentioned by Adalhard, divided into 3 categories, assuming that the three qualities of beer assigned to them have a 100% malt composition, which is undoubtedly not the case for the lower quality beer made with raw grain in a proportion hard to evaluate (50% to 80%?).

This estimate is based on several data:

- The quality of the beer depends first of all on its density, namely the quantity of grains used per hl of beer brewed. This density induces a final % of alcohol. For lack of data, we cannot take into account the nature of the grain.
- We assume that the three beer qualities have an alc. % vol. of 6%, 4% and 2% respectively. These values are taken from the study published in 2010 by [Leen Alberts](#) (*Bier drinken met maten. Dronkenschap en het alcoholgehalte van Stichtse en Hollandse bieren in de late middeleeuwen*). His study covers North Holland beers brewed between 1366 and 1550 in the cities of Amersfoort, Amsterdam, Delft, Gouda, Haarlem, Utrecht and Wijk bij Duurstede. The alcohol contents calculated by Alberts range from 8.8% to 1.8% with an average value of 4.9%. The alcoholic fermentation technique of the Carolingian beers must have been less advanced 5

centuries earlier. We reduce the strength of the strongest beers (8.8% => 6%)²⁹.

- The volume of beer consumed is fixed at 1 litre / day / person, regardless of social category, without taking into account the 13 to 50 days of major festivals which resulted in the consumption of stronger beers, sometimes extended to all the abbey's residents (servants, workers, ...).
- The conversion of beer volumes of a given density into needed malt volume uses the modern formulas explained in the appendix 9.1.

Table 2: malt to brew 3 types of beer at Corbie Abbey for a year

Annual quantity of malt consumed by the abbey of Corbie around 820 (estimate)			
A	B	C	D
Social rank	Quality of beer *	Beer/year Ax365	Malt (kg)**
200 brethren (estimate)	Brethren's beer (≈ 6% alc.)	73,000 l/year	24.820
150 feed manufacturers (Adalhard) + 38 guests on average	Medium beer (≈ 4% alc.)	67,160 l/ year	14.775
12 paupers or sick (2.4)	Small beer (≈ 2% alc.)	4,280 l/ year	513
Yearly total			40 tons
* Assumed density of beer (supra) ** Modern ratio calculated with high yield malt (amyolysis). Neither the quality of medieval malts nor the proportion of malt to raw grain are known (9.1). Ditto for the attenuation of the wort during fermentation (% sugar => % ethanol).			

This approximate calculation makes tangible the quantity of grain (barley, wheat, rye, oats) processed each year by the brewhouses for only one Carolingian abbey (Corbie), the work done by the servants and feeders (malting of the grain, crushing of the malt, grinding of the raw grain) and the technical organisation behind these figures (malting area, hydraulic mill, brewing workshop, cellar, etc.). These 40 tonnes of malt are sufficient to satisfy the beer consumption of the monks, the feed manufacturers (provendiers) and the guests, whether permanent or temporary residents of the abbey. To be compared with the 352 tonnes of hulled spelt that Corbie uses for bread each year (7,051hl x 50 kg/hl)!

²⁹ E. Urion estimated the alcohol content of the beers brewed in Paris in the 18th century on the basis of a recipe published around 1766: "In the recipe for double beer, the raw materials appear in the ratio: 1 setier of barley and 7.5 pounds of hops per muid of water of 2.7 hl; the setier of barley weighing 60 to 70 kg, the pouring reaches 22 to 25 kg and the hopping 1,350 g per hectolitre. It is likely that the brewing yield was quite low at that time, so that double beer could have a density of 16 to 18%, which reached 7 to 7.5 degrees Regie and an alcohol content of 5 to 5.5 degrees. Single beers would have a density of 9 to 10 with an alcohol content of about 3° and small beers would have an extract of 5 to 6 and an alcohol content of about 1.5°." (Urion 1966, 147-148). Urion, director of the High School for Brewing and Malting at Nancy (1941-58), gives the beer density in degrees Regie (a French fiscal unit) and the alcohol content in weight. So, a 5 w. % beer = 5/0.8 = 6.25% vol. alc.

Fortunately, there are records of malt production on the scale of several estates, including the malt used to brew beer by laymen working for the abbeys: abbeys of St Denis ([Table 6](#)) and St Bertin ([Table 8](#)). The figures confirm these orders of magnitude for the annual production and consumption of malt by these two abbeys comparable to Corbie in size and wealth.

The ratios *vol. of brewed beer / vol. of used malt* according to the three quality of the beers is used to estimate the monthly or annual volumes of beer consumed by the abbeys, knowing the volumes of malt or grain delivered to the abbeys and recorded in the cartularies or the rent-rolls (*censiers*).

Ratios of malt and raw grain per litre of beer (estimated)		
Quality of beer	Ratio malt (kg) / litre of beer (Table 2 D/C)	Ratio raw grains (kg) / litre of beer *
Brethren's beer (≈ 6% alc.)	0.34 kg (or 0.60 l)	Idem
Medium beer (≈ 4% alc.)	0.22 kg (or 0.40 l)	Idem
Small beer (≈ 2% alc.)	0.12 kg (or 0.22 l)	Idem
* Brewing productivity of raw grain and malt is assumed to be similar		

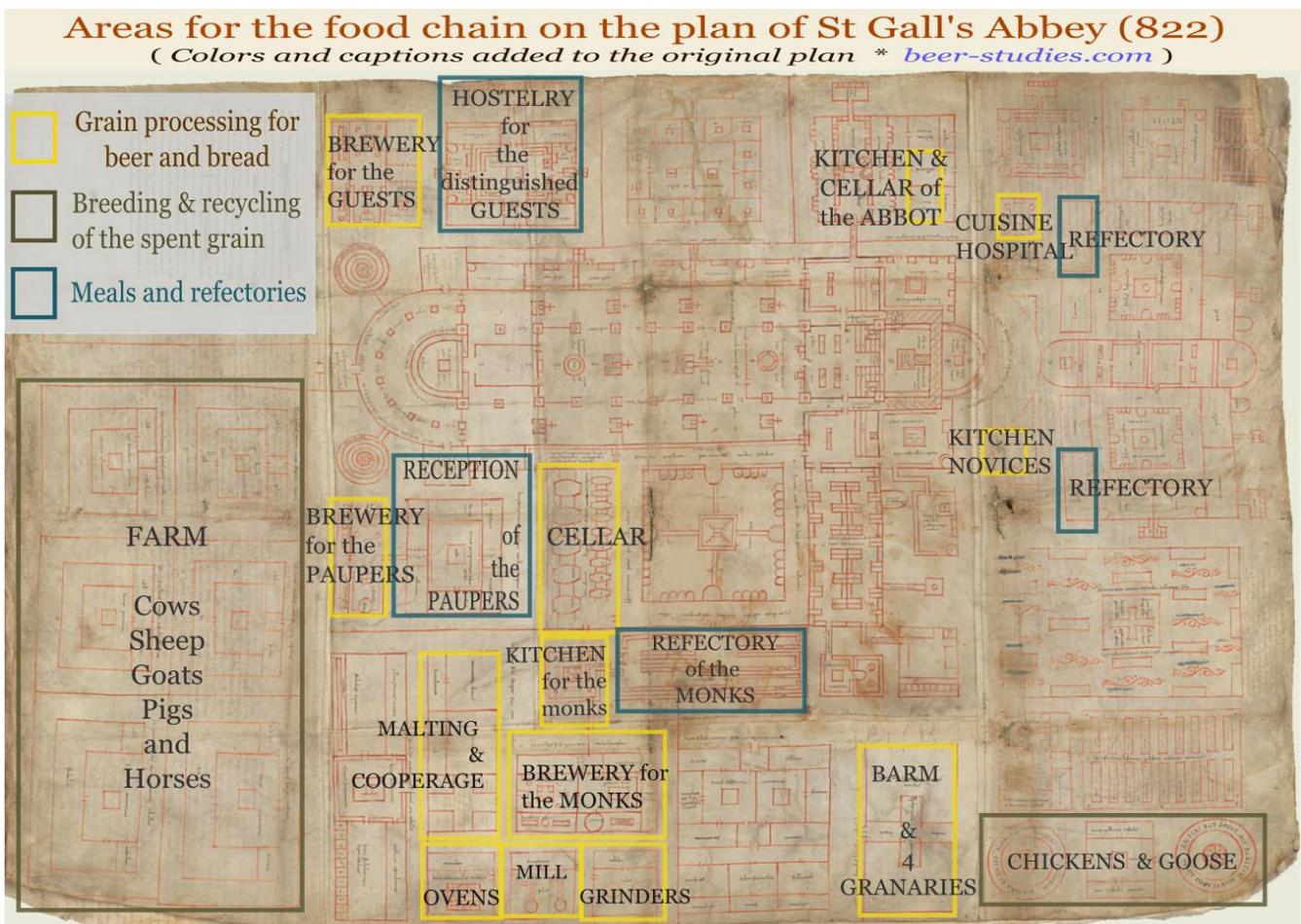
Table 3: ratios quantity of malt (kg) per litre of beer

3 Three brewhouse-bakeries inside St Gall Abbey

[Walter Horn and Ernest Born](#) published a masterly three-volume study of the St. Gall plan in 1979. Starting from the fact that the plan respects its scale down to the smallest detail, the authors calculate the surfaces, the architectural structures and even the capacity of the barrels. Their analysis allows us to reconstruct the technical operations of the abbey's breweries, bakeries and workshops, helped by the Latin comments written on the parchment. We have borrowed a large part of this chapter from their valuable study.

According to the monastic canons, the plan of the abbey clearly separates the areas dedicated to the monks, the prestigious guests and the paupers. Each area has its own facilities: kitchen, bakery, brewery, refectories, dormitories, baths and latrines. Only the granary and the cellar for fermented beverages, the technical workshops (mill, malting area, cooperage, etc.), the farm and the medicinal garden serve the whole community and are enclosed in the area controlled by the monks.

Diagram 2: plan of the technical installations devoted to food



The buildings devoted to the food processing of grains (threshing, storage, milling, malting, breweries, bakeries) occupy almost 30% of the total area (Diagram 2). The plan shows an optimised and very fine technical and spatial organisation of the food chain. The conversion of grain into bread and beer was carried out almost day and night. The Benedictines were very pragmatic. The population of the abbey is estimated at 110 monks, 150-170 serfs and servants and a variable company of 40-50 guests managed by the hostelry and its gatekeeper throughout the year³⁰.

3.1 The brewhouse-bakery for the monks

« *Here the sustenance of the brethren is prepared with practiced honesty* » (*hic uictus fratrum cura tractetur honesta*). Sustenance (*victus*) includes bread and beer. The cellarer-monk supervising the brewhouse-bakery is required to have personal qualities that explain this caption. He must know how beer and bread are prepared and preserved. No addiction to drunkenness, and unflinching probity: the cellarer manages the grain collected by the abbey in its granaries, its real treasure. A dishonest cellarer endangers his community. Deprived of bread and beer, the monks disperse.

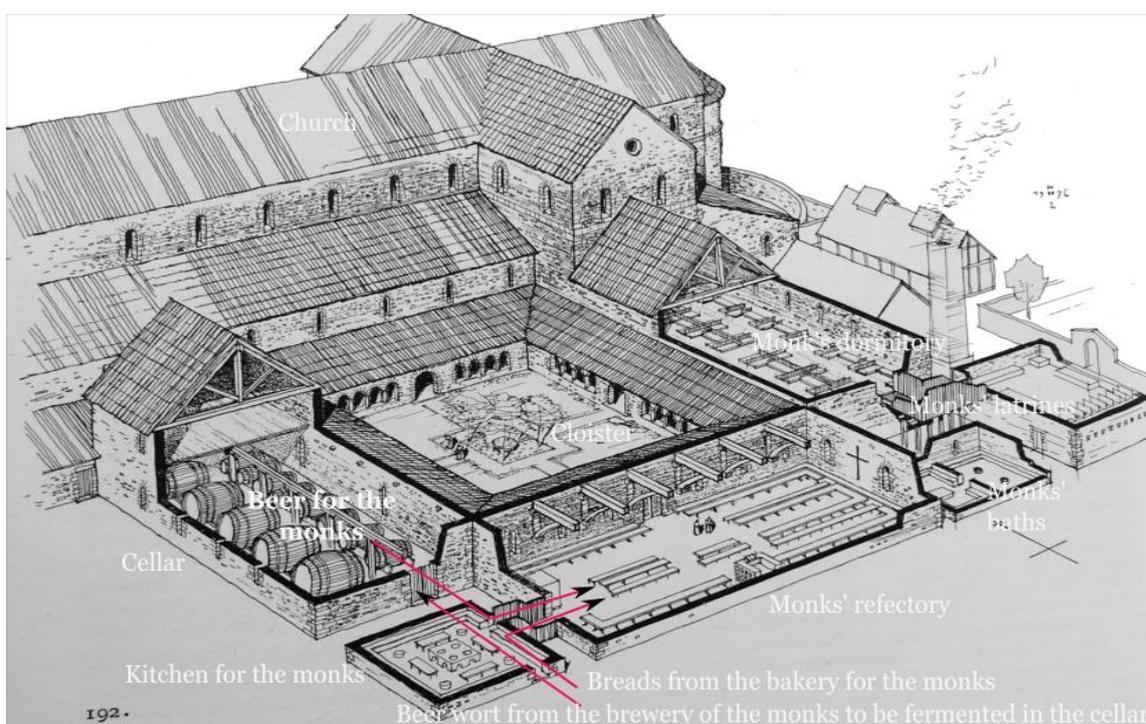


Figure 5: a compact complex for the monks: kitchen, cellar, refectory, cloister, dormitory and baths (rendition by [W. Horn. 1979](#), vol. I, 244)

³⁰ [Horn & Born 1979](#), vol. I 303 et 324. Calculation based on the number of refectory places, monks' beds and workshop beds for servants in the abbey.

The brewery-bakery building (23x13m ≈ 300m²) is divided into two parts: on the left the brewery, on the right the bakery (*pistrinum*) through which one enters. On either side of the entrance, two rooms serve as sleeping quarters for the servants (*uernarum repausationes*) employed by the monks to make their bread and beer (**Diagram 3**).

The brethren's bakery (*pistrinū fr̄m*) has its own storage of flour (*repositio farinae*, 9x2,25m ≈ 20m²) supplied by the abbey's milling workshop (**3.2.2**). It is equipped with a kneading trough, a trough (*alueolus*) for raising the dough, an oven (*caminus*) and shelves with a total length of 19m running along three walls. Here the dough is split into loaves and left to swell before being baked in the oven, with at least two daily batches in the morning and evening. The size of the oven (Ø 3m) is adapted to the baking of 250 to 270 loaves of 400g in a single batch, which matches the number of monks and their servants ([Horn & Born 1979](#), II 259 & n. 26). This may have been done by baking 1.8 kg loaves cut into four pieces.

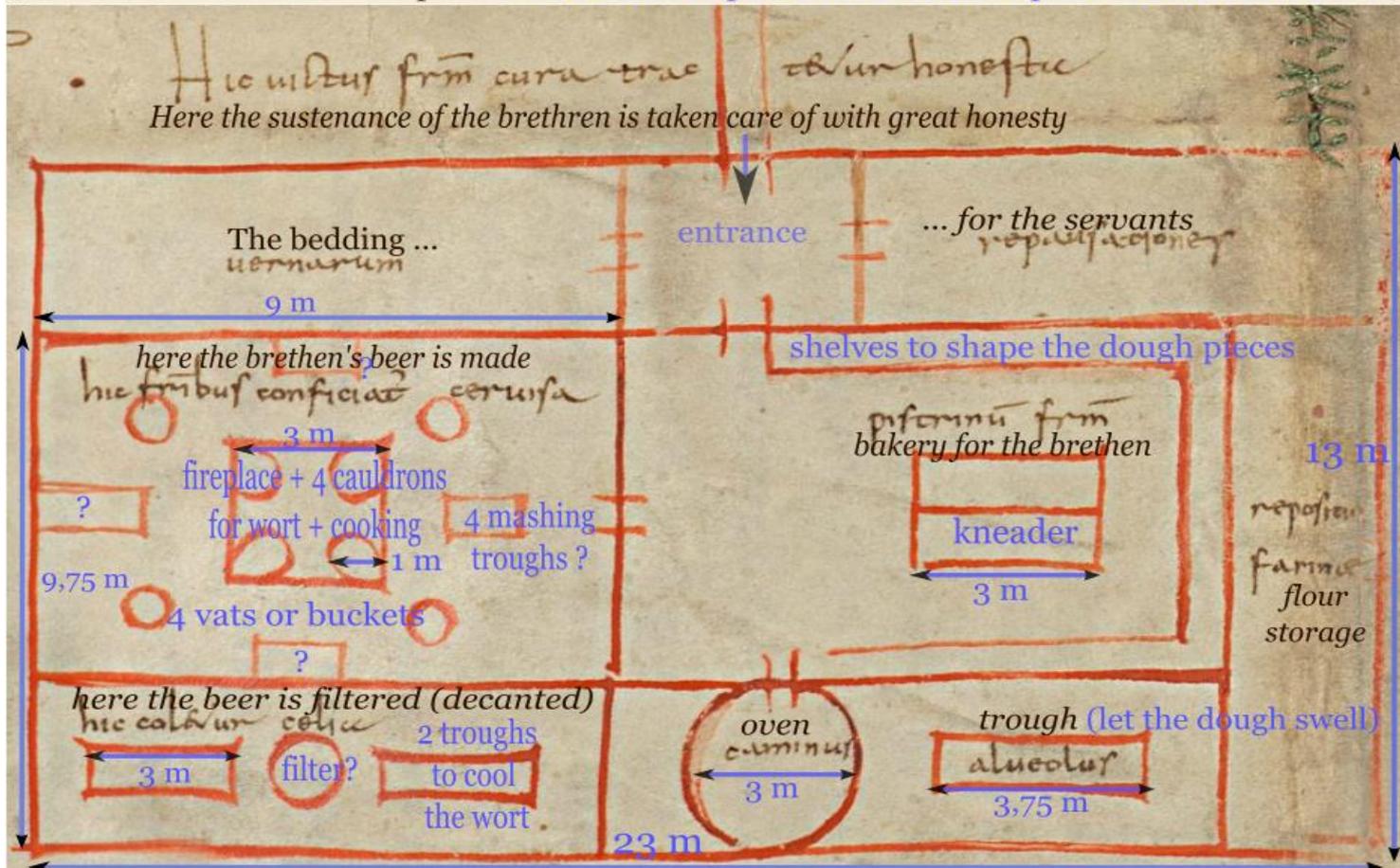


Figure 6: kneading the dough and baking the bread in the oven, Luttrell Psalter, 1320

Diagram 3: the brewhouse-bakery for the monks after the plan of St Gall

The monks' brewery and bakery according to the plan of St Gall's Abbey (822)

(translation of the Latin captions * [technical captions added to the plan - beer-studies.com](#))



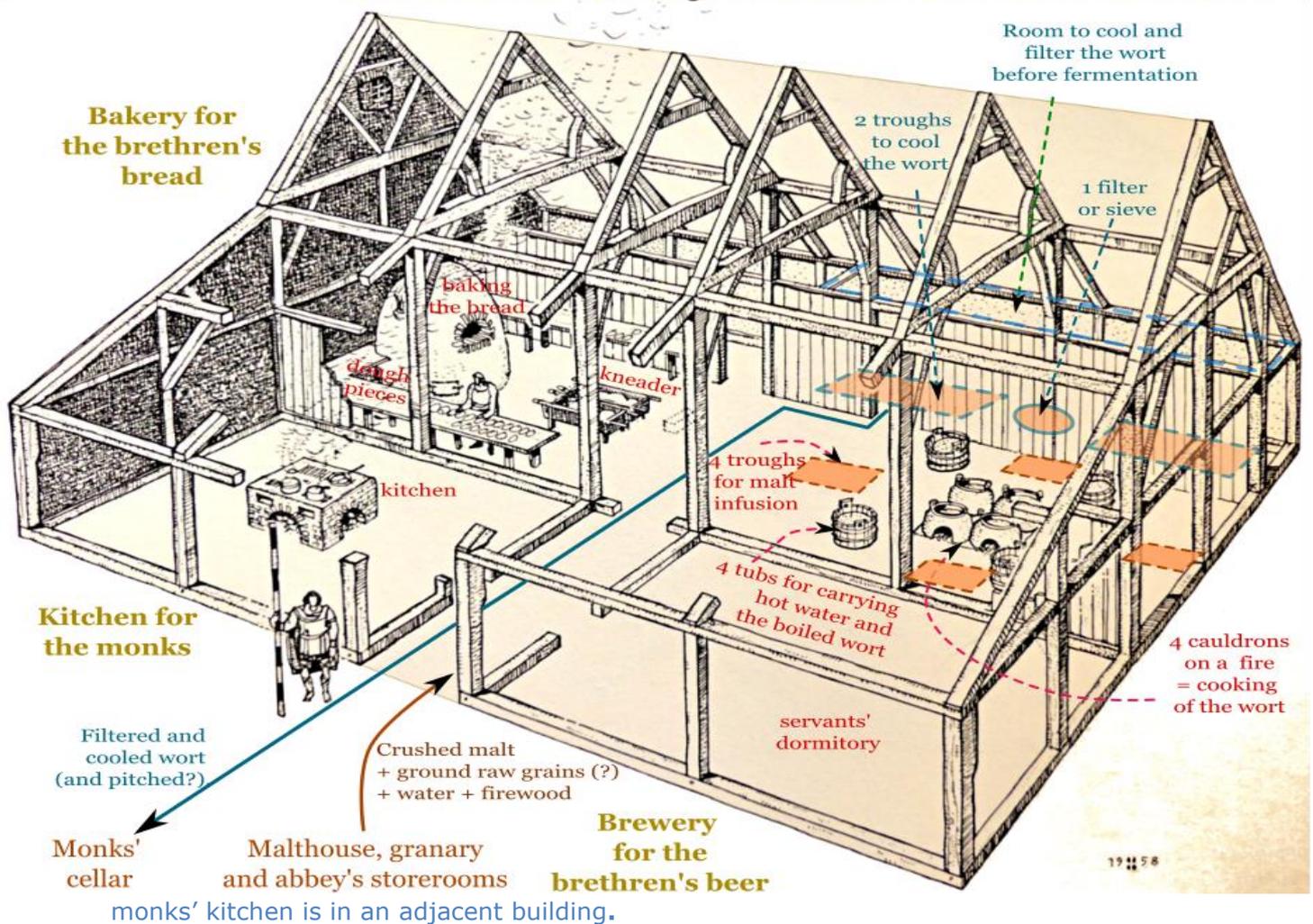
The brewery (*here the brethren's beer is made, hic fribus conficiat' ceruisa*), measures 9,75x9m≈88m². We chose the monks' brewery as a support to reconstruct a brewing scheme within an abbey ([Diagram 3](#), [Diagram 4](#), [Diagram 7](#), [Diagram 10](#)). Except for a few details, its plan replicates the pattern drawn for the brewhouse of the guests and that of the paupers.



Figure 7: cooking in cauldrons. Golf Book (1540). British Library.

Diagram 4: brewery for the monks' beer, technical diagram according to [Born 1979, vol. II 152](#). On Haito's plan, the bakery oven is actually at the back of the room, a grain store runs along the bakery wall, the

Brewery for the monks based on the reconstruction by W. Horn 1979, vol II, 152.
 Technical captions added to the plan - beer-studies.com (2020)



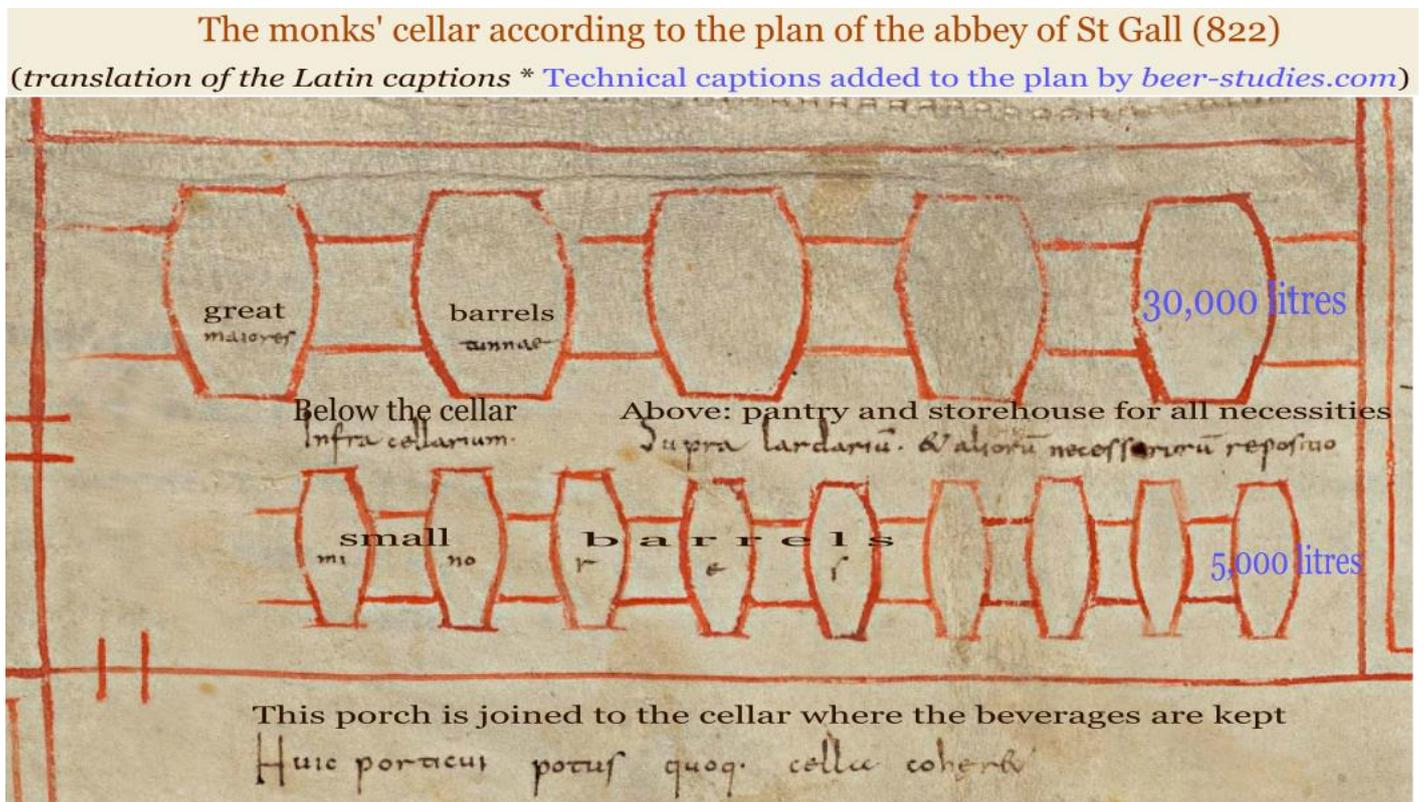
The brewery uses a 3x3m square hearth and 4 cauldrons at its corners. Four Ø 1m circles in [Diagram 3](#) identify tubs or buckets. The meaning of the 4 rectangles is conjectured: 4 troughs for infusing malt and hot water carried with the tubs, or same troughs for mashing and adjusting the density of the wort (?). The multiplication by 4 of all these brewing tools evokes an operating chain ([Diagram 10](#)). The wort is collected, filtered in the adjoining room, *here the beer is filtered* (*hic coletur celia*), equipped with a cooling tank or trough (?) flanked by 2 filtration

tanks (?). The guesthouse brewery gives an additional technical caption for this adjoining room (3.3): *here the beer is cooled* (hic refrigeratur ceruisa). The wort is therefore both filtered and cooled before fermentation, which takes place elsewhere, in the cellar. A leavening could possibly be added to the cooled and filtered wort in this room.

3.1.1 Managing the abbey's beer and wine in the cellar

Like the bakery, does the brewery have the capacity to satisfy the monks' daily thirst? A visit to the cellar and its barrels is required. They are captioned and quite finely drawn to estimate their capacity (Diagram 5).

Diagram 5: St Gall plan – The cellar managed by the abbey's cellarer.



The building houses a *cellar below* (Infra cellarum), or semi-buried ground floor (?), and *above it a larder and storerooms of other necessities* (Supra Lardariū. & aliorū necessariorū repositio). *The portico of the cloister sticks to the cellar where the beverages are* (Huic porticui potus quoque cella coheret). This cellar lines up two rows of barrels on rails or beams, 5 elongated *large barrels* (maiores tunnae, Ø 3m/L. 4.3m ≈ 30,000 litres each) and 9 *small barrels* (minores tunnae, Ø 1.3m/L. 3.5m ≈ 5,000 litres each). So, 1 large barrel = 6 small barrels³¹.

³¹ The northern regions (Moselle, Rhine) use the *lagena*, a small barrel, and the *vasa* (large barrel) of varying capacities.

With a wine ration of 1 hemina = 1 litre/day (Adalhard 2.4), the 110 monks and 40 guests drink \approx 55,000 litres of wine/year, a little more than a large barrel³². If the abbey matures its wine for two consecutive years in 2 large casks, the contents of one of them filled with the oldest wine must be transferred to 6 small casks to avoid acidification as the large cask empties. This leaves 3 large and 3 small casks available for the fermentation and storage of three different beers.

The 110 monks + 40 guests + 150 servants drink \approx 300 litres of beer/day, 1/16th of a small barrel, hence a cycle of 16 days of fermentation-maturing-consumption to renew the totality of the beer contained in a small barrel (5000/300 litres). Strictly speaking, this overall daily consumption should be differentiated according to the 3 qualities of beer, the corresponding number of drinkers and the 3 separate small casks containing one type of beer³³. The 3 types of beer wort brewed by the 3 brewhouses must all converge in the cellar barrels to ferment and be kept there.

The three brewing facilities shown on the plan are theoretically only used for brewing wort. Each type of beer is managed by three different officers: the cellarer (*cellarius*) for the monks' beer, the gatekeeper (*ostarius*) for the guests' beer, and the hospitaller (*hostellarius*) or gatekeeper for that of the paupers, the sick and pilgrims. In all cases, there are 3 stocks of beer of different density and composition brewed by 3 separate breweries with 3 stocks and 3 grain accounts, all centralised in the cellar which stores all the fermented beverages of the abbey. Technically, the brewing of 3 different qualities of beer implies a distinct management from start to finish, from the brewing workshops to the consumption.

At least 3 different barrels are needed in the cellar to manage these 3 qualities of beer separately and to control their respective consumption by 3 categories of people: monks, prestigious hosts and guests, the needy and the sick. 3 big barrels, 3 small ones, or a combination of the two, it is difficult to decide (Diagram 6)³⁴.

One essential piece of data is missing to support these speculations: the volume of the brews made by the monks' brewery. The capacity of the 4 cauldrons with a diameter of approximately 1m, namely \approx 200 litres when half-filled x 4 = 800 litres of wort before cooking, 600 litres afterwards, which the texts indicate by referring to the brewery as "*a workshop where beer is cooked*" (*officina ubi*

³² Wine was restricted to the monks and the nobility who were invited to the abbey. Serfs, servants, prebendaries, the paupers, pilgrims and the sick drank beer. [Horn & Born](#) (1979, I 286 & 299) base their calculations on wine management for 300 people but a 0,27 litre *hemina* instead of 1 litre. [Hocquet \(1985\)](#) re-established the true value and conversion ratios of the capacity units at the time of Abbot Adalhard, around 822, thus after the reform of the muid of Charlemagne (1 muid \approx 52 litres) and that of Louis the Pious (creation of a 'large muid' of 68 litres) (Table 1).

³³ 110 monks drink "good beer", 40-50 guests drink medium beer, 150 servants drink inferior beer. We assume that wine and beer add up to 1 + 1 litre/day for monks and guests. Servants only drink beer.

³⁴ Transferring each type of beer from 3 large barrels to 3 small ones in the course of its consumption can contaminate it. This care of modern times is of little relevance in the Middle Ages.

cerevisia coquitur). St. Columban, two centuries earlier, says that "As the hour of the meal approached, the steward had to prepare to manage the beer, which is cooked from the juice [succo] of wheat and barley (and just as by all the other nations of the world, with the exception of the Scottish and barbarian peoples who inhabit the ocean, that is Gaul, Britannia, Ireland, Germania and the others who do not deviate from their customs), the attendant brings to the cellar the vessel called a tybrum, and in front of the cask in which the beer is violently agitated, he lets it flow into the tybrum, having put a guide (?) [serraculo] which allows it to flow."³⁵. Beer is managed in a special way between the cellar and the refectory.

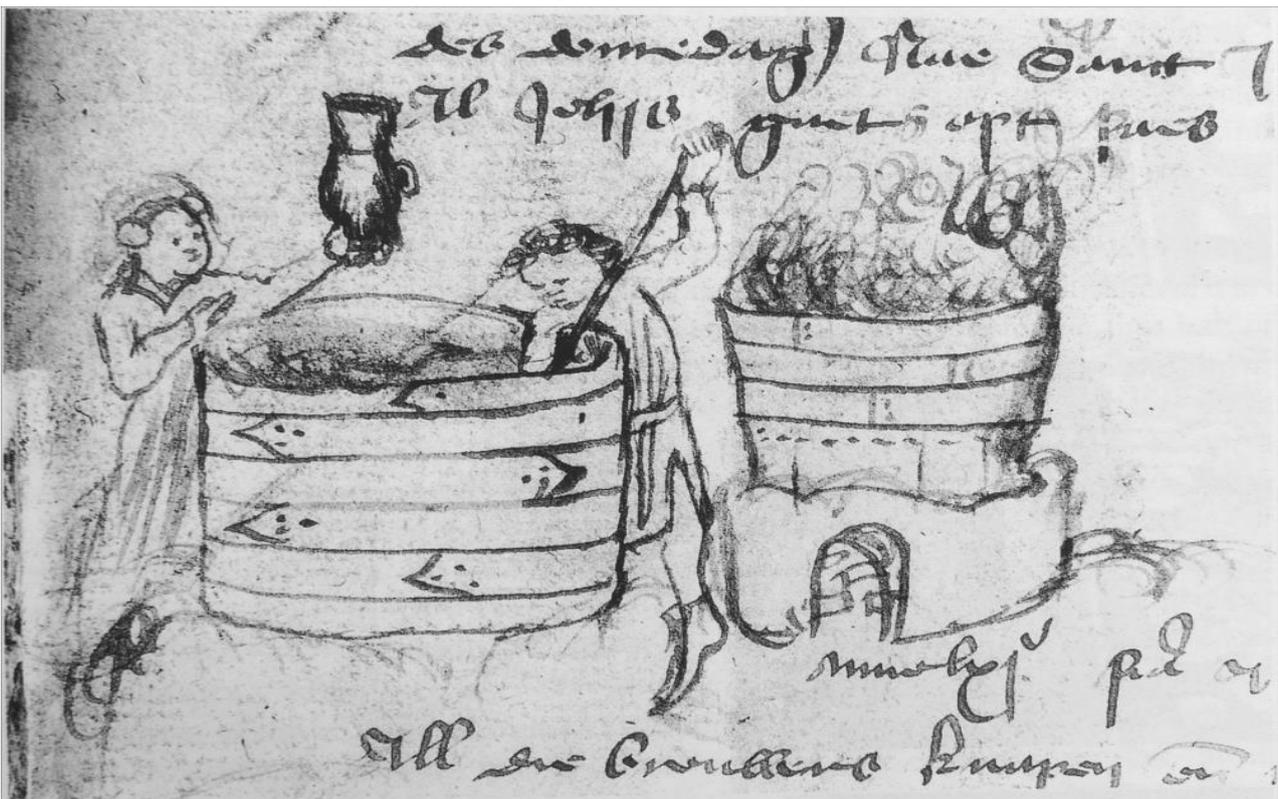


Figure 8: Brewing mash in a wooden vat (left) and boiling the wort in a metal cauldron (right). Document from 1462, very late compared to the St Gall plan (Municipal Archives, Kampen, The Netherlands)

Thus, a mash (*succo*) obtained by infusion (in this case of wheat and barley) in a vat, then cooked (*excoquitur*) in a cauldron or other fireproof vessel as shown on the St Gall plan. The Figure 36 (mid-13th century) is closer to the technical reality of the St Gall plan (troughs and pottery) than the artisanal metal or wooden

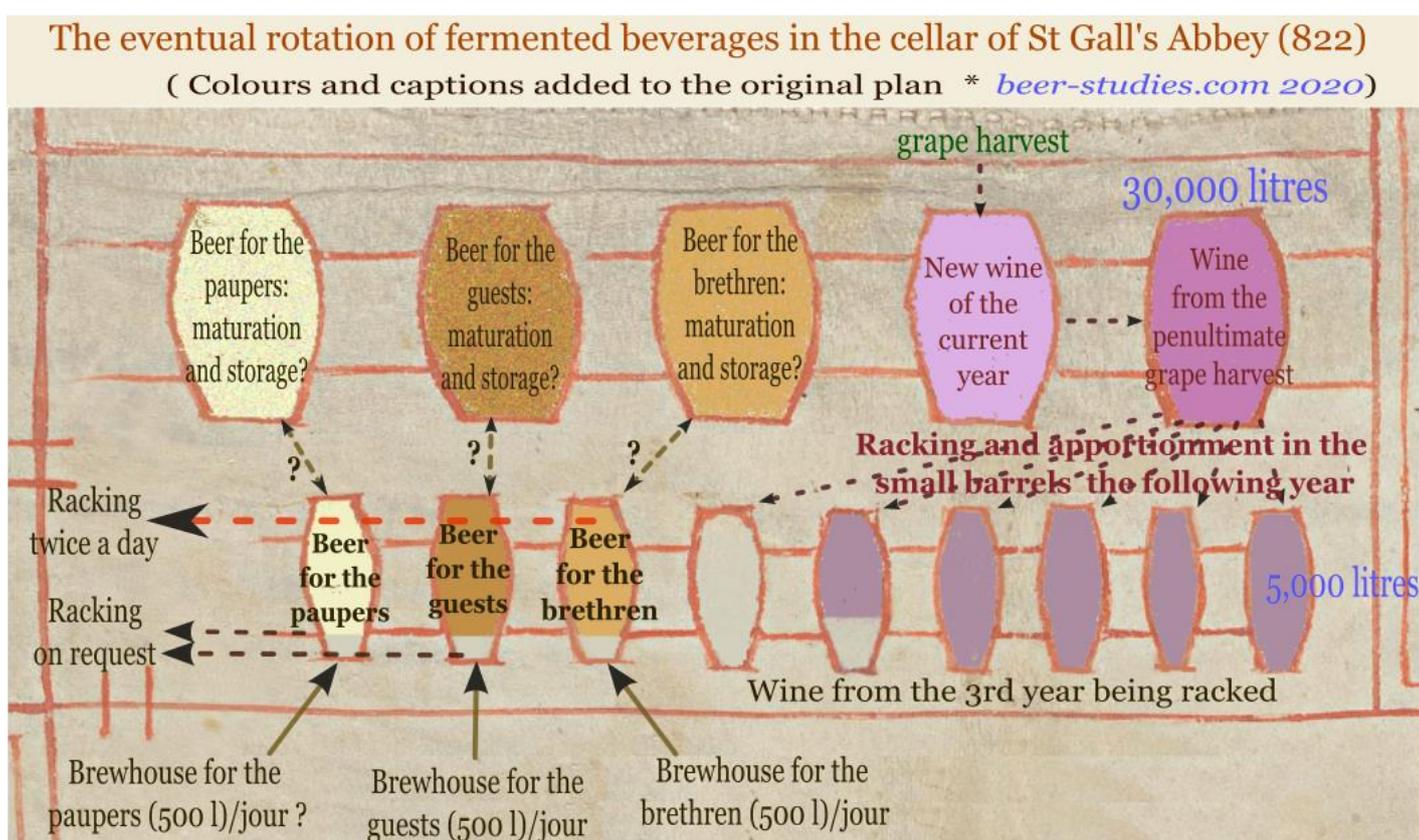
³⁵ Cum hora refectiois appropinquaret, et minister refectorii cervisiam administrare conaretur (quae ex frumenti vel hordei succo excoquitur, quamque prae caeteris in orbe terrarum gentibus, praeter Scoticas et barbaras gentes, quae Oceanum incolunt usitantur, id est Gallia, Britannia, Hibernia, Germania caeteraeque quae ab eorum moribus non desciscunt), vas quod tybrum nuncupant, minister ad cellarium deportat, et ante vas quo cervisia condita erat apponit: tractoque serraculo meatum in tybrum currere sinit. ([Jonas Bobiensis, Vita Columbani, 87, 1026C](#)).

vats depicted in [Figure 8](#) (15th century). The *tybrum* (filter container?) and the *serraculo* (pipe or spout) are devices for drawing beer from a barrel.

In all cases, the cooled and decanted wort is carried in tubs from the brewery to the cellar to be poured into a barrel where fermentation begins. With the losses (filtration, transport, overflow fermentation, etc.), it can be estimated that 500 litres of wort/brew reach a cellar barrel for each type of beer³⁶. The brewing schedules and frequency for each of the three breweries remain unknown.

The most striking technical feature of the St. Gallen plan is its high capacity for storing and maturing beverages (cellar capacity = 195,000 litres) and its low production capacity for the three types of beer ([Diagram 6](#)). The three breweries can each brew 500-600 litres of wort/brew, or 1,500 litres/day. If the average fermentation time is estimated to be 10 days, a complete 10-day brewing=>drafting cycle of a single beer category requires only a small 5,000 litres barrel. The filtered-cooled wort is added each day to the cask (small or large) matching its beer category, itself drawn off as it is consumed each day.

Diagram 6: turnover of barrels of fermented beverages in the monks' cellar



³⁶ Assuming only one brew per day. The losses are all relative. The abbey brews a small amount of beer for the servants by washing out the draff from one brew of good beer, and feeds its barnyard with the spent draff from that second brew. Saving resources, avoiding waste, recycling everything that can be recycled are encouraged by the Benedictine monastic canons and above all by the extreme hierarchy of society: good beer for a monk is not the same as small beer for a serf.

Each barrel houses a continuous fermentation which protects its precious contents thanks to the CO₂ layer generated by the alcoholic fermentation. The three breweries are equipped to cool and filter the wort, not to inoculate it with leaven, unless the adjacent bakery contributes. This operation takes place in the cellar by adding fresh wort to a fermenting beer barrel, probably the smallest of 5,000 litres, in reality more like 4,000 litres to leave a free space for the foams of the bubbling primary fermentation.

Theoretically, three small 5,000-litre barrels are sufficient to handle the three types of beer all year round. What are the three large barrels for? For beer or wine stocks for the big annual festivals? For the abbey's lavish guesthouse and its luxury fermented beverages like mead, honeyed beer or flavoured wines ([chap. 6](#))?

The hostelry for distinguished guests and the building for the paupers and pilgrims each have a room marked as a cellar. They are modest compared to the monks' cellar and have no barrels. It is unlikely that the fresh wort from the two breweries of the hostelry and the poorhouse was fermented in these cellars. In Carolingian times, the *cellarium* was also a place to store various liquids such as oil or brine alongside the fermented beverages. This can explain the apparent extra number of barrels in the cellar beside the normal needs to ferment and store beer and wine.

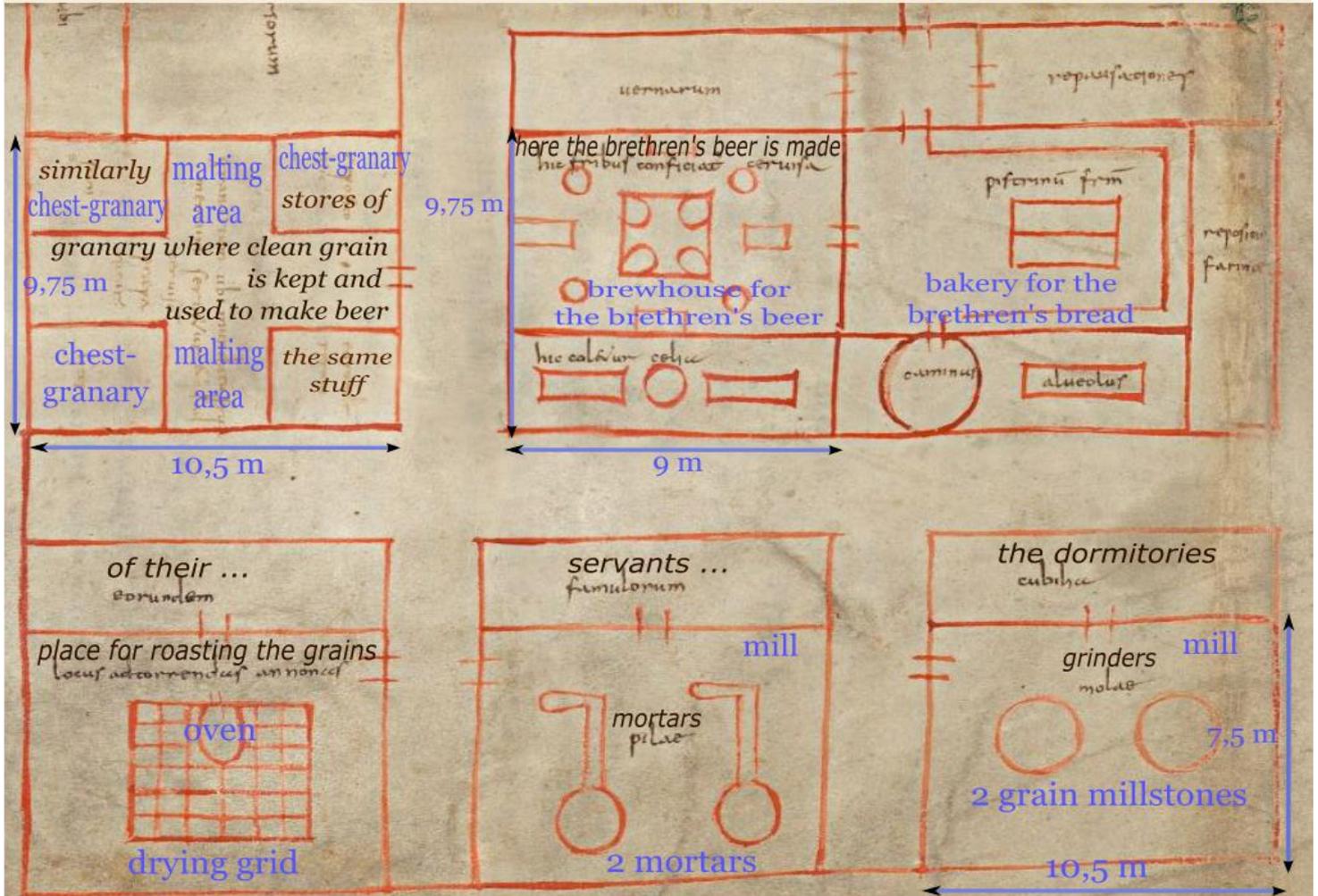
3.2 The auxiliary buildings for breweries and bakeries

The brewing of beer cannot be understood without the other buildings and their facilities. The many serfs of the abbey processed the grain for brewing, which was one of the most arduous tasks: threshing, cleaning, storage, milling and malting were in the hands of the serfs who were "owned" by the monks. Female servants or free women were undoubtedly excluded from the male abbeys. The men did all the work. This was not the case in female abbeys: the hardest and most dangerous tasks were reserved for men, as in N-D de Soissons.

The plan of St Gallen is very rational: each workshop is linked to its neighbours and makes it possible to reconstruct a chain of operations that is very valuable for reconstructing the techniques of the Carolingian monastic brewery, a series of technical operations that we will attempt to reconstruct. It is important to avoid extrapolating all its features to the brewery of the laity, which did not have the same material resources, except for the imperial and count's courts.

Diagram 7: St Gallen - Ancillary buildings for processing the cereals

The ancillary buildings of the brewery-bakery according to the plan of St Gall's Abbey (822)
 (Translation of the Latin captions * Technical captions added to the plan - beer-studies.com)



3.2.1 The malthouse and its malting floor

Next to the brewery for the monks' beer is a building for making and storing the malt and the cleaned grain for beer production: "a granary where clean grain is kept and used to make beer" (*granarium ubi mandatu(m) frumentum seruetur et quod ad ceruisā praeparatur*). The building covers $10.5 \times 9.75\text{m} \approx 102\text{m}^2$, including 57m^2 for the malting and grain-cleaning floors, free areas on the floor marked by a cruciform design (Diagram 7). This area for sprouting the grains is large enough to prepare the malt for the three brewhouses, as shown by the following calculation.



Figure 9: threshing the ears. Luttrell Psalter, 1320

Clean seeds are germinated in 10-15cm layers (modern standard before moistening the seeds to cause them to swell). Germination requires clean surfaces. Moulds, insects, animal droppings, broken or rotten grains quickly contaminate the warm and moist grains (germination is exothermic). A 25m² layer (5x5x0.1m) contains approx. 2500 litres of grain, equivalent to 1500 kg of germinated grain (average weight by volume of grain and malt = 0.6 kg/litres).

The cycle of steeping + germination + drying takes about 7 days for malting 1500kg. Depending on the workforce of St. Gallen Abbey and the quality of the beers, all three breweries consume the equivalent of 105kg of malt per day, or 735 kg of malt per week for beer brewing, about half of the 1500kg that the malting area can produce per week (Table 4). This figure does not take into account the annual festivals or the beer consumption of the aristocratic families who invited themselves to the abbot's table. Either the malting follows a bi-weekly schedule, or the batches of malt are half the size, or some of the malt is bartered by the abbey, at least according to the plan drawn up by Bishop Haito.

Quantity of malt consumed / day in St Gallen (estimate)				
Quality of beer	Staff	Litre of beer/day*	Ratio malt/beer Table 3	Kg of malt/day
Brethren's beer (≈ 6% alc.)	110	2	0.34 kg/l	75
Medium beer (≈ 4% alc.)	40	2	0.22 kg/l	18
Small beer (≈ 2% alc.)	100	1	0.12 kg/l	12
Total	250			105 kg
* 2 litres / day for monks and distinguished guests, a realistic volume				

Table 4: quantity of malt consumed / day for beer brewing at St Gall

In any cases, the maltsters servants can process enough grain to supply the three breweries in the abbey on a weekly basis. The abbey can store its malt surplus in storage chests (Diagram 7) to meet the extraordinary demands of the hostelry when an imperial retinue, a bishop or a count are fed and quenched at the abbey's expense.

The circuit followed from raw grains to malt is as follows:

1. The raw grain is taken from the abbey barn to the malt house
2. Malting of grains in weekly cycles
3. Drying in the annex building (oven and drying grid)
4. Storage in the malthouse stocking chests
5. Malt supply to the three breweries inside the abbey

Various types of cereals can be malted (4.1.2). However, we have no information about the quality of the malts, their colours, or the drying methods.

The main barn of the abbey, located opposite the monks' brewery, covers 27x14m \approx 385 m². *Here the threshing work of the entire harvest is carried out (Frugibus hic instat cunctis labor excutiendis). Excutare* means to shake, tear off, detach, clean, throw away, all the work of threshing the ears and winnowing the straw and outer husks of the grain. *Frugibus* denotes all kinds of grain. The only door of the granary is double-leafed to allow the entrance of the carts (*caruadas*) of ears of grain that tenants and serfs bring to the abbey. The granary is split into dual areas: the barn, namely the granary for the year's harvest (*horreum* i.e. *repositio fructuū annaliū*) and the area where grain and straw are rubbed (*area in qua tritulant' grana et palea*), therefore the actual threshing and winnowing area. The barn supplies the entire abbey: its breweries, bakeries and kitchens.

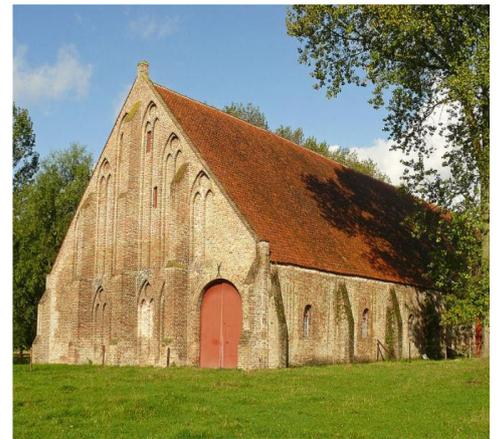


Figure 10: impressive tithe barn of the former abbey of Ter Doest (Bruges, West Flanders, Belgium) ([wikipedia/commons](https://www.wikipedia/commons))

This imposing building is designed to store the rich harvests that meet the needs of the abbey for bread and beer. It also serves as a gauge to evaluate the economic weight and wealth of an abbey in the 9th century. At that time, the only barns of equivalent size were in the vicinity of the imperial or count's courts.

3.2.2 The grain ovens, mills and mortars

This is a sequence of 3 workshops (*Diagram 7*), each covering 10.5x7.5m \approx 80m²: a kiln-grill for drying or roasting grain and malt, 2 mortars, and a mill with 2 grindstones. The kiln is "*the place to toast the grains*" (*locus ad torrendas annonas*). The grains are baked to dry out their husks before being ground. The adhering husks of spelt in particular require this treatment. The plan shows a grid with an oven in the centre. Here the germinated grains are dried and processed into malt. The malt stores are located next to this kiln (*Diagram 7*).



Figure 11: mortar. Luttrell Psalter, 1320

[Horn & Born](#) (1979, II 247) hypothesise that hydraulic energy was used to power the mortars (*pilae*) and millstones (*molae*) with two arguments: 1) the abbeys of the 9th century built hydraulic mills 2) the enormous volume of cereals consumed by the monks justifies this technical investment. Other sources of energy were possible: the horse or the muscular strength of the serfs who slept in the rooms provided for the servants "*dormitories of their servants*" (*eorundem famulorum cubilia*). The coarsely ground raw grain is used alongside the malt in the composition of the beer. After germination and drying, the malt must be crushed. A simple pestle is enough to break up the grains that have become crumbly due to germination.

3.2.3 The coopers and wheelwrights

The coopers' workshop (*tunnariorum domus*) measures 10.5x8.25m \approx 87m², as does that of the wheelwrights (*tornarii*). They adjoined their dormitories (*famulorum cubi*) in this building (*Diagram 7*). The coopers and wheelwrights are dependent on the abbey where they work and live. The *famula* or *familia* refers to all the workers who support the monks and carry out the daily tasks and craft work. The plan of St Gall gives a long list of trades needed by the monks: shoemaker (*sutor*), saddler (*sellarius*), slicer (*emundator*), polisher (*politor*), armourer (*scutarius*), turner (*tornator*), tanner (*coriarius*), blacksmith (*faber ferramentorum*), goldsmith (*aurifex*), fuller (*fullo*), cooper (*tunnario*), wheelwright (*ternarius*), pig keeper (*porcarius*), bullock herder (*bulbulcus*), cowherd (*armentarius*), shepherd or goatherd (*pastor*), stable boy (*custodo equaritae*), ...

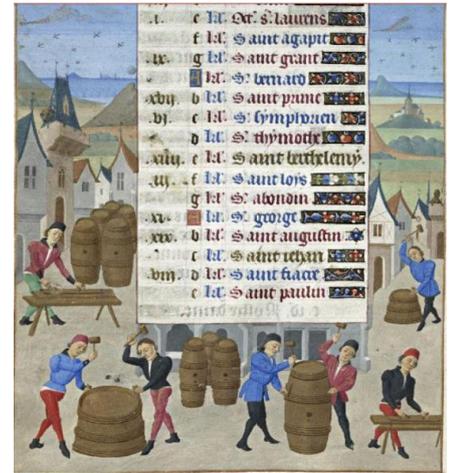


Figure 12: Coopers. Heures d'Adélaïde de Savoie, August. Musée Condé de Chantilly Ms 076. Year 1450

3.3 The brewhouse-bakery for prestigious guests.

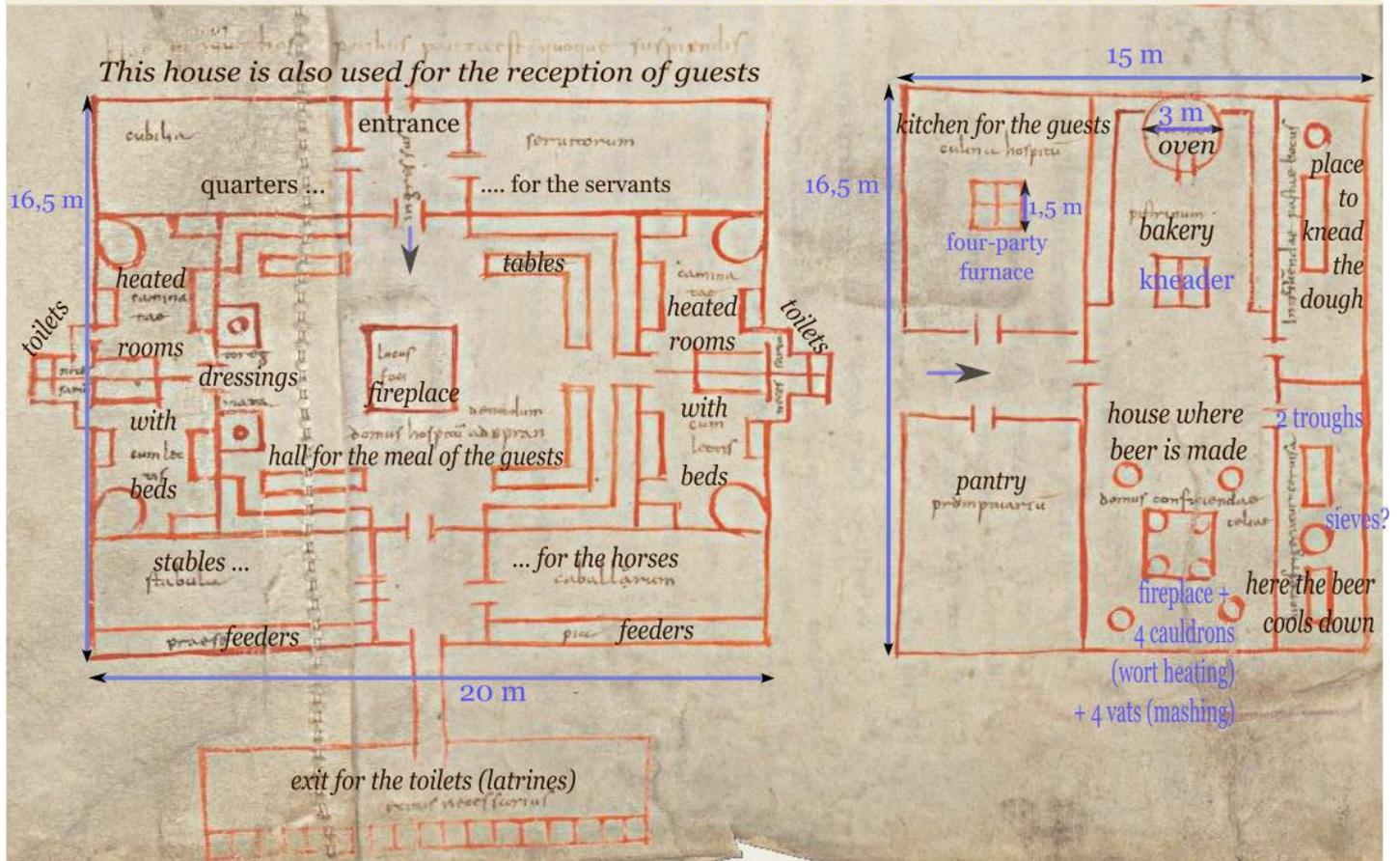
It is a building of 16.5 x 15m \approx 247m² built next to the guesthouse intended for prestigious guests. The brewery, *the house where beer is made* (*domus conficiendae celiae*) is barely smaller than the brewery devolved to the monks. The plan offers a detail: the adjoining room is used *to cool the beer* (*hic refrigeratur ceruisa*). It therefore has a double function: filtering (cf. 3.1) and cool the wort before fermenting in the cellar barrels (*Diagram 8*). Like that of the monks, this brewery coexists with the bakery (*pistrinum*). Its oven (*fornax*), Ø 2,25m, is only slightly smaller than the one used for the monks' bread, and must be able to bake almost as many loaves of bread.



Figure 13: kneading and baking the bread. Psalter mid 12è. Paul Getty Museum, Ms. 14, fol. 8v. Belgium

Diagram 8: St Gall brewhouse, bakery and hostelry for the Frankish aristocracy

The brewery-bakery and hostelry for distinguished guests on the plan of St. Gall's Abbey (822)
(Translation of the Latin captions * Technical captions added to the plan - Beer-studies.com)



Little is known about the operation of this brewery-bakery coupled with the hostelry and the buildings dedicated to the reception of guests. It is a permanent work place, apart from the visits of the nobility. The caption for the hostelry, *this house is also used to receive guests* (*Hae domus quoque hospitibus parta est quoque suscipiendis*) indicates that the abbey's hospitality extends beyond the circle of the imperial or local nobility, while separating this space for the laity from that dedicated to the brethren. The abbot has his own house in the abbey, with baths, kitchen and cellar. Foreign monks are received in a special building adjoining the abbey church: *reception of the visiting brothers, their dormitory and toilet* (*susceptio fr[m] [fratem] supuenientium, dormitoriū eorum, necessarium*). It is assumed that they enjoy the same quality of beer and bread as the other monks.

The St. Gallen plan allocates one fifth of the area of the buildings used for the reception of prestigious guests to their beer and food (brewery, bakery, kitchen) ([Horn & Born 1979](#) II 155). This shows the emphasis placed on fermented beverages by the Carolingian aristocracy.

3.4 The brewhouse-bakery for the paupers and pilgrims

This brewery (*braciatoriū*, 18x6.75m≈121m²) is coupled with the reception of the paupers. An abbey receives them according to a moderate charity, not more than twelve poor a day so as not to waste the abbey's grains. Adalhard regulates it strictly: one loaf of bread + 1 litre of beer in the evening, idem the next morning (2.4). Distributing 24-30 litres of beer per day is not much for a brewhouse that is only slightly smaller than that of the monks and can brew the same volume of beer (Diagram 9).

It is assumed that this brewhouse also makes beer for the many servants of the abbey, the serfs and provenders working outdoors, and the pilgrims. The plan does not provide any additional technical information. The equipment of the brewery is identical to that of the two breweries already reviewed. The caption *for cooling the beer* (*ad refrigerendā ceruisā*) bears the same information given by the brewery for the guests.

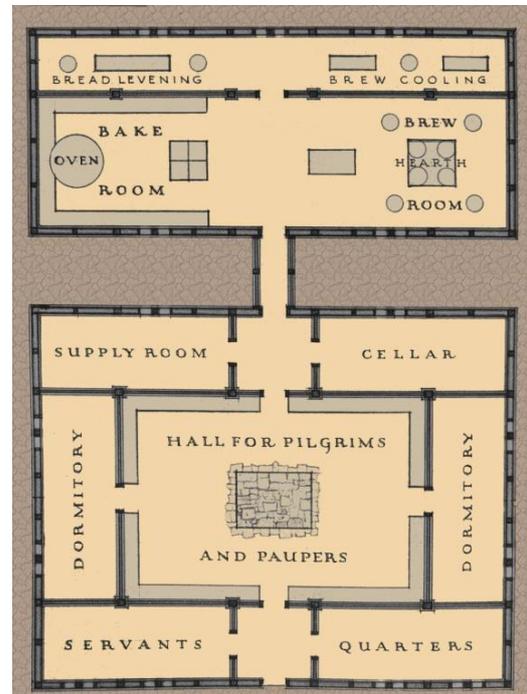
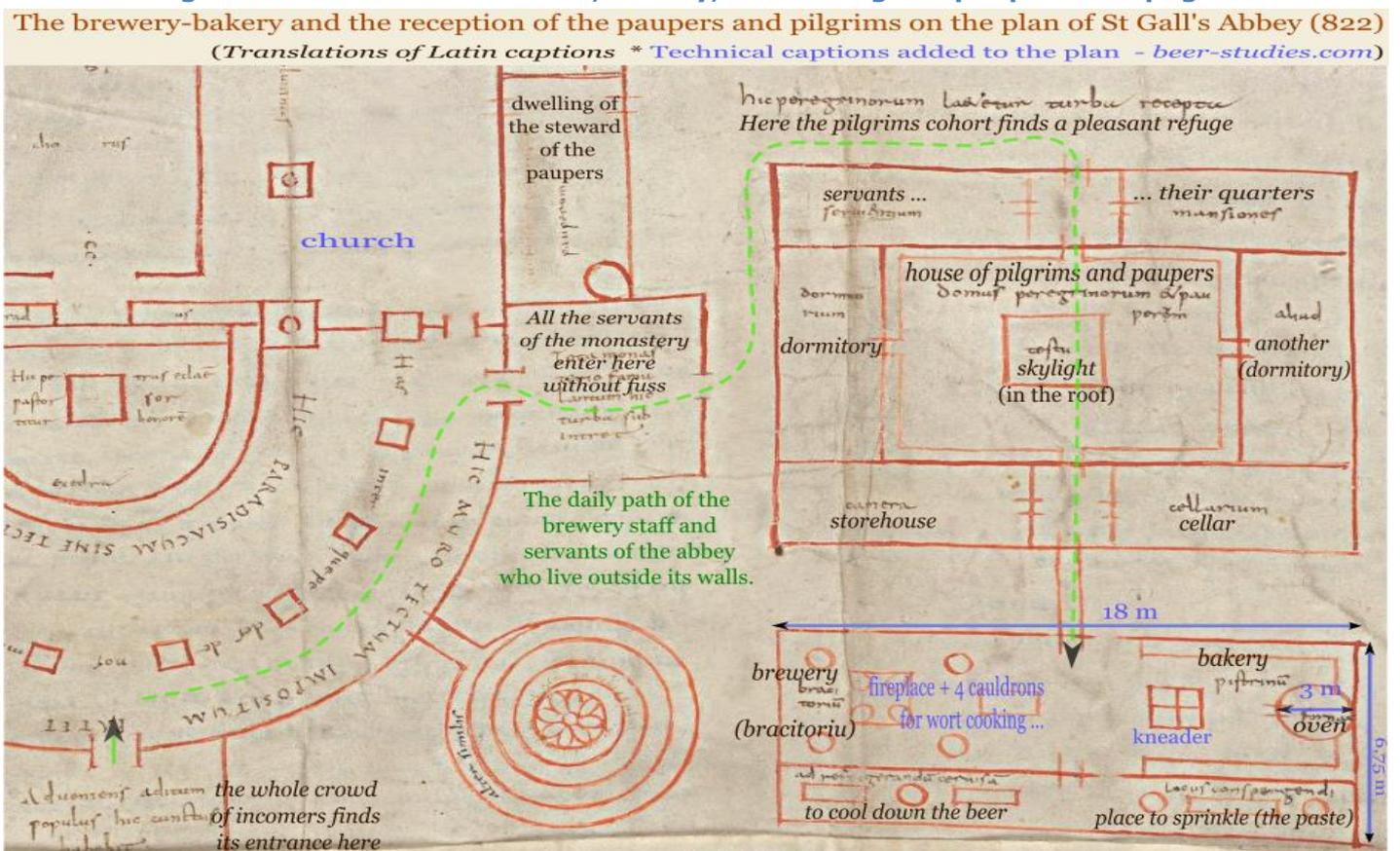


Figure 14: hostelry for indigent and pilgrims after Horn & Born 1979

Diagram 9: St Gall - Brewhouse, bakery, welcoming the paupers and pilgrims



The oven (*fornax*) of the bakery (*pistrinum*), Ø 2.25m, is also sized to bake more than a hundred loaves per batch. A new indication concerns the leaven. The expression *locus conspergerendi*, place of dusting or sprinkling, could refer to the use of leaven added to the bread dough already kneaded in the kneading trough, and in this case indicates a certain mastery of the ferments used for brewing beer. This remains conjectural (4.1.7).

3.5 The overall organisation of beer brewing inside the abbey

Diagram 10 summarises all the product flows and technical operations linked to the beer brewing process within the walls of St Gall's Abbey. It shows a rather complex daily management under the responsibility of the cellarer. From the threshing of the grains (green flows), the brewing itself (blue flows) to the filling and fermentation of the beer in the cellar (brown flows), no less than twenty workers are involved in the work. The zoom at the top right details the operations (4a => 4f) for one of the brewing workshops, the one dedicated to the monks' beer.

This reconstitution includes the management of the brewing dregs, a chapter often neglected by the history of brewing, although of great economic importance. The recycling of the spent grain from the brewing process made it possible to feed the small and large livestock reared within the abbeys. The outbuildings of the Carolingian abbeys resemble vast farms where servants took care of geese, ducks, chickens, cows and sheep (4.8).

This diagram has no historical value. The rebuilding of St. Gallen Abbey in the 9th century did not follow the programmatic plan. Nevertheless, its ambitious character demonstrates that the relatively complex management of the malting, brewing and cellaring facilities did not deter abbots and cellarer or gatekeeper monks whose technical skills are beyond doubt. The plans of Canterbury (Map 3) or Norwich (Map 5) show that abbeys with brewery-bakeries and farms were a reality.

4 Brewing beer for the abbeys and lordly courts

The abbeys, "owners for eternity" of very extensive land domains, are leading economic agents in the Carolingian period. Under the protection of the Carolingians, from the 9th century onwards they steadily strengthen their economic power throughout the empire. Their geographical locations range from the North Sea coast to the Basque marches and Catalonia, from Brittany to Bavaria, to which can be added the British Isles and Ireland, outside Carolingian imperial control but under the influence of the Benedictines (Map 9).

The Polyptychs, the Directives (*brevia*, writs) and the Carolingian Censiers (rent rolls) record the properties of the abbeys (lands, persons, buildings, rivers, duties of the tenants, [rents](#), [tithes](#) etc.). The privileges and donations granted by the aristocracy are written down in charters and cartularies³⁷. All these documents provide an overview of the economic organisation of the Carolingian brewery in the monastic estates. The inventories describe the nature of the obligations imposed on the tenants and provendiers, their activities and the quantities owed in kind, labour or money. Unfortunately, these documents are incomplete or even silent on technical details. We cannot hope to reconstruct the recipe of a Carolingian beer from this documentary basis alone. The beer brewing in the secular estates, in fact the majority of the empire's agricultural land, escapes us beyond the indications provided by the Capitulary De Villis and a few documents concerning imperial estates or donations from laymen, and by later sources relating to bishoprics, and therefore to urban brewing. Breweries existed in Carolingian cities and left some traces, as in Metz, Ghent or Strasbourg, or in Liège (Leuven), a prosperous and powerful bishopric on the banks of the Meuse.



Figure 15: Bishop of Tournai receiving the title of beer granted by King Chilperic I (539-584), stained glass window in Tournai Cathedral, 15th century

Beer brewing requires many supplies: grain (mainly barley, spelt, oats and rye), malt, herbs and hops, honey, firewood, tuns and barrels, and clean water. Brewing requires the work of many actors: harvesters, collectors of herbs, hops

³⁷ The inventories of landed property (manses and reserves) are divided into chapters (*brevia*). The censiers list the royalties (*cens*) in labour, in kind or in money owed to the abbey. The majority of the polyptychs come from abbeys situated between the Loire and the Rhine rivers, in eastern Neustria and western Austrasia, with the addition of Swabia (Reichenau) and eastern Burgundy (St. Gall).

and honey³⁸, maltsters, millers, water carriers, wood cutters and carriers, brewers, coopers, carters and beer carriers. Thanks to this multiplication of brewing ingredients and crafts involved in the brewing, we can find the presence of beer in some Carolingian texts³⁹.

The monks encounter no difficulty in having their beer brewed on their estates or in collecting the raw materials for the brewhouses inside their abbeys. An abbey has several economic advantages. On the one hand, its status as a large landowner allowed it to demand labour and payments-in-kind from all tenants living and working on its land, a right that an abbey exercised like any other Carolingian landlord. As a landowner, an abbey requires its serfs and tenants to perform chores (agricultural work, maintenance of roads and paths, transport, collection of wood, etc.), and to pay fees in kind (grain, flour, malt, wood, hops, beer, poultry, eggs, wool, etc.) and sometimes money. On the other hand, an abbey collects [tithes](#) in its capacity as an ecclesiastical establishment, namely 1/10th of everything that is harvested, raised, gathered or manufactured on its lands. Pepin III makes tithing compulsory in 765, a decision confirmed by his son Charlemagne in 779. Tithes, chores, [rents](#) and fees in kind bring to the abbeys' doors an awesome volume of foodstuffs, animals, beverages, plants, clothing, leather, firewood, building timber, iron, etc. (5.1).

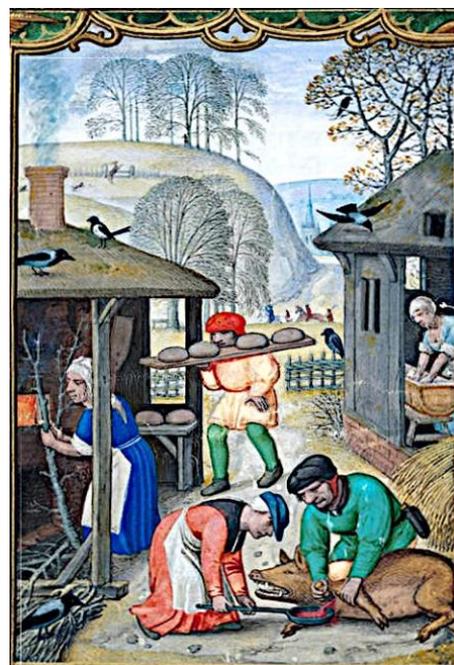


Figure 16: knead the dough, cook the bread, kill a pig. Golf Book, winter (1540). British Library

The Carolingian social structures are based on a complex web of customary law, state regulations, abbatial statutes, and count, royal and imperial prerogatives. All of these customary and legal layers shape the personal obligations and govern the work, the dues in kind or in money, which the majority of the population, the *laboratores*, owed to the powerful members of this highly hierarchical society, the *bellatores* and *oratores*, the warlords and the clergy.

Whether free or servile, the tenants have two obligations towards an abbey: to provide the *tributa* or tribute in kind, most often agricultural products, and the *servitium*, a chore or work of several days (carriage, maintenance of roads, buildings, etc.) The nature and content of these obligations are defined by each abbey according to its material needs, the local economy, the season, the labour force, etc. In concrete terms, the tributes are raw materials (grain, malt, wood, herbs, hops, eggs, chickens, etc.). The serfs (*serviles*) have to work three days a week on the abbeys' lands, the free tenants (*ingenuiles*) two days: ploughing

³⁸ A superior quality of *cervisa* is reinforced and flavoured with honey.

³⁹ These documents are under-exploited by medievalists who are not very passionate about the history of the brewery. The studies of [Van Santebergen](#) (1949), [J. Deckers](#) (1970 & 1971), [R. Unger](#) (1992 & 2004), [K-E. Behre](#) (1999), [C. Blankenburg](#) (2001), [M. Nelson](#) (2005 & 2013) are all too rare exceptions. Rich bibliography in [Unger 2004](#).

(*coruada*), harvesting, transport of grain, wood, etc. There are also chores defined by task (*riga*). Tenants' wives had to spin wool or linen and deliver defined quantities of cloth or spindles per year (one spindle/year for a servant tenant, ½ spindle for a free tenant). In every aspect of life, servants and serfs (*mancipia*) are the lowest social status group, without any legal personality, without protection, under the total dependence of the abbey, its provost and its stewards. Their tasks and work are rarely described, because they are mercilessly treated as drudges liable to indefinite servitude even by the clerics.

The provision of beer by free or servile tenants is customary. The Law of the Alamanni (XXII) of the 730s provides that *"the serfs of the church shall bring her tribute according to law: 15 measures of beer, a pig worth a tremisse [1/3 of solidus, the golden penny], 2 muids of bread, 5 hens, 20 eggs"*. (Servi enim ecclesiae tributa sua legitime reddant: quindecim siclas de cervisa, porcum valentem tremisse uno, panem modia duo, pullos quinque, ova viginti, [Guérard 1844](#), T1, 712)⁴⁰. These churches are held by the priest of a parish or by monks of an abbey, all of whom are provided with land and servile families to support the clergy. This tribute was also imposed on the *coloni*, free people who cultivated and cleared the land. In the 8th century, Christianisation and the power of the clergy were established among the Alamanni. This law for the benefit of the Alamanni clergy was generalised with the introduction of the tithe for the benefit of all the clergy of the empire, made compulsory by Pepin the Short in 765.

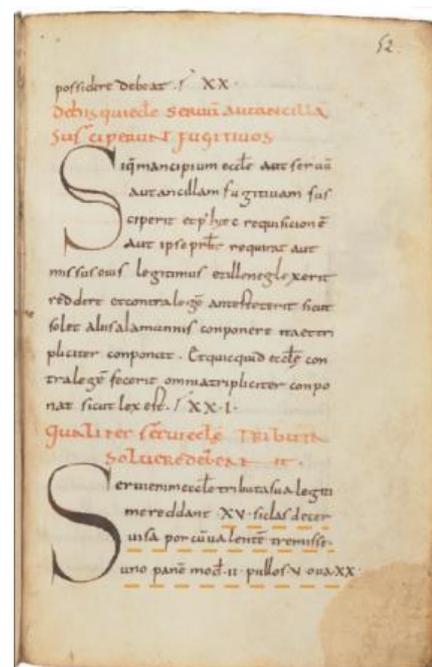


Figure 17: the Alamanni's law

There is a reverse movement: the provision of beer and bread to the tenants when they carry out chores on behalf of the abbey, a sort of compensation in kind for arduous work, particularly ploughing. An excerpt from the polyptych of Prüm ([Prüm Abbey](#) in the Rhineland-Palatinate, Eastern Ardennes), the brief XLV relating to the domain of Villance, is explicit and illustrates the multiplicity of obligations which weigh upon the free or servile dependents of a monastic domain:

*"In the villa of Libin, Amulricus, R., F. and H. have a manse and pay together in December 4 pigs or 20 denarii; in May, they pay for the military tax 4 lambs or 20 denarii; 60 flax spindles; in August, for the chore, 4 piglets or 16 denarii; 3 chickens; 20 eggs; 20 trout or 2 muids of oats. They work twice a fortnight for the abbey, wherever they are required. They plough and fatten with their manure a *iornale*⁴¹ for winter sowing; for sowing rye, for the semis in March and April, they plough 4 *iornales*. They are then given 4 loaves of bread and 4 setiers of beer.*

⁴⁰ In the 8th century, the [Alamanni](#) lived on the upper reaches of the Rhine, Danube and Rhone rivers, straddling the northern border of present-day Switzerland.

⁴¹ The *iornale* (*journal*) = area ploughed by an ox from dawn to dusk, estimated at 1/3 ha, or ≈3000 m². This unit varies according to the land, the animal and the customs.

They do two chores. They then receive 4 loaves of bread and 2 setiers of beer. They make a cut of wood measuring 6 feet in length, the height of a man and the same width. They transport grain in May and December. If wheat or rye is being hauled, each cart carries 12 muids; if it is oats, 20 muids; and in May, if wheat is being hauled, 15 muids, if it is oats, 20 muids. Every week they do three days' work for the villa. If in this villa four men hold a manse, they pay for 4 pigs, 20 denarii; for 4 military taxes, 20 denarii; for 4 chores, 17 denarii; 3 chickens; 20 eggs; 20 trout or 2 muids of oats; 60 spindles of linen. If three men remain on a manse, they pay, for 3 pigs, 15 d., for 3 military taxes, 15 d., for 3 chores, 12 d.; [they pay] the chickens and the rest of the service due as the manse of Amulricus. If two men stay on a manse, they pay, for 2 piglets, 10 d.; for 2 military taxes, 10 d., for 2 chores, 10 d.; flax, chickens and the rest like Amulricus. If a man holds a manse or half manse, he pays, for 1 piglet, 5 d., for a chore, 7 d., for a military tax, 5 d. As regards the whole manse held by one man, he renders chickens and eggs and trout as the manse of Amulricus. And if a man has half a manse, he pays half the chickens and eggs, trout and flax that the manse of Amulricus pays. H. and H., R. and A. hold a manse, they pay like Amulricus. (...)"

polycarolingien.free.fr/article.php3?id_article=18; translation Beer-Studies.

4.1 The raw materials for the brewery

A manse is a group of fields, meadows, woods or thickets given in tenure to a family with a dwelling and barn(s), and in some cases with a mill, a brewery or other technical installations. A manse covers an average of 16.5 ha (12 bonniers)⁴². This unit of agricultural production, fixing the number of chores and rents (cens) in kind due to the landowner (king, nobleman, bishop, abbey, church), is the source of the grain converted into beer. Millers and brewers are allocated half the size for the subsistence of their families and serfs, as their job is to process the grain that others are growing. Their supply of grain for grinding flour and brewing beer is ensured by the system of dues. A second source of grain comes from the fields cultivated on the so-called reserve lands belonging to the lord. This land is cultivated by means of chores that the tenants owe to their master. The reserve also includes forests, heaths, marshes and wastelands for the exclusive use of the lord. On this reserve land, herbs and wild hops are gathered, before the first hop fields are cultivated in some regions (4.1.5).



Figure 18: Ploughing scene with plough and 4 oxen. Luttrell Psalter, 1320

Millers and brewers are allocated half the size for the subsistence of their families and serfs, as their job is to process the grain that others are growing. Their supply of grain for grinding flour and brewing beer is ensured by the system of dues. A second source of grain comes from the fields cultivated on the so-called reserve lands belonging to the lord. This land is cultivated by means of chores that the tenants owe to their master. The reserve also includes forests, heaths, marshes and wastelands for the exclusive use of the lord. On this reserve land, herbs and wild hops are gathered, before the first hop fields are cultivated in some regions (4.1.5).

4.1.1 The grain for brewing purposes

The Carolingian countryside cultivated many species of cereals: wheat (*frumentum* or *triticum*), spelt (*spelta*, *espeate*), barley (*ordeum*), rye (*sigulum*, *sigilinum*), oats (*avena*), millet (*milio*). The land is usually cultivated on a three-year basis: for example, a winter cereal (wheat or rye), a spring cereal (oats or barley), and fallow land (or beans and peas) during the third year.



Figure 19: Calendar around 1000. Miniature, [Cotton ms. Tiberius B. V. f. 3r.](#), British Library.

There is a scale of value for cereals. In 806, a muid of wheat was worth 6 denarii, rye 4, spelt (*spelta disparata*) 3, barley 3, oats 2 ([Guérard 1844](#), 710), a

⁴² A lordly manse is larger, others are smaller, especially manses with a mill and a brewery. The manse of 12 bonniers was ordered by Louis the Pious as the minimum area for supplying the needs of a parish church. This measure was to become a reference for abbeys. In practice, it varied according to the regions of the empire, the policies of the counts, the customary law and the time.

hierarchy no longer applied during the many famines occurring at that time. All these cereals are used in brewing as raw grain or malted grain. The Vita S. Columbani (c. 640-643), c. 13 says that "*the refectory attendant must be prepared to handle the beer, which is cooked from the juice (wort, succo) of wheat and barley*" (note 35). The grain deliveries to the abbeys show that beer was also brewed with rye, oats or spelt. Together with wheat and barley, the five most important cereals of the time were used to make beer. The same applies to the malt made from these five cereals (4.1.2).

The Carolingian beers are brewed with malt and a mixture of raw grains (*mixtura* or meslin), spelt + oats, spelt + rye, wheat + oats, etc. Within the Carolingian Empire, the terroirs, climates and customs vary greatly. The composition of the beer also differs. A higher proportion of malt characterises the superior beer for nuns and monks, according to the quantities of malt received by the abbeys. At the other end of the social scale, the beer of paupers and serfs has a high proportion of raw grain and a very low density (Table 3).

This 100% raw grain beer raises the problem of its brewing. In the absence of malt, another technique is required to convert the starch into sugar before fermentation of the wort (*succo*): that of beer ferments. This involves the use of plants (roots, stems) carrying microorganisms (fungi) able to hydrolyse starch. This is precisely the question raised by the technical nature of *gruit* or *grutum* (4.2). It should be noted that acid hydrolysis is another brewing method that makes it possible to avoid using malt to saccharify the starch of the grain. [Adalhard](#)

4.1.2 The malt (*brace, braxis, bracium*)

One of the instructions written by the [abbot Adalhard](#) (752-826) details the management of malt and malting that he imposed upon his abbey of Corbie:

*"Of the breweries as well as of the malt that comes from the breweries, we likewise want a tenth of the muids of malt that has been made to be set aside for the gatekeeper before being given to the monastery. And if it happens that what remains to be owed from the domanical obligations is insufficient and cannot be complemented by these same breweries, the shortfall is complemented with the grain already tithed [already received, stored and accounted for in the tithing category by the monastery]. Then the gatekeeper does not have to count this as tithe. But, as said before, the gatekeeper must bring in malt from the malt house [malatura] by his own means. However, if he does not have enough malt from this source, he must, with the help of a man of skill, make malt in sufficient quantity."*⁴³

⁴³ De cambis quoque et bracibus, quae de cambis fiunt, similiter volumus ut decimus modius de bracibus, postquam facte fuerint, portario dandus, priusquam monasterio deducantur separetur; et si forte tantum non restat unde illa servita dominica plena sit nec de ipsis cambis impleri possit, de annona dominica quae decimata est compleatur, et inde

Adalhard explains several important points: 1) Malt is delivered to the abbey by the breweries on the estate. 10% [tithe] is set aside for the gatekeeper in charge of the paupers and travellers. 90% of the remaining malt goes to the monks and guests. Malt is thus produced on the abbey estates by the breweries and moves between them and the abbey gate. 2) The breweries are also malt houses, like the mills. 3) If there is not enough delivered malt, the gatekeeper can complement it with raw grain already harvested by the abbey. In the event of a shortage of malt, the proportion of raw grain in the brew was to be increased. 4) The gatekeeper could have malt made from the same raw grain by the abbey's malting plant (*malatura*). The plan of St. Gallen also provides for a malthouse, a building with a malting area. This building is described as a "*granary where clean grain is kept and used to prepare beer*" (3.2.1). 5) The gatekeeper can also call on the skills of maltsters to make malt. The gatekeeper is one of the monk-officers of the abbey who is in constant contact with the outer world. These maltsters may belong to the abbey or work outside. We will use this information to try to reconstruct the general organisation of the brewery in a Carolingian estate between the 8th and 10th centuries (Chap. 5.1).

Can the management of malt by Corbie, a large and rich royal abbey founded around 660 in the Somme near Amiens, be generalised to apply to the abbeys of the empire? Fortunately, we have other sources.

The abbey of Saint-Germain-des-Prés owned 22 mills around Paris, between Villemeux and Aulnay, settled on Eure and Blaise rivers or their tributaries, the rent (*cens*) of which brought in each year: "*22 mills liable for milling, including 1990 muids [1,034 hl] of raw grain, 177 muids [9.2 hl] of malt, solidos of silver...*"⁴⁴.

The abbey of St Bertin (St Omer in Artois, France) lists 14 of its estates that must supply it with malt and flour. The abbey requires from its 196 tenants the delivery of 520 litres of malt and 300 litres of flour each, a total of 1,066hl of malt and 640hl of flour per year (Table 8). The malt is used in large quantities by the monks of St Denis. It was also bartered and traded. This case is examined in detail at chap. 4.3 with the work and status of maltsters, the general management of malt and the question of its carriage over distances of several dozen kilometres.

Near to Paris, the economic wealth of the abbey of St. Denis and its food habits are often presented as being based on wine and its trade. In fact, the abbey

portario decima non detur. Portarius autem, ut supradictum est, de malatura braces suas per suam sollicitudinem ad se venire faciat. Si vero ibi satis non habuerit ipse sibi scientem hominem conducat qui tantum ei braces faciat quantum sufficiat. (Levillain 1900, 384)

⁴⁴ ... Habet inter Villamilt et Alnidumb farinarios XXII, qui reddunt de multura, inter totos, MCCCCXC de viva annona, de braciis modios CLXXVII, de argento solidos ..., Guérard 1844, Tome 2, 76 ; Hägerman D. (ed.), Das Polyptychon von Saint-Germain-des-Prés. Studienausgabe, Cologne/Weimar/Vienne, 1993, 57.

was also an economic centre for brewing. In 832, Abbot Hilduin surveys the estates that produced rye, malt and hops for the abbey ([Table 6](#)). These volumes of malt and hops imply a significant beer production. The geographical distribution of the areas of malt and hop supply indicates that beer is partly brewed locally ([Map 2](#)).

Malt is consumed in large quantities by the monks of St Denis: 209hl or 12,500kg to brew 368hl of monks' beer per year ($\approx 6\%$ alc. according to the [Table 3](#)). The average annual consumption of malt in St Denis (12.5 tonnes/year for 150 monks, 83kg/monk⁴⁵) is lower than that of Corbie (40 tons for 400 people, 100 kg/person, monks + dependants + guests). It should be remembered that the abbey of St Denis consumes wine at a rate of at least 1 litre/day/month. Malt consumption shows marked regional differences between the Paris basin and the northern regions of the empire.

In 862, a diploma from Charles the Bald confirms the use of malt at St Denis. We learn that this malt is given on 1 February and used to brew beer for the festivities organised by the abbey ([Levillain 1909](#), 86). The total of 234hl of malt (that is 14 tonnes) is used to brew 410hl of monks' beer ($\approx 6\%$ alc.), or 640hl of medium grade beer ($\approx 4\%$ alc.) ([Table 3](#)), substantial volumes for religious festivities lasting several days and involving both religious and lay people. However, the lion's share is offered to the prestigious guests who attend this abbey, which was favoured by the Carolingians and became a royal abbey after the death of Dagobert in 638.

For the consumption of its 120 monks, the conventual manse of Saint-Germain is allocated 20 cartloads (*corbes*) of malt of 12 muids each year, namely 125hl or 7,500 kg of malt/year, which allows the brewing of about 220hl of monks' beer ([Guérard 1844](#), T1/2, 713). This was enough to serve each monk $\frac{1}{2}$ litre of beer every day. Knowing that the conventual monastery of St Denis also received 2,500 muids of pure wine per year (1,300hl or 356 litre/day), it is clear that these high quantities of fermented beverages were served to the numerous guests of these two abbeys and perhaps also to their dependents, servants, paupers and sick people.

Charlemagne's Breviarium, in the guidelines for the management of his own estates, specifies that the cellarer of each royal house takes care the wheat, malt, lard, butter, cheeses, salt and honey and keeps accounts of them ([Guérard 1844](#), T1/1, 466).

The nature of the malts at that time has been debated⁴⁶. The composition of the beer reflects the local agriculture and its dominant cereals. The beer is brewed with oats, rye, wheat, spelt, barley and even grasses whose use as food has been

⁴⁵ Obviously less if we could count the dependents' and guests' consumption of beer.

⁴⁶ Discussions are often distorted when they consider the considerable evolution between ancient practices and modern brewing technology to be allegedly negligible.

lost. For example, a polyptych of the [princely abbey of Fulda](#) (founded in 744 near Kassel in Germany) indicates that 40 serfs each provided this abbey with "7 cartloads of oats to make beer" (*avenae ad VII carradas cervisiae*)⁴⁷. This is an explicit reference to a beer brewed with oats either as raw grain or malted grain.

What about the origin of malt? The texts rarely make the connection between a cereal and malt. Carolingian beer was brewed with a mixture of raw grain (*meslin* or *mixtura*) and malt in unknown proportions. The brewery of the abbeys, more careful and richer, favours malt made from the dominant cereals of the region. It was not necessarily barley that became the main brewing grain much later in Europe. A rare mention of a cereal explicitly intended for malting concerns the abbey of St Denis in 832. The 120 monks of St Denis receive each year 30 (*carts?*) of 12 muids of malt [187hl] and in addition 3 (*carts?*) of 30 muids of spelt malt (*bracii de spelta*) [47hl] (*Bracii per modia duodecim triginta, et, exceptis his, bracii tres de spelta, secundum consuetudinem, per modia triginta*, [Levillain 1909](#), 86)⁴⁸. Therefore, the abbey of St Denis uses at least two different malts, one made from spelt, the second from another unspecified grain.

The monastic brewing was not the norm and the major beer production under the Carolingians, in comparison to the beer brewing carried out by the lay people. The almost exclusively ecclesiastical documentary sources skew our reconstruction of the entire Carolingian brewing landscape because the monks favoured the luxury bread-making cereals spelt and wheat for their own use, which produced white bread and fruity beer. It is to be assumed that malt was generally made from all the common cereals grown in one area (spelt, rye, oats, wheat, barley), as was beer by common people for their own consumption, thus in the villages and outside the monasteries.

⁴⁷ Quoted by [Guérard 1844](#), T. 1/2 p. 711. Rather read *avenae VII carradas ad cervisiae*.

⁴⁸ Diploma of Louis the Pious in 832. Use confirmed by a diploma of Charles the Bald in 862 "*Bracii etiam de spelta secundum consuetudinem per modia triginta in tribus festivitibus*". These are supplements given by the abbot to the convent for the three major religious feasts of the year celebrated in St Denis, including that of the eponymous saint on 9 November. It is known that in addition to this gift, the convent receives 30 muids of malt and 12 muids of spelt for these celebrations each time.

4.1.3 Firewood for drying the malt and cooking the wort

Firewood is used at several stages of the brewing process: to dry the germinated grains and make malt, to heat the water for infusing the grains and malt, and to cook the wort. It also allowed coopers to heat the inside of barrels with or without resin. Here again, the Abbot Adalhard serves as a guide for the Abbey of Corbie:

"In addition to the inspection of the bread and beer which the gatekeepers provide with the grain and malt received from the tithe, likewise the firewood must be used in the appropriate quantity for their task of preparing the latter two [grain and malt], after consultation with the other attendants [ministris]. Therefore, it is necessary that every load of wood that our whole community delivers to the monastery for annual needs be tithed like everything else [1/10th of the wood from the estates cut or collected goes back to the abbey], and then locked up in various places within the enclosure. The reason for this is to prevent the gatekeepers from using it when they are short of wood for other needs, which they have to provide from their own reserves, and then running out of both reserves as happened this year. Moreover, the wood used for the comfort of the guests or any other need at the gate in the course of the year, must be delivered in summer outside the monastery door and then stored in suitable places, so that there is always enough in each hospice for those who are to receive it properly, while being safe from all sorts of fraud. For these reasons we have said that this wood, considering it more valuable, should be piled up around the monastery, lest we seem to have opened the doors to its being wasted, even out of necessity, and a shortage result. Now that we have specially dealt with the supply of wood, let us turn to the other provisions."⁴⁹



Figure 20: cutting firewood during the winter. Golf Book, 1540

⁴⁹ De pane autem et cervisa ista erit consideratio, ut, sicut ipsi portarii de decimis que eis dantur annonam et braces de suo dant, ita quoque ligna similiter dent, juxta quod in utroque ad suum opus preparandi ipsi cum ceteris ministris consideraverint necessarium esse. Unde necesse erit ut omnia ligna, que familia nostra generaliter ad annualem necessitatem ad monasterium adducit, sicut cetera omnia, decimata fiant et semotim ponantur in ipsa tamen clausura. Et hoc ideo, ne forte cum portariis ligna ad alios usus que ipsi ex sua sollicitudine providere debent, deficere ceperint, ipsi ad ea que supradiximus manum mittant et in utraque parte decepti fiant, sicut hoc anno factum vidimus. Et ideo ligna que ad suscipiendos hospites vel ad ceteras omnes necessitates ad totius anni spatium ad portam necessaria fuerint, estivo tempore erga portam monasterii comparata fiant et in locis oportunis servanda collocata, ut semper eis qui merito accipere debent in omni hospitio sufficiant et tamen ab omni fraude tuta permaneant. Idcirco autem eadem ligna, licet carius sit, circa monasterium comparare diximus, ne vagandi acsi ad conducendum et hoc levius comparandi occasionem dedisse videremur. His ita etiam specialiter de lignorum providentia dispositis, transeamus ad cetera. (Levillain 1900, 370).

Adalhard tells us the following: 1) He confirms a strong correlation between the management of malt, beer and wood stocks. Malt is dried over a wood fire. Both malt and grain are taken from the estates through the tithe. The malt is therefore prepared and dried at the abbey gates and not in a building inside the abbey. 2) Wood is collected for the abbey once a year in summer. This seasonality is restrictive. Large quantities have to be stored and controlled. 3) The abbey stores some firewood within its walls, a well-monitored strategic stock for heating the dormitories, cooking and brewing beer. The rest is stored outside with the risk of theft, bribery, or corruption (of wood!). 4) The wood stocks necessary for the running of the hostelry are relegated to the vicinity of the abbey. 5) Firewood is a precious commodity essential to all the operations ran by an abbey: cooking, baking, malting, brewing, various workshops, heating of dormitories or refectories, etc. There is competition between the needs of the monks managed by the cellarer and those of the hostelry managed by the gatekeeper.

On the lands and estates of the [abbey of St Bertin](#) (St Omer, Pas-de-Calais, France) around 844-859⁵⁰, a tenant occupies a 41 ha (30 bonniers/bunders) manse between Mighem and Huolingham, intended for his maintenance and close to the abbey. He had to deliver the wood needed for the abbey's bakery (*pistrinum*) and brewery (*bracitorium*) every day (*Item, habet inter Mighem et Huolingaham bunaria XXX. Seruit unaquaque die ad pistrinum et ad bracitorium in adducendis lignis. Ganshof 1975, 189*). This wood is cut in the abbey's forests. Services involving daily deliveries (vegetables, plants, wood, water, etc.) were provided by the abbey's neighbouring tenants. Within the precincts of St Bertin's Abbey, bakery and brewery are to stand side by side, as on the plans of St Gall, Canterbury ([Map 4](#)) or Norwich Priory ([Map 5](#)).

4.1.4 Herbs and flavourings used in beer brewing

These plants have two main functions: to flavour the beer and to improve its preservation through the action of resins, tannins, gums and essential oils. The Carolingian sources say nothing about their use in brewing. We have to transpose late medieval techniques to the 9th-11th centuries on the basis of the plants mentioned in the Carolingian texts or the St Gall plan.

The Capitulary De Villis lists 77 plants to be cultivated in the gardens of the imperial estates. Some of these plants were used as herbs in the composition of beer, or would be used a few centuries later.

⁵⁰ These lands and estates, 23 in all, including Poperinge (2,398 ha) famous for its hop gardens in the modern age, cover 10,878 ha.

The plan of St. Gallen includes a garden of culinary and medicinal plants, the names of which are given ([Appendix 9.3](#)). They are partly consistent with those of the Capitulary ([Appendix 9.2](#)). Among these leaves, berries or roots, the following were later used in brewing: laurel, juniper, marjoram, myrtle, mint, sage, (common) broom, horseradish, boxwood, lupine, water clover, oak bark (in Germany), ash leaf, wormwood, sweet woodruff, anise, mint, etc. Some, like myrtle, were used in the composition of gruit. ([4.2](#)).



Figure 21: mistress and servant in a garden, and woodcutters (March). Golf Book, 1540

Some of these plants are grown in the abbey gardens by the abbey staff. For example, in and around St Bertin's abbey, many prebendaries are working in the gardens (*hortus*) of vegetables and condiments (garlic, laurel, thyme, etc.), medicinal herbs and certain aromatic plants used in the composition of beer. There are 95 of these prebendaries at St Bertin's, serving the monks (*Intra monasterium per diuersas officinas habet prebendarios XCV*. [Ganshof 1975](#), 187-188). They collectively have to pay 20 pounds a year to the abbey, a large sum which implies that, in addition to serving the monks, they carry on a trade in herbs and vegetables. A part of their incomes, which is difficult to evaluate, goes back to the abbey.

In Corbie around 822, 150 provenders are assigned to the many maintenance tasks of the abbey. Among them, 8 laymen cultivate the four vast gardens of the monastery under the direction of the gardener-brethren and receive bread, beer and vegetables as payment in kind for their work. The brethren in charge of supervising all the provenders have a daily allowance of 100 loaves of provender bread (a lower quality than the white bread of the monks), a muid of beer (52 litres) and a muid of vegetables, which are distributed to the provenders, in part or in total ([Hocquet 1985](#), 677).

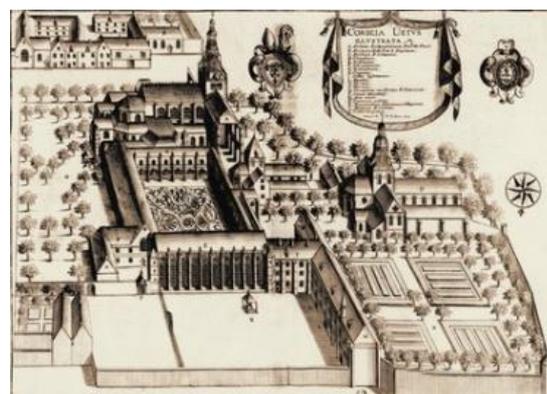


Figure 22: modern engraving of the Corbie Abbey gardens

4.1.5 Hops (*humlonem*) and hops garden (*humluncam, humlonaria*)

The oldest mention of a hop farm in Western Europe concerns the monastery of St Denis near Paris. In 768, [Pepin the Short](#) (714-768) endows it with the forest of Iveline and a *humlonaria* with two manses in its entirety, ditto with two other villae (et in Ulfrisiagas mansos duos et Humlonarias cum integritate. Uisiniolo Simuliter, Ursionevillare similiter. [M.G.H. Diplomatum Karolinorum, t. I, p. 39, line 37](#)). This *humlonarias* may refer to a locality (Ouerre, near Dreux?) known for its wild hops, or to an actual hop crop ([Moulin 1981](#), 124).

A little later, the polyptych of St Rémy de Reims includes the word *humlo* in a list of cereals and legumes around 786 (*frumenti... speltae... ordeii... mixturae* (meslin)... *leguminis...* [Moulin 1981](#), 125). The same text speaks of sound milling (*molturam salvam*) and malt (*bracem*). It is likely that these hops, listed among the cereals and brewing ingredients, refer to their brewing and not their medicinal use.

During his abbatiage (823-833), the abbot Ansegis draws up a list of products that the estates of the [Abbey of St Wandrille](#) (Normandy) must bring to the monks. Amongst thousands of eggs, hundreds of chickens, capons, fattened geese, fish and eels, honey, peas, beans, there are quantities of wine from Burgundy, and this mention: "*for beer with hops, as much as is necessary*" (*sicera homulone quantum necessitas exposcit*) ([Horn & Born 1979](#), III 126). [Polyptyque de St Germain-des-Prés](#)

Around 823-828, the [Polyptych of St Germain-des-Prés](#) (Paris) lists hops (*humlo/fumlo*), mustard (*sinapi*), torches and iron (ore?) among the charges levied on the servile manses of Combs-la-Ville (1 muid of hops/year = 52 l), Mareuil (*idem*) and Boissy (2-4 setiers/year ≈ 6.5 to 13 litres/year).

Hops is mentioned in the annals of Freisingen Abbey (Bavaria) between 859 and 875 and later ([Unger 2004](#), 54).

Once again, let us see what Abbot Adalhard says about hops around 822: "*Of the hops [humlone] also which have come to the monastery, a tenth of each monthly share [tithe] must be given to the gatekeeper over several months. However, if this is not enough for him, he must procure it for his needs by purchase or any other method, so that he has enough to make his beer. Likewise, if it becomes necessary for him, the provost must contribute with the products of the abbey so that under no circumstances does he afflict the familia itself beyond the legitimate cens. Let this be understood by all: the bakers of the monastery must themselves bake all the bread that is needed at the gate. Likewise, let all the beer be brewed by the brewers of the monastery. But the gatekeeper must take the grain and malt from its stores. And whenever the beer and bread he has given*

have been consumed, he must always take from his reserves and not from those of the estate."⁵¹

What Adalhard reveals to us: 1) The annual hop harvest is divided into monthly batches. The abbey knows how to store hops properly for 12 months. The hops cones are either dried, stored fresh in canvas bags, or left to oxidise in the open air⁵². 2) Hops are traded on a large scale. The monk-gatekeeper can buy them. The other way is by bartering or collecting wild hops. 3) The provost may also supply them. He is the steward (a monk or layman) of the abbey's estates. Adalhard was careful to prohibit abuse of power. The provost could appropriate the hops of the tenants of the domain under the pretext of the rents (cens) that they owe to the abbey. 4) Adalhard reiterates his instructions: the monk-gatekeeper must not obtain (or extort) grain, bread, malt and beer from the tenants and prebendaries beyond the 1/10th that they must deliver to the abbey as a tithe. The widespread abuses of power can be read between the lines.

Adalhard forbids millers to be asked to grow hops (4.3). The custom assigns the care of the hop fields to the millers. The reasons are not obvious. It may be due to the location of water mills along rivers with draining soils. Hops are top-hungry when young but do not require irrigation. Grindstones are of no use in a hop farm. The only common skills are the drying of the spelt, which has to be milled, and the slow drying of the malt and the harvested hop cones. The supply of hops by the millers is best explained by the grain trade, the miller's storage capacity and the mill being situated along a river suitable for waterway transport.

The manses of the [abbey of Saint-Amand](#) founded in 647 (Tournai, Ardennes) owe him 1 to 2 muids of hops and 4 to 10 muids of malt per year. The ratio hops to malt = 1:5 for the Businiacas and Salaconis estates implies that malt is also supplied by other farms (ratio 1/10 at St Denis [Table 6](#)).

⁵¹ De humlone quoque, postquam ad monasterium venerit decima, ei portio de singulis servidis per singulos manses detur. Si vero hoc ei non sufficit, ipse, vel comparando vel quolibet alio modo, sibi adquirat unde ad cervisas suas faciendas sufficienter habeat. Similiter prepositus, si ei necesse fuerit, de dominica substantia faciat ut propter hoc nequaquam ipsam familiam supra suum legitimum censum affligat. Hoc tamen sciendum quod omnem panem, quantum ad portam necessarium est, ipsi pistores dominici coquere debent. Similiter ad omnes cervisas bratsare bratsatores dominici. Portarius autem annonam et braces de suo dare debet, et quotiens aut in cervisa aut in panibus numerus ejus quem dedit consumptus fuerit, iterum alium augeat ut semper de suo et non de dominico fiat. ([Levillain 1900](#), 384).

⁵² That is to say, over-aged, as in the brewing of authentic Brussels lambic. The overaged hops do not lose their antiseptic properties, but their lesser bitterness is replaced by astringency. There is no evidence that the Carolingian brewers compressed the cones in a canvas bag to better preserve them.

Abbey's estates	Excerpt from the St Amand polyptych concerning the tenant's obligations fulfilled with supplies of beer, malt, hops, flour and bread.
Businiacas (11 farms)	<i>... There is one mill there from which 20 measures a year is derived. There are there 11 farms. Each and every one pays <u>10 muids of malt</u> [brace] and <u>2 muids of hops</u> [humblone] ... Likewise 1 farm which owes <u>9 muids of malt</u>; it makes linen cloth or remits 1 solidus instead. All other services [owed], just as those above. Likewise, 1 farm which owes <u>6 muids of malt and one muid of hops</u>. There are likewise 8 farms. Each one owes <u>5 muids of malt and one muid of hops</u>. And these and that above render all other services just as those above ...</i>
Salaconis (6 farms)	<i>... There are there 6 farms. Each one owes <u>5 muids of malt</u> [brace] and <u>1 muid of hops</u> [humblone]. They produce another amount of the lord's wheat ... There are 2 mills, from each 4 solidi are derived. There are there 6 females weavers, who remit 6 denarii for linen cloth. They work in the summer <...></i>
Incomplete text (21 farms)	<i>... There are there 21 farms, from these are ... each one gives 30 buckets of beer [cervisa]. They transport the wine [vineas] in every other year or remit 1 solidus and serve. They give 4 solidi between all of them in lieu of military service each year. They give bread [panes] ... from 2 farms, which give 25 buckets of beer and 2 chickens. They do not give bread. All the other services are owed just as above. Indeed, they do fencing service and watch duty. There are there 2 dependent farms. Each serves as they are ordered. There is 1 mill [molinum], from which ... measures can be gained. There is one farm pertaining to this benefice which now is deserted by all, which had previously produced 4 solidi in tax (in censum). There are near there 3 farms, one gives <u>4 muids of malt</u> [brace], two give <u>6 measures</u> between them. There are there 9 haistaldi [semi-free workers], who owe 1 solidus per head. There are 15 women who owe likewise.</i>
Brillon (10 farms)	<i>... There are there 10 farms, 2 of which each owe 30 buckets of beer [de cervisa situlas .XXX=780 l], 3 chickens, 10 eggs, and 1 pig. They transport the wine in alternate years or remit 1 solidus. They serve. Between them all they give 2 solidi each year in lieu of military service. They give 10 loaves of bread. They do watch duty.</i>

Table 5: Fragmentary polyptych of St Amand written between 821 and 872
www.le.ac.uk/hi/polyptyques/stamand/latin2english.html

The frequent supply of bread, chickens, eggs and linen clothes, combined with the supply of malt, suggests that women also prepared the malt and brewed the beer. The same economic combination is explicitly described by the Wissembourg polyptych (Table 9).

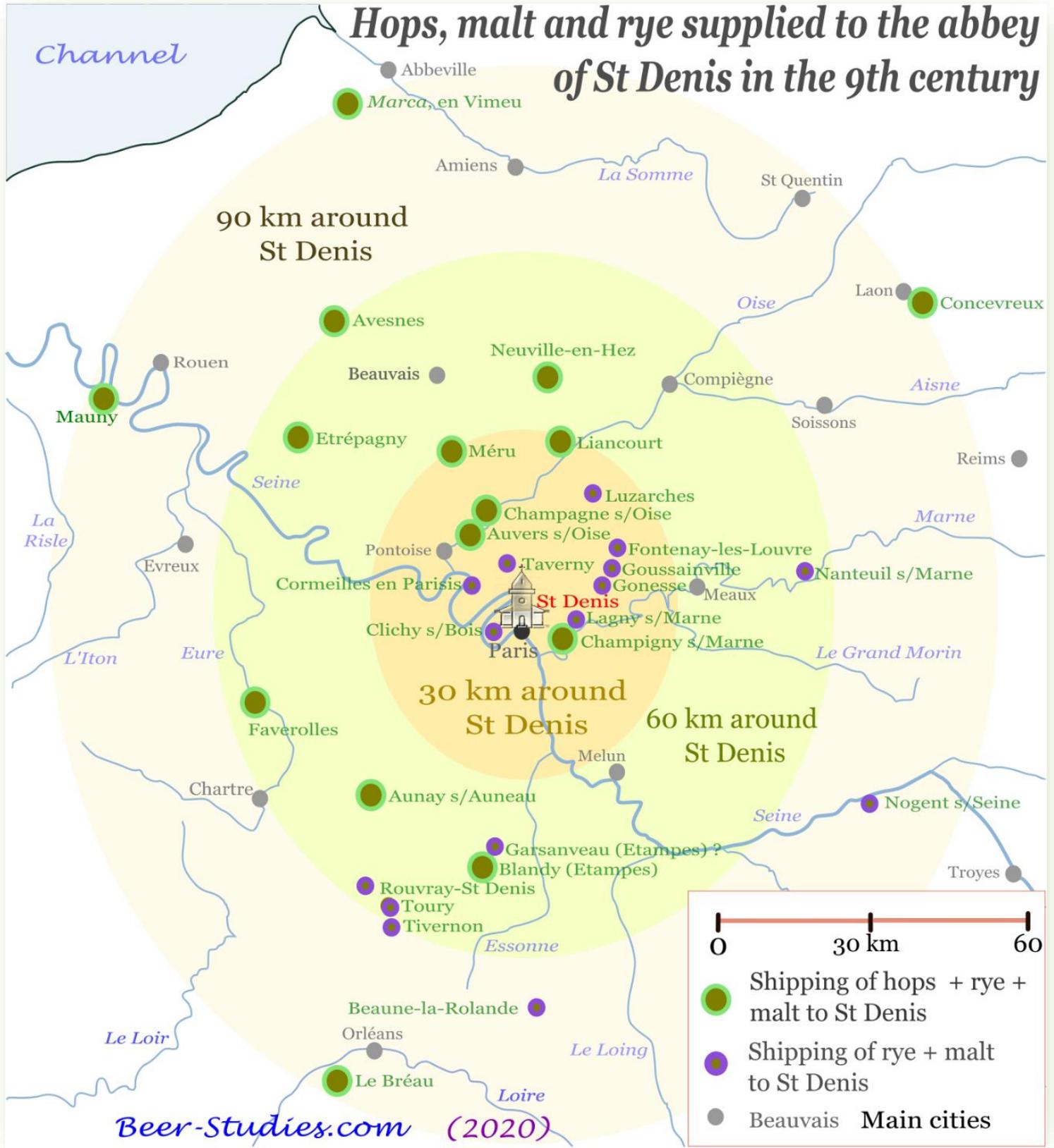
One source reveals the importance of hops for the monastic breweries, their origin and trade. In 832, the abbot Hilduin of St Denis (Paris) summarised what the abbey was to receive from its vast agricultural estates, which were among the richest in the empire (Table 10). Four headings are relevant to us: rye, malt (4.1.2), hops and aromatic herbs.

As regards rye, 885 muids (460hl) were used for the bread of the abbey's many servants and serfs. This yields 280hl of sifted flour or 460hl of wholemeal flour, the most likely option, or $\approx 26,500$ loaves of bread per year if we apply the Corbie ratio calculated by Abbot Adalhard (52 litres of spelt flour = 30 loaves of 1.5kg). As for the fermented beverages, this result of 72 loaves/day reflects a large population serving the monks of the abbey who also consumed wheat and spelt.

Hops ([umlonne](#)) is the most interesting item. Its presence next to the malt and the quantities delivered rule out medicinal use. It is counted in muids: 2314 litres/year or 350kg/year (1 litre dried hop cones ≈ 0.15 kg). Assuming that all the hops are used with all the malt delivered to brew the monks' beer ($\approx 6\%$ alc.), it can be deduced that the beer will be not very bitter by modern standards (15-20 °IBU). The hops/malt weight ratio $\approx 3\%$ in St Denis is technically consistent with our modern ratios ([appendix](#)).

The hops used in St Denis come firstly from the Oise region to the north-east of Paris, the Marne valley to the east, the Essonne valley to the south, and secondarily from the lower Seine valley and Basse Normandie. Three concentric zones can be defined, respectively at 30, 60 and 90 km around Paris ([Map 2](#)). Hops, a fragile plant, is dried and packed for transport. We know nothing about this drying and preservation. It should be noted that the 90km zone extends to the edge of the river Loire, a land believed to be devoted to viticulture. It is risky to evaluate the surface area of the hop fields according to the quantities delivered. Avesnes delivers 12 muids of hops or 700 litres of fresh cones or ≈ 100 kg dried. This is half of what a one hectare hop farm grows today (1,500kg/ha). The quantities delivered are on average small: 2 muids = 100 litres ≈ 15 kg of dried hops per hop farm. The Carolingian hop fields are close to vegetable farming, small plots in the middle of fields, around the houses, or along the banks of rivers.

The word [humulator](#) comes later. In 1368, it defines the person who cultivates a hop garden, "[humularium colit](#)" ([Moulin 1970](#), 119). Six centuries have passed since the first mention of a "hops yard". The use of hops in beer brewing was only slowly established, locally and partially in the Carolingian Empire. It seems to have become a common practice for monks' beer. The luxurious diet of nuns and monks described in the documents is certainly not partaken of by the majority of the population! The technical reasons given to explain the success of hops in the 14th century (better conservation of beer) are anachronistic for the 8-11th centuries. At that time, no large volumes of beer are brewed, shipped or marketed. Hops offers no advantage, except perhaps for the rich abbeys that are able to devote large volumes of grain to brewing beer and have a wide range of ecosystems in their wide estates in which hops can grow. On the other hand, the powerful bishoprics of East Francia will later oppose the hop trade for a long time by imposing their [gruit rights \(4.2\)](#).



Map 2: Concentric circles of the hop, malt and rye sources for the abbey of St Denis according to Hilduin (832)

FEES IN KIND ATTRIBUTED TO THE CONVENTUAL MANSE OF St DENIS AND PRODUCED BY THE ESTATES OF THE ABBEY

	RYE	MALT	VEGETABLES			Cheese	Butter	Soap	Dried herbs	HOPS	Ceps	Leeks	Vegetable garden plants
			Beans	Peas	Total								
NAMES OF THE LOCALITIES	Muids	Muids	Muids			Weighing	Setiers	Muids	Setiers	Muids	Ells	Ells	Days
Clichy-sur-Seine et Rubrido (Rouvray?), Seine	30	10	4	1	5	5	2	1					
<i>Viviario</i>	20	7	1	2	3	4	1	1	8				12
Cormeilles en Parisis, Seine-et-Oise	10	10	3	3	6	6		1					11
Taverny (Saint-Leu-p, Seine-et-Oise	20	10	3	3	6	4		1					10
Sarcelles	10	5	3	3	6	5		1					10
Fontenay-les-Louvres, Seine-et-Oise	10	5	5	5	10	6		1					5
Goussainville, Seine-et-Oise	10	10	5	5	10	3		1					5
Gonesse, Seine-et-Oise	10	10	5	5	10	3		1					5
Luzarches, Seine-et-Oise	10	10	1	2	3	5	1	1					6
<i>Cava</i>	30	10	2	2	4	6	2	1					
<i>Vitriaco</i>	10	6	4	4	8	7	1						6
Lagny-sur-Marne, Seine-et-Marne	10	5	2	3	5	2							
Nanteuil-s/Marne et <i>Latuero</i> (?), Seine-et-Marne	20	10	6	6	12	8	1						3
? in monte	10	5	2	3	5	5	1						3
? et Avesnes, Seine-Inférieure	10	10	2	3	5	5	1	?		12			
?	10	6	4	4	8	8		?					6
?	10	?	6	6	12	8		1					6
?	10	?	?	3	?	8	1	1					
?						8	1	1					7
?	?	?	?	1	1			?					
Beaune-la-Rolande, Loiret		?	2	1	3			?					
Nogent-sur-Seine, Aube	15	8	5	5	10	6		1		8			
<i>Madriaco</i> et Faverolles, Eure	20	15	3	3	6	?	2	1					7
Tivernon, Loire, arr. Pithiviers			2	3	5	5							



Toury, Eure-et-Loir			2	3	5	5							
Rouvray-Saint-Denis, Eure-et-Loir			2	3	5	5							
Garsanveau, Seine-et-Oise			2	3	5	5							
Champagne, Seine-et-Oise	100	30	9	9	18	20	3	1	8	3	8	160	12
Auvers-sur-Oise, Seine-et-Oise	50	20	5	5	10	10	1	1		2			6
Méru, Oise (Beauvais)		20	5	5	10	12	1	1		2			7
<i>Curtis</i> (i) (Concevreuxi), Aisne, arr. Laon	50	20	6	6	12	15	2	1		2			4
Liancourt, Oise	50	20	5	5	10	10	1	1		2			4
<i>Novavilla</i> (la Neuville-en-Hez?), Oise	50	10	4	4	8	8		1		1			6
Etrépagny, Eure	100	30	6	6	12	15	2	1		3			5
Champigny-sur-Marne, Seine et Marne	20	10	2	3	5	6		1		1			
Le Bréau, Loiret, comm. Mézières	30	15	3	3	6	10	1	1		1½			
Blondy, Seine-et-Oise, arr. Etampes	40	15	4	4	8	12	1	1		1½			
Aunay-sous-Auneau, Eure-et-Loir	25	20	5	5	10	18	1	1		2			
Maunv, Seine-Inférieure, arr. Rouen	30	12	5	5	10	8		1		1			
<i>..a.a..iaco</i>	30	13	3	3	6	8	1	1		1			
<i>Marca</i> , en Vimeu	25	15	2	3	5	8	1	1		1½			
TOTALS	885	402	140	151	287	292	29	29	16	44½	8	160	146

Table 6: fees summarised by Abbot Hilduin in 832 for the conventual manse of St Denis (Levillain 1909, 88). A locality name in italics is an unidentified place

4.1.6 The honey (*melle*)

A very old beverage, mead, is prepared with honey and water. Pliny gives a complete recipe. The peoples of Gaul honoured a goddess of fertility called Nantasuelta, one of whose emblems was a beehive. Honey is a commodity valued by the Germanic and Frankish peoples, it is one of their few sugary foods for sweetening their beverages.

Under the Merovingians, the Greek-born physician Anthimus wrote a dietary advice for the Frankish king [Theoderic I/Thierry 1^{er}](#) (r. 511-534): *"Drinking beer [ceruisa], mead [medus] and wormwood infusion [aloxinum] is best for all, because beer, when properly brewed, is a blessing and produces strength, like the barley infusion we make (though generally of a cold character).*

*Similarly, a well-prepared mead, if it contains a lot of honey, is very beneficial."*⁵³

Honey and mead hold a place of honour at the table of the Carolingian aristocracy.

The Council of Worms in 868 orders certain penitents to abstain from wine, mead and honeyed beer (*cervisia mellita*) three times a week. Honeyed beer is considered an "aristocratic" beverage. The fact that it is mentioned alongside wine and mead shows that abbeys and princely courts enjoy a luxury beer, strong and with added honey, which is intended to reassert the social status of the drinkers. In 895, the Council of Tribur reiterates this rule, which was not widely respected. Regino, abbot of the imperial abbey of Prüm in 892-99, orders this same penance against homicides, parricides and fratricides!

In the register of Prüm, it is said that a honey fee imposed on several tenants is paid with honey from bees found in the woods of the abbey, and that this honey is used to make claret (*hypocras*) for feast days and for disabled monks.

The third use of honey that interests us here is the preparation of honeyed beer (*mellita cervisia*), a luxury beverage reserved for members of the nobility. In 952, the German Emperor [Otton I](#) (912-973) confirmed to the abbeys of [Corvey](#) and [Herdford](#) their ownership of the churches of Meppen, Marsberg, Bünde and Rheina with the privileges granted to these churches. Each one will receive "4 pigs,



Figure 23: two Gallo-Roman altars found in Moselle, Metz Museum, featuring Nantasuelta, goddess of beehives and mead, and Sucellus, god of coopers and beer

⁵³ "Ceruisa bibendo vel medus et aloxinum quam maxime omnibus congruum est ex toto, quia ceruisa, qui bene facta fuerit, beneficium prestat et rationem habet, sicut et tesanae, quae nos facimus alio genere. [tamen generaliter frigida est.] " (digital.bib-bvb.de/view/bvb_mets/viewer.0.6.5.jsp?folder_id=0&dvs=1630445306919~341 f. 72v. www.bayerische-landesbibliothek-online.de/arzneibuch Beer-studies.com (2021)

*4 piglets, 4 geese, 8 chickens, 20 situlas of mead [520 litres], 20 situlas of honeyed beer [mellita cervisa, 520 litres], 60 situlas of beer without honey [1,560 litres], 120 loaves of bread, 100 muids of oats [5,200 litres] and 600 serfs in its service*⁵⁴. Corvey and Herford are imperial abbeys, under the immediate protection of the imperial power (Reichsunmittelbarkeit), independent of the bishops and the local aristocracy. Herford is a women's abbey in the Duchy of Saxony. Its successive abbesses are members of the imperial family. These generous allocations of beer with and without honey benefit the four churches that depend on Corvey or Herford. One can imagine the luxurious lifestyle of the two mother abbeys to which these churches belong.

Beekeeping and honey harvesting are controlled activities within the royal domains. The Capitulary De Villis orders: "*That each intendant have as many men employed in bees for our service as he has land in his jurisdiction*", meaning heathland and other wasteland rich in melliferous flowers (Capitulary §17).

Beer with honey is not a habit unique to the Germanic regions. All the abbeys in the empire harvested honey for their own use.

At the [monastery of St Bertin](#) (town of St Omer, northern Francia), "*a piece of land of 12 bunders [16 ha] subject to the payment of cens [terra censalis] yielded 2 setiers [3 litres] of honey*" to the monks (De terra censali bunaria XII, ueniunt de mel sextarii II, [Ganshof 1975](#), 147). It is assumed that this is 16 ha of heathland or fallow land with melliferous plants. The same monastery receives 3 setiers of honey from 5 bunders (old French bonnier) of arable land, 6 setiers from 1/16 of a bunders.

The abbey of Saint-Germain receives under [Louis the Pious](#) (r. 814-840) and [Charles the Bald](#) (r. 843-877), for the conventual manse alone, 8 muids of honey per year and 4 setiers per month, totalling 11 muids ≈ 572 litres of honey ([Guérard 1844](#), t. 1/2, 725).

Among the Bavarians, colonists and church serfs must give a tenth of the honey produced by their hives. In the Marini papyrus, settlers give 70 pounds of honey ([Guérard 1844](#), t.1/2, 726).

In the 9th century, the abbey of Corbie withdraws from its mayors (stewards of the manses) 3 muids and 12 setiers of honey due on Saint-Mathieu's day, and from its tenants of the Ternois, 39 situles, or approximately 10 muids. The mayor of Aguilcourt is required to offer 2 bottles or pots of honey to the abbey of Saint-Rémy de Reims every year ([Guérard 1844](#), t. 1/2 726).



Figure 24: bees and apiary.
Luttrell Psalter 1320

⁵⁴ "quantum satis sit eis dari ... ad singulas ecclesias porcis quatuor ..., IIII porcelli, IIII aucae, octo pulli, XX situlae de medone, XX de mellita cervisa, LX de non mellita, centum viginti panes, centum modii de avena, manipuli DC ..." [dmgh.de/mgh_dd ...](http://dmgh.de/mgh_dd...)
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Around 800, the Frisian Liudger founded the Werden Abbey on the banks of the Ruhr. At the end of the 10th century, his abbot Luidolf compiles a list of the fees levied by his prosperous abbey. The following excerpt concerns hamlets in East Friesland. The omnipresence of honey and the coexistence of beer and wine are noted, the former always in greater volume, but this is not the case everywhere. The document does not say whether honey is used to make mead or whether it enters into the composition of beer or wine ([Lebecq 1983](#), vol. 2, 387):

"Liuppo: 5 amphorae of honey and 6 sheep and 1 cow and 30 loaves of bread, fish, 10 cheeses and butter.

Tio: 4 sheep, 1 amphora of honey, fish, 10 cheeses, butter and a coat of precious wool (worth) 6 coins.

Folkmar: 5 sheep and 1 cow, 30 loaves of bread, fish, 20 cheeses and butter and eggs, 6 amphorae of wine, 15 muids of beer (cervisae), 10 muids of oats and firewood.

From the council in Pevishem: 5 sheep and 30 loaves of bread, fish, cheese, butter and 5 amphorae of wine and 12 amphorae of beer [cervisae]."

Honey is partly produced in apiaries, partly collected from wild hives in forests or meadows. The men who take care of the bees are called **apiarii**, or **cidelarii** in diplomas dating back to the 10th century. An apiary (**apiarium**, **apile**, **apiculare**) is placed under the roof of the house or in a remote place. Among the Bavarians, hives are made of wood, bark or tree branches. When beehives built in towns or villages disturbed the inhabitants, the Visigothic law ordered them to be moved to uninhabited places. Much of the honey is collected in the woods, where trees are prepared to house the bees. These trees are marked with signs to show the master's right over the swarm. If someone finds bees in his wood, either in the crack of a rock, or under a stone or in a tree, he must mark the place with three X's, and not with one, to make fraud more difficult. Whoever steals another's bees must give back twice as many and receive 20 lashes. Hive theft, **apis**, **vas** or **vasculum apum**, is punished more or less severely. The Bavarian law prescribes the formalities that the master of a swarm must fulfil in order to take it back when this swarm has lodged itself in another's tree or hive. Among the exorcism formulas, there is one for gathering a scattered swarm of bees "**ad revocandum examen apum dispersum**".

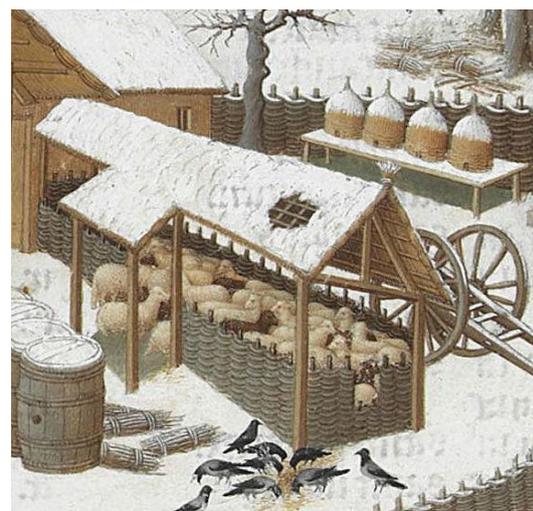


Figure 25: hives and sheepfold in February. Très Riches Heures of the Duke of Berry, 1410.

4.1.7 The beer ferments (beer starters) and the leaven

This is one of the most challenging issues in the history of brewing. Sources are scarce but the question is pivotal. A few clues point to a certain mastery of beer ferments during the Carolingian period: the coupling of brewing and baking, the expressions used *to make beer rise* (*unde levarantur cerevisiae*) (4.2) and *sprinkle/scatter* [the wort with a ferment] *conspergere* (3.4), later the gruit technique referred to as *fermentum* (4.2). These expressions suggest that the seeding of the beer wort is a relatively well monitored and voluntary action. It is not always left to the chance of fermentations born of yeasts impregnated in the wooden walls of barrels or tubs, at least inside the cellars of the abbeys.

We know nothing about the techniques used to brew the domestic beers of the laity, at least not until the 13th century. Walter de Bibbesworth's *Tretiz* uses two technical terms around 1234-35: *geeste* (in Old French; Gallic root **jesta*; modern English *yeast*) and *berme* (Old English *beorma*; mod. English *barn*) to designate the yeast collected from the foam of the fermenting beer (appendix 9.7). Since a technical term refers to a technical action, we can infer that the brewers of the 13th century knew how to collect and reseed the yeast. Was this the case under the Carolingians, four centuries before the *Tretiz*?

The *Tretiz* raises another issue: written in the two vernacular languages of its time (Old French and Anglo-Norman), it provides us with a richer technical vocabulary for beer brewing than the Carolingian texts do. These latter are accustomed to latinising the common technical terms of brewing borrowed to the vernacular languages (*brace*, *cervisia*, *humlonem*, *serraculo*, *tybrum*, etc.) or to construct technical periphrasis (*frumenti vel hordei succo* = bersil/wort). The technical vocabulary of the lay brewers was undoubtedly richer than what the Latin clerical texts reveal, and with it their practice certainly more advanced, in particular for controlling the density and fermentation of the wort.

These few indications say nothing about the techniques used, except that the spectacular fermentation of beer (like that of wine) is the subject of great attention. The yeasts that rise with the foam during the first tumultuous phase of fermentation are collected. They are also used to rejuvenate and reactivate the yeast in the bakery. Is there technical cooperation in the reverse direction, baker's yeast used to prepare beer ferments? This is the very question of *grutum*. Before the introduction of hops, whose technical role has been overestimated under the Carolingians, brewers knew how to monitor fermentation and probably control certain parameters by eye, taste and touch: foam, effervescence, temperature, sugar content, beneficial lactic or acetic acidity, alcoholic flavour, various tastes and even putrescence.

In the cellars of the abbeys, the fermentation and storage barrels have a large capacity (Diagram 6). They are home to an evolving and complex population of microorganisms. We believe that these barrels are the true reservoir of beer ferments. The constant addition of wort and the daily racking of the beer maintain Beer-studies.com (2021)

a flora of yeasts and bacteria in the barrels whose biological balance is maintained over time.

The barrels were not airtight. At that time, beer and wine drinkers did not expect standardised tastes from their fermented beverages. The glass bottle and the cork were not yet available. The beer evolved in the barrels over the course of the day. The range of accepted flavours and aromas for beer is probably much wider than it is today. A modern nose would reject the sour fermented soups and dairy products, the pickled meats and marinades of Carolingian cuisine. The range of herbs added to fermented beverages and medicinal tonics is very wide (appendix 9.4 & 9.5). Most of these plants also have an antiseptic role.

For the question of beer ferments, which should not be confused with yeast, see the question of gruit in 4.2.

4.1.8 The water to brew the beer

There are no texts concerning water in direct relation to beer brewing. This essential ingredient posed two problems for the Carolingian brewers: its quantity and its quality.

Our information on the water supply of the breweries is indirect. Abbeys are always established near a regular source of drinking water (resurgence, river, well). The stories of the creation of monasteries or hermitages illustrate the sanctity of the founder by the miraculous discovery of a pure water source or an ancient hidden well. Water mills associated with breweries multiplied under the Carolingians (4.3). On the map of breweries in the Meuse from 800 to 1350 drawn up by [J. Deckers](#) (5.3), the majority of them are unsurprisingly located along rivers, or near rivers and lakes. Where water was scarce, the tenants had to carry it to the abbeys. The Prüm register shows two servile manses responsible for bringing water and messages to the abbey ([Guérard 1844](#), t. 1/2, 774).

The quality of the brewing water and the care taken by the monks to protect it are illustrated by the Benedictine abbey that was added between 959 and 988 to the [cathedral of Augustin founded at Canterbury](#). The plans, drawn later by Prior Wilbert between 1153-1167, show an extraordinary conception of water circulation, taking advantage of the topography of the land (Map 4). On a hill one kilometre south of the cathedral, a spring protected by a tower feeds a

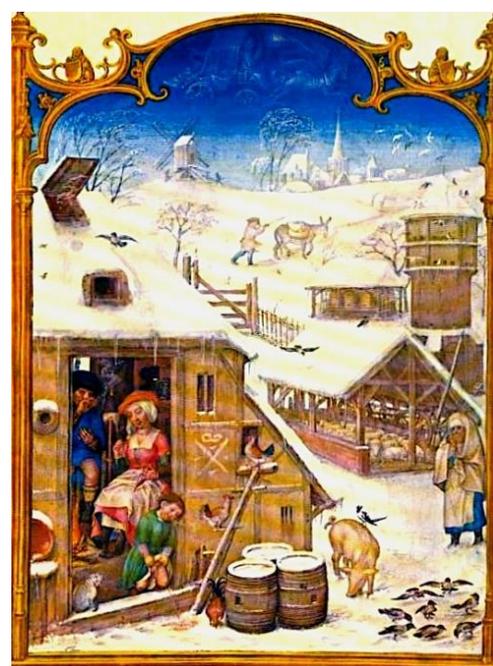
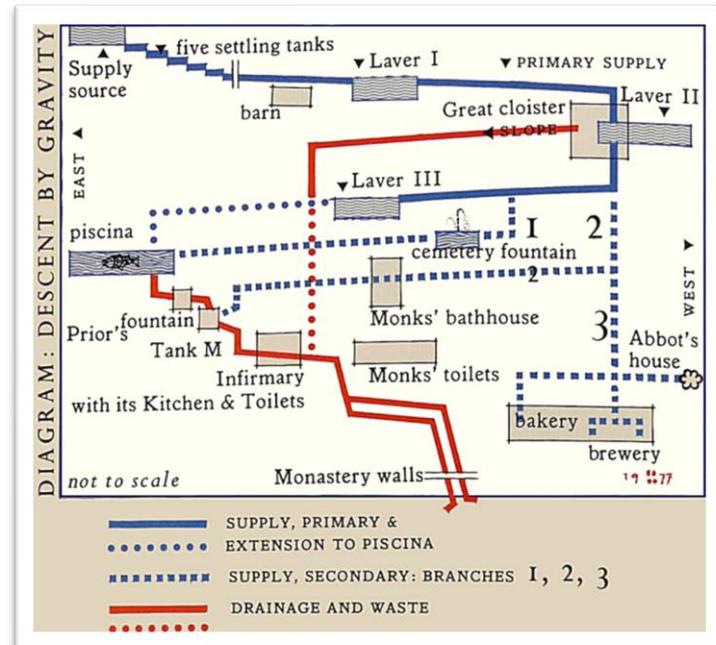


Figure 26: villagers living with polluted water amidst domestic and wild animals. February. Breviario Grimani, Flanders 1510-1520. Biblioteca Nazionale Marciana Fol. 2v.

sophisticated hydraulic system: a primary circuit for clean water coming from the spring and a secondary circuit for waste water⁵⁵.

The primary circuit irrigates fields (*campus*), vineyards (*vinea*) and fruit gardens (*pomin*) with five large reservoirs, before flowing towards the abbey and serving the cathedral, its gardens, a washhouse, the large cloister and a second washhouse, then the refectory (*refectorium*) and the dormitory (*dormitorium*) of the monks (Map 3). From there it divides into three branches. The first branch (1) flows to a third washhouse, a fishpond (*piscina*), then the priory, a reservoir, the cemetery fountain, the infirmary (*infirmorium*), its kitchen and toilets. The second branch (2) leads to the baths and rooms (*balneatorium* and *camera*) of the monks. The third branch, which is of interest to us here, first supplies the monks' kitchen (*coquina*), then the brewery (*bracinum*), the bakery (*pistrinum*) and the granary (*granarium*). No waste water comes out of these three buildings. A clean water pipe leads from the bakery to the abbey gate (*porta curie*) and the abbot's quarters (*aula novae*).



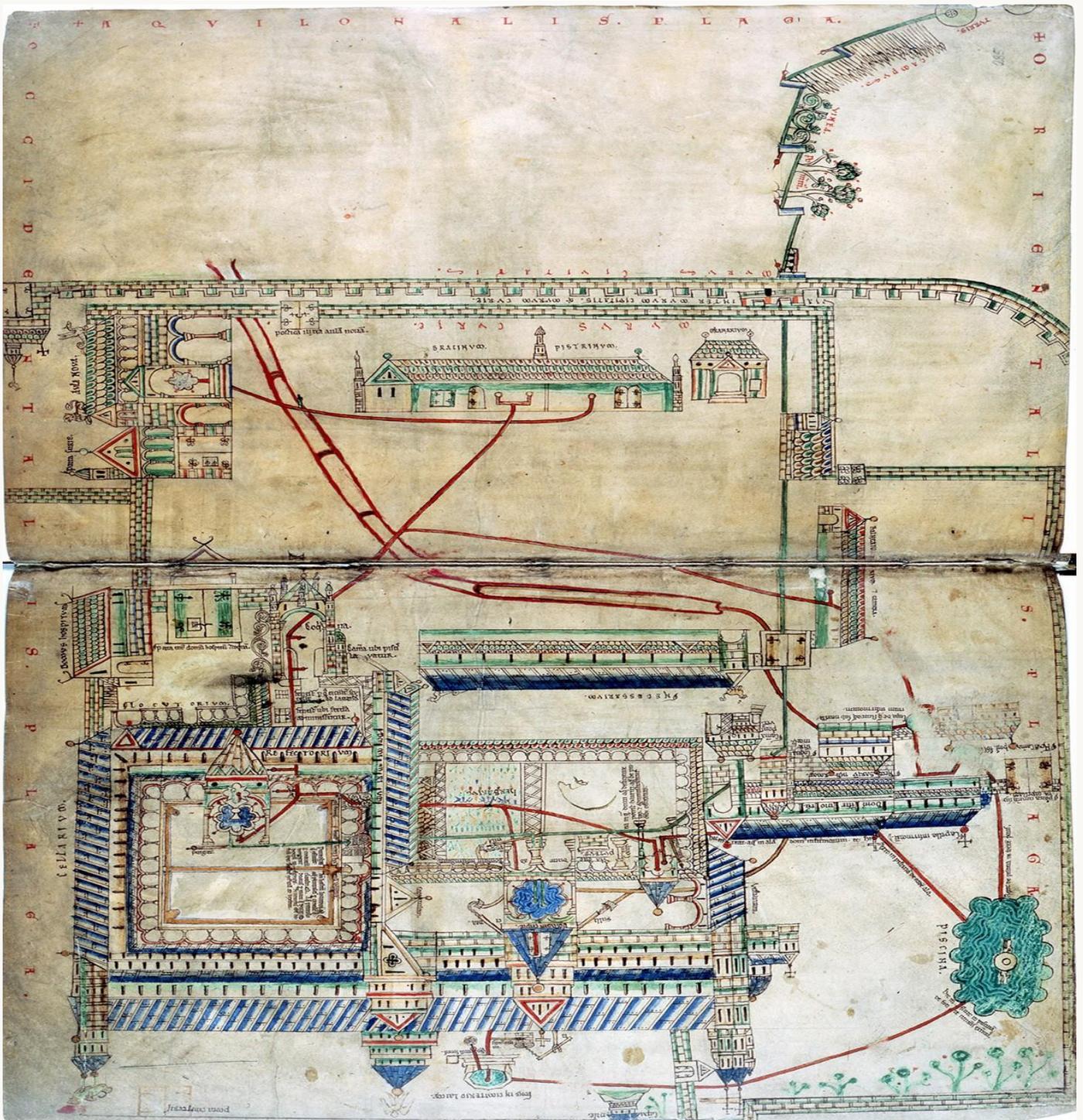
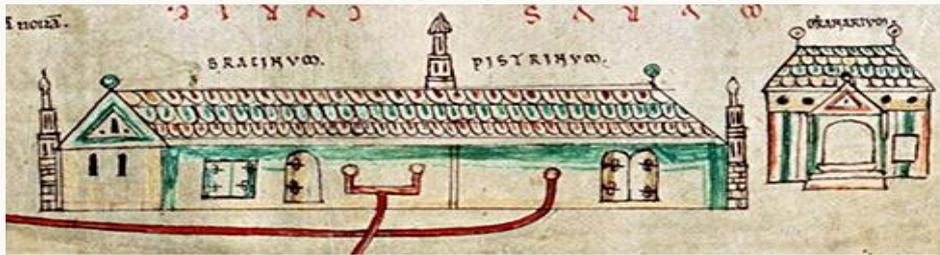
Map 3: Canterbury abbey. Water management. [Horn & Born 1979, Vol. 1, 72.](#)

The technical complex of brewery, bakery and monastic kitchen is well isolated on the plan and clearly associated with the clean water circuit. The concern for hygiene in order to brew a healthy beer is a major preoccupation of abbeys. Charlemagne indicates the same concern for hygiene in the brewing of healthy beer (*cervisia bona*) and forbids the barefoot treading of grapes (Capitulary of Villis). Canterbury's builders took advantage of the slope of the land to make water circulate by gravity and cleverly separate clean and dirty water. The plan was drawn around 1160, but the abbey's layout and lead pipework may date from the Norman conquest (1066). The complete reconstruction of the abbey complements the pattern of Benedictine abbeys in Normandy under [Dunsthan](#), the 10th century Archbishop of Canterbury. We know how important beer was in England in the monastic world at that time, and since St. Columban in the 6th century.

The Canterbury abbey's second circuit, that of sewage, collects the water from the great cloister and cathedral, the fishpond, under the necessarium (see St Gall's plan 3.1 for comparison), the infirmary, under the curia, under the southern wall of the monastery, and it flows away from there.

⁵⁵ About 10,000 litres of fresh, pressurised water flowed every hour from a spring-fed pond one km to the south of the cathedral. A plan of such detail was needed in case of repairs of the lead pipes; its accuracy has been attested in subsequent excavations.

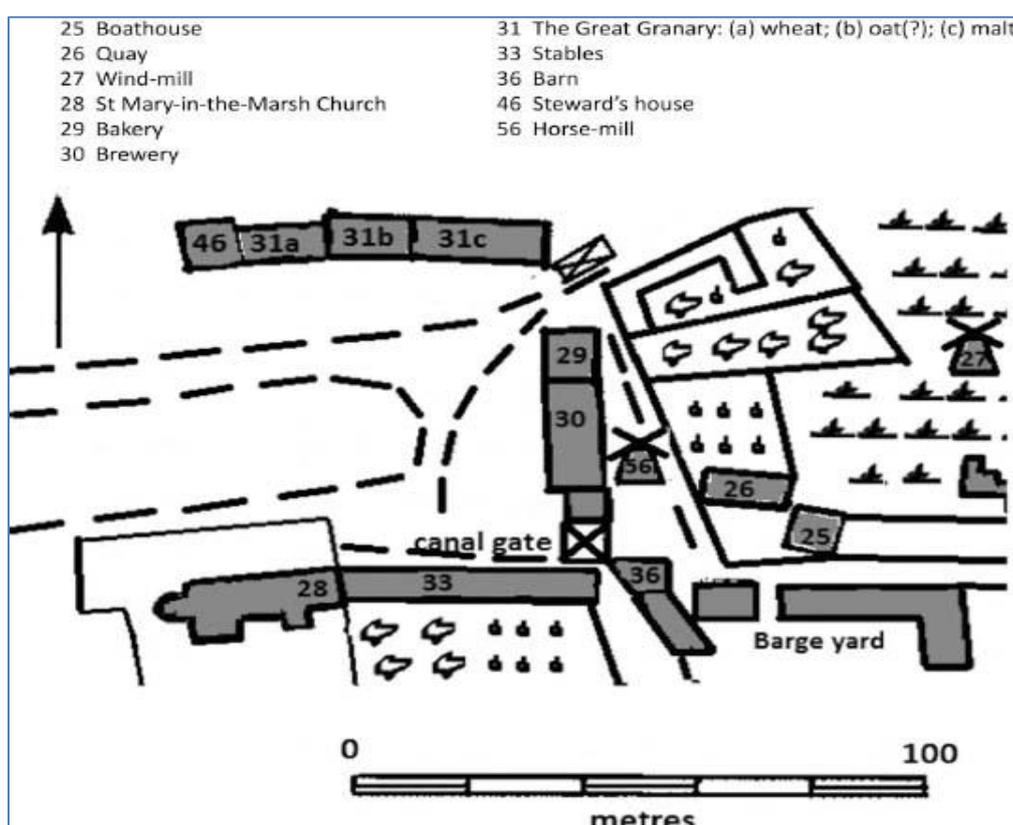
Side by side, the brewhouse (bracium), the bakery (pistrinum) and the barn (granarium), the perfect trilogy of grain processing.



Map 4: Canterbury Abbey and its water management (Eadwine Psalter, 1160). To the north, the spring, the gardens and then circuit 1 (dark green) leading down to the great cloister. In red, the water circuit 2 supplies the brewery and the bakery. [Download plan](#)

The spectacular waterworks of Canterbury and St. Gallen were designed for the comfort and health of the monks who benefited from the wealth accumulated by the abbeys. Ordinary people live among dirty water, animals and filth, suffer from illnesses and stomach aches, and drink more or less healthy beer. The cooking of the wort and the aromatic plants do not protect beer stored in unsanitary places in villages for long. This is not the case in abbey cellars. For centuries to come, low-alcohol beer will carry the reputation of a dubious beverage if it is not drunk immediately after fermentation.

The plan of Norwich Cathedral Priory shows also the brewery and bakery side by side along a canal. Both are very close from the main barn which can store up to 15,536 hl of grain (Slavin 2012, fig. 2.2 et 6.1. Map 5).



Map 5: brewery (30) and bakery (29) near the main barn (36) and canal. Norwich Cathedral Priory (after Slavin 2012, fig. 6.1).

An amazing anecdote from the Chronicle of the Monastery of St. Peter in Erfurt for the year 1295 tells of people besieged in a fort (*castrum*) and deprived of water. They have only beer [*cerevisia*] to drink for themselves and their horses, and are forced to make their bread with beer, which gave them courage and saved their lives⁵⁶.

⁵⁶ "Quo prodito et auctoribus huius vendicionis iussu regis miserabiliter trucidatis, cum hii qui super castrum erant tanta aque carencia urgerentur, ut et equis cerevisia potus esset, et panes cum cerevisia coquerentur, cum fortissime, non absque dampno regii exercitus hactenus restitissent, has una compulsi necessitate castrum dederunt, permessa sibi et rebus et vita ac libertate."

dmgh.de/mgh_ss_rer_germ_42/index.htm#page/313/mode/1up
Beer-studies.com (2021)

4.1.9 The wood for barrels and various brewing utensils

Cooking the wort and making barrels are the two main uses of wood in brewing, along with the making of tubs, buckets, troughs and various wooden utensils for stirring the mash, carrying the hot water, pouring the wort and removing the spent grain. The wood and all these tools were once again objects of tribute required of the tenants in the service of the monks. It is therefore on the side of those who work that we must look for the specialist craftsmen, the foresters, coopers and carpenters, not on the side of those who pray.

The Polyptych of the Saint-Germain abbey lists the work that the inhabitants of the fisc of Boissy must do for the monks. It mentions the brewing work carried out by the inhabitants: a fee of 780 staves with the hoops to get 36 barrels made by coopers; a fee consisting of 60 barrels with a capacity of one muid, a boiler and various utensils, imposed on the forester, which presupposes several other professions related to iron and copper works ([Guérard 1844](#), t. 1/1 472). The main royalties exacted from the tenants of St Germain consisted of money, livestock, poultry, wine, wheat, malt, hops, mustard and flax; woollen and yarn fabrics; honey, wax, oil and soap; iron and various metal or wooden implements; firewood, stilts and chariots; tons, staves, hoops and muids; shingles and roofing boards; torches and miscellaneous objects ([Guérard 1844](#), t. 1/2 703).

The plan of St. Gallen includes a workshop for the coopers, close to the monks' brewery (**3.2.3**). The barrels are not only used in the cellars. Beer is transported in barrels of one muid (52 litres) or smaller. These barrels are delivered to the gates of the abbeys when they run out of beer or choose to brew their beer outside their walls like the supra-abbey of Saint-Germain.

Barrels are used to carry the beer within an estate, between a brewer and his inhabitants, between a brewer and the lord of that estate.

Beer barrels are also an essential tool in the beer trade, which begins to flourish in the 1200s from the merchant cities and river ports of northern Europe.

4.1.10 The transport by hand or by cart



Figure 27: hay conveyance by cart. A late illustration, c. 1540 (Golf Book, fol. 44)

The Carolingian brewery generates multiple conveyances: that of the ingredients (grains, malt, hops), that of the spent grains and that of the beer itself.

One of the best examples of the carriage of ingredients is provided by St Bertin's Abbey. The tenants of its estates must deliver malt and flour every year (Table 8). The manses (farms) of the tenants are clustered in 14 villages around the abbey, about 20-25 km apart (Map 6), except four of them located much further away. Each year, each village has to bring to the abbey an average of 100hl of malt and 50hl of flour counted per muid (a sack of 52 litres). The malt carried from all the villages does not converge toward the abbey all at once. In all cases, the fractioned deliveries meant that the malt had to be brought in by water, given the geography of the [Audomarois](#), the abbey location between Artois and Flanders, or by oxcart at a rate of 12 muids per cart (*corbe*).

Intra- and inter-domain transport was therefore of crucial importance for the abbeys whose economic lifestyle was the opposite of autarky. St Bertin's relies entirely on its tenants to obtain malt, unlike St Gall's, whose plan includes a malt house.

The Carolingian system distinguishes between farms according to the transport service they are required to perform. The *mansi manoperarii* were those who had to do manual work. The *mansi carroperari* were required to transport goods by cart or to carry them on their backs. The *mansi paraveredarii* have to provide fresh horses to transport luggage, aristocratic families, abbots or imperial envoys ([Guérard 1844](#), t.1 vol. 2, 596).

The plan for St. Gallen includes a workshop for wheelwrights, adjacent to the cooper's workshop and close to the monks' brewery (3.2.3).

4.2 The question of the gruit (**grut, grutum**)

We will briefly survey the topic of gruit (**grutum, fermentum, scrutum, materia, mairia, maceria**), a mixture of herbs and berries. Its composition and use have changed over time. In Carolingian times, it consisted of Mirtus (*Myrica gale* L. or gagel, custus), a plant of marshes and wet soils, wild rosemary (*Ledum palustre* L.), Silphium (*Laserpitium siler*, or *Serpentium*), and laurel berries (*Laurus nobilis* L). Some plants that are later used in the composition of gruit are not among those mentioned in the Capitulary De Villis (appendix 9.2) or the St Gallen Plan (appendix 9.3), namely the myrtle or bog-myrtle (*Myrica gale*), the yarrow or common yarrow (*Achillea millefolium*) and the wild rosemary (*Rhododendron tomentosum* or *ledum palustre*). These wild plants were probably collected in the wetlands of the estates and not cultivated in the gardens.

The preparation of gruit is not described under the Carolingians, which does not mean that it was kept secret. The known recipes for preparing gruit date from the 14th and 15th centuries ([Deckers 1971](#), [Verberg 2018](#)), when the craft of beer brewing in an urban context changed significantly. The technical role of gruit is a matter of debate. Some see it as a combination of plants to flavour the beer, and secondarily to colour it (**pigmentum**). Others see it as a special malt, or even a sweet malt concentrate. Others see it as a ferment for beer (**fermentum, levariantur**). The first mention of gruit is found in a diploma dated 999 issued by Otto III in the church of St Martin in Utrecht ([Deckers 1970](#), n. 49), and raises the question of its technical function. Otto grants a right to "*general trade in beer ferment, commonly called grutt*" ("*negocium generale fermentatæ cervisiæ, quod vulgo grutt nuncupatur*")⁵⁷.

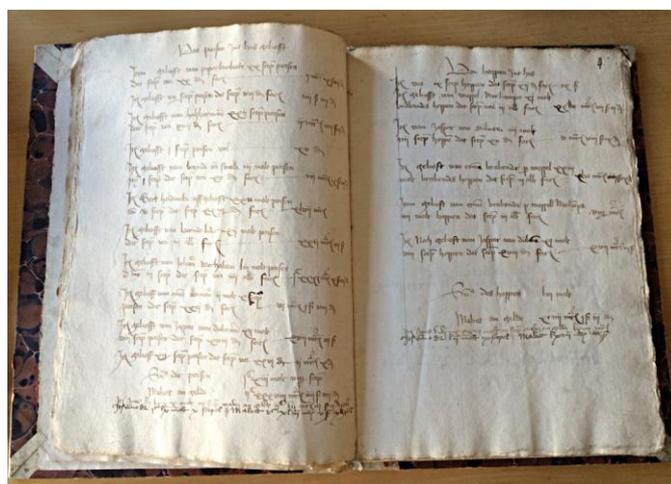


Figure 28: Gruit accounts of the city of Münster c. 1450. On the left page, declarations of 'porsen' (bog-myrtle or wild rosemary?), on the right that of hops verlorenbieren.nl

If gruit = leaven, its purpose goes beyond being a simple flavouring. In 1138, a letter from Abbot Rudolf of St. Trond's Abbey to his steward Walerammum mentions the gruit (**scrutum**) able to leaven beer and which the bishop of the city provided to the friars: "... cum consilio amicorum suorum donavit eidem ecclesiae et fratribus inibi Deo servientibus scrutum eiusdem oppidi, hoc est potestatem ponere et deponere illum qui materiam faceret, unde levariantur cerevisiae, et de singulis cerevisiis quae brasciarentur in oppido nostro sex picarios ad opus fratrum

⁵⁷ Two texts from 946 (Otto I) and 977 (Otto II) refer to **materia cervisiæ** (beer product) as gruit. The first document is suspected of being a forgery. This does not invalidate the wording used.

suscipere, quod ad servitium suum et antecessorum suorum pertinebat"⁵⁸. We are dealing here with the gruit used to ferment the beer (*unde levarentur cerevisiae*), not with a mixture of herbs with or without hops. *Levarentur* means to make the beer rise, to make it foam in full fermentation⁵⁹.

The paucity of Latin brewing vocabulary has been used to give the term *fermentum*, which describes gruit, the general meaning of an additive or flavouring for beer. This is the opinion of Deckers and Unger. Susan Verberg has provided an excellent summary of this unresolved issue ([Verberg 2018](#), 68 and Appendix I). Experimental archaeology can shed light on this by testing the possibility of a gruit = beer ferment⁶⁰.

Discussions about gruit are confusing because its manufacture and trade gave birth to a "gruit right" (*grutum*), a source of ecclesiastical income in the Middle Ages. This privilege was gradually challenged by the use of hops in brewing in the 13th century. This led to the belief that gruit and hops had exactly the same technical function in beer brewing, namely a dual role of sanitising and bittering. There is no evidence for this. Moreover, two fundamental issues are being overlooked in this debate. On the one hand, the mastery of ferments was more advanced in the Middle Ages than one might think, with the technical coupling of baking and brewing and the widespread use of aromatic plants with antiseptic properties to make fermented beverages (appendix 9.4 et 9.5). On the other hand, plants that are sources of microorganisms, some of which are able to hydrolyse starch, are used in medieval 'cooking', which calls upon many wild plants, roots and tubers.

Historians of European beer assume that medieval brewing is merely a prehistory of modern Western brewing technologies, with the formula beer = malt + water + hops + yeast as the only guideline. The gruit dossier shows that medieval techniques are both more complex and more diverse than one might imagine. Brewing techniques are based on pragmatism, a very good knowledge of the plant world, and effective know-how in the fields of food and phytotherapy (example of [The Lorsch Pharmacopoeia](#). Appendix 9.5). There is nothing to support the vision of a rudimentary medieval brewery and primitive, barely drinkable beers. The available documents say otherwise.

⁵⁸ Epistola Rodulfi abbatis ad Walerammum ducem, 1138.
dmgh.de/mgh_ss_10/index.htm#page/325/mode/1up

⁵⁹ The charter of the bishop of Metz, Thiéri, to the monastery of Saint-Trond, in 1064, states: "*Scrutum vel grutam, materiam unde levarentur cerevisiae.*" That of the Count of Guelders to the nuns of Ruremonde, in 1218: "*Fermentum cerevisiae quod vulgo grut nuncupatur.*" verbatim of the text written by Oton III in 999, a formula copied ad libitum.

⁶⁰ Today's gruit beers revive its flavour version and argue for replacing hops with other plants. The gruit=*fermentum* (beer ferment) version raises much more interesting technical and historical questions. Experimental testing: a mixture of raw grain + malt + gruit plants, fermented and dried = *fermentum* that can be stored and used to brew beer.
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4.3 The mills (**molinis**) and the millers (**molinarius**)

The water mill (*molendinum*, *molinis*, *farinacium*, *farinari*) is of central economic importance in the Carolingian period. The millers are the main actors in the processing of grain, a portion of which goes into the hands of the brewer. This technology, already known to the Romans, was revived in Europe from the 7th century onwards in Italy and Catalonia. From the 8th century onwards, northern Europe is gradually covered with mills, from the Rhineland, the large domains between the rivers Loire and Rhine, all the way to England (*Domesday Book*). The hydraulic mills proliferate along the large rivers and smaller rivers. The saturation of waterways with hydraulic mills, their competition, and the ensuing conflicts between lords, favoured the construction of windmills in the 11th century and the development of new sites to grind grain ([Champion 1996](#), [Arnoux 2008](#)).

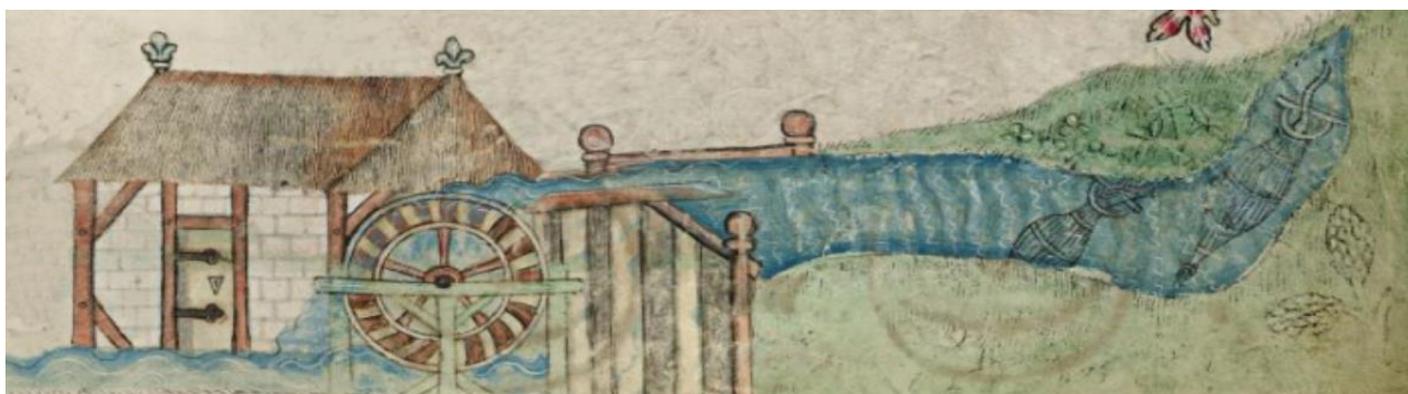


Figure 29: hydraulic mill and fish traps (Luttrell Psalter f181.r, 1320)

The imperial estates own breweries associated with the mills. The grain is malted by the millers who then have to crush it : “That each steward shall make an annual statement of all our income, from the oxen which our ploughmen keep, from the holdings which owe ploughing services, from the pigs, from rents, judgement-fees and fines, from the fines for taking game in our forests without our permission and from the various other payments [fees for a late payment of the cens]; **from the mills** (*molinis*), forests, **breweries** (*cambis*), bridges and ships; from the free men and the hundreds which are attached to our fisc; from the markets; from the vineyards, and those who pay their dues in wine; from hay, **firewood** and torches, from planks and other timber; from waste land; from vegetables, millet and panic; from wool, linen and hemp; from the fruits of trees; from larger and smaller nuts; from the graftings of various trees; from gardens, turnips, fishponds; from hides, skins and horns; from **honey** (*melle*), and wax; from oil, tallow and soap; from **mulberry wine, boiled wine, mead** (*medo*) and **vinegar** (*aceto*), from **beer** (*cervisa*) and from new and old wine(*vino novo et vetere*), from new and old grain, ...” (Capitulary De Villis §62).

Carolingian breweries and mills are often joined in the documents: no *cambis* without a *molinis* nearby. The census of one agricultural estate often brings together malt (*braces*) and flour (*farina*), and more generally milling (*moltura*, Beer-studies.com (2021)

annona), for example at St Bertin (Table 8). Or else on the estates of Montier-en-Der (Haute-Marne, France): in Sommevoire "They have a mill here that produces 80 muids of wheat and 20 muids of malt [bratio]", in Ragisicorte and Milperario "3 mills and 1 brewery that produces 84 muids of oats and 30 muids of malt". The technical explanation is obvious. The miller (molinarium) has the facilities to crush malt, a crumbly grain that is easier to grind than raw grain. There is also an economic and fiscal reason. The miller is involved in the trade, transport and storage of grain. Malt is managed as one category of grain among others. A large part of the fees on the making and carriage of the malt are levied through the activities of the miller.

The construction of a mill is the subject of heavy work (Champion 1996). In return, the mills generate considerable royalties for the abbeys and the landed gentry. They levy a milling fee, 1/16th of the grain brought to the mills or of the flour produced. Cereal production is already taxed once at its source (cens and tithes). The mills are the means of taxing the grain a second time (milling duty). This is also the case for brewing through the tithe or cens, which is levied on the beer brewed (third tax). The cities will soon invent a fourth levy in the form of fees on the grain and beer sold in their suburbs and within their walls.

Pierre Toubert (2004, 70) concluded that "... the early Middle Ages did not ignore either the spread of the watermill nor, consequently, a significant capacity for seigneurial investment in the construction and maintenance of rather complex and costly technical devices, such as mills and breweries."

Table 7 summarises the volumes of grain brought to the abbeys by the mills working on their reserves, thus without taking into account the royalties levied on the manses. Given the average annual consumption of 340 litres of grain per nun or monk, we can observe that the mill levies provide the bulk of the grain used to produce the monks' food and beer.

Abbeys	Muids/year from rents	HI/year	Portions of 6,5 muids/year*	Clerics number
St-Pierre de Lobbes	497	258	76	71
St-Germain-des-Prés	4923	2560	757	250
St-Bertin	451	235	70	83
Montier-en-Der	258	134	40	?
St-Rémi de Reims	472	245	72	416
Wissembourg (mid 9 ^{ème})	330	172	51	?
Wissembourg (early 10 ^{ème})	419	218	64	?
Prüm	399	207	61	66
(*)6.5 muids (340 litres) of grain consumed/year by the nuns of N-D. de Soissons, the reference portion for the abbeys of men or women.				

Table 7: royalties from mills set up on the abbeys' reserves (after Champion 1996, 69)

The Directives of Corbie even specify that the miller must be freed from the ordinary tasks (servitium) assigned to the other tenants: "Thus we do not want him to perform any other services, neither with a cart, nor with a horse, nor manual work, nor ploughing, nor sowing, nor reaping fields or meadows, nor making malt,

nor hops, nor cutting down trees, nor doing other necessary things on the estate than taking care of himself and his mill".⁶¹.

The malting and the cultivation (or collection) of hops are both tied to the work of the miller, a custom which explains why the abbot Adalhard in Corbie wants to spare the miller these chores in order to improve the management of his abbey. Moreover, the Carolingian period witnesses the multiplication of hydraulic mills which leads to a closer cooperation between millers and brewers, and creates the ideal technical complex for brewing: water + grain + malt + millstones + brewing utensils. It is understandable that hops is also grown by both of them.

The abbey of St Bertin (St Omer, Pas-de-Calais) offers a good example of this technical association. On its estates, each tenant occupying with his family a farm (manse) of 12 bunders must deliver each year 10 muids of malt (*brace*) and 6 muids of flour (*farina*), respectively 520 and 310 litres ([Ganshof 1975](#), 95). According to the Polyptych written between 844 and 859, all the manses submitted to this service have to deliver 1,066hl of malt to the abbey each year, about 58 tonnes ([Table 8](#)). This figure should be compared with the 40 tonnes of malt consumed annually at Corbie Abbey by the monks, provenders and servants ([Table 2](#)). Given that we ignore the total number of occupants at St Bertin's abbey (≈ 83 monks around 820, servants? provendiers? compared to 200 brethren at Corbie), it appears that St Bertin's, which was much richer in malt, must also have traded in it.

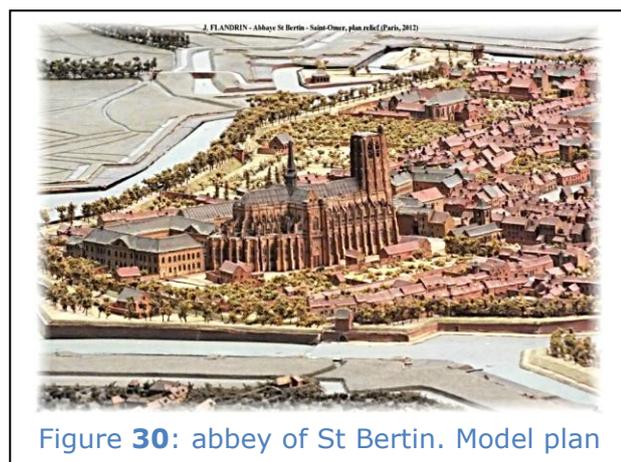


Figure 30: abbey of St Bertin. Model plan

The milling of flour is also a heavy and time-consuming task for that period. The conversion of the volume of grain to flour is problematic. We know neither the composition of the flour, nor its density, nor its degree of sifting. Nevertheless, we can estimate the work done by these 196 millers, as well as the organisation behind these regular deliveries to the abbey. At St Bertin (c. 844-859), a mill in the immediate vicinity of the abbey is *ad opus eorum*, available to the servants of the monastic community who operate it directly ([Ganshof 1975](#), 190).

According to the calculations of the abbot Adalhard of Corbie and the monastic regulations of the year 815, 30 loaves of 1.5kg each can be baked with 1 muid (52 litres) of spelt flour ([Hocquet 1985](#)). The provost of Corbie collects 9,000 muids of spelt grain/year = 468,000 litres ([Levillain 1900](#), 357). These grains are carried to the abbey by 750 carts (1 *corbe*=1 cart carrying 12 muids pulled by an ox), i.e. 2 carts/day or 24 muids of grain/day⁶². After milling, the abbey gets 15 muids of

⁶¹ "Et ideo nolumus ut ullum alium servitium, nec cum carro, nec cum caballo, nec manibus operando nec arando nec seminando, nec messis vel prata colligendo, nec braces faciendo, nec humlonem, nec ligna solvendo nec quicquam aliud ad opus dominicum faciat, sed tantum sibi et suo molino serviat." ([Levillain 1900](#), 359)

⁶² With foresight, Adalhard calculated 730 corbes of grain per year + 20 corbes of relief.
Beer-studies.com (2021)

spelt flour/day (5,475 muids of flour/year): grain/flour ratio \approx 62% for the sifted flour to bake the white bread eaten by monks and guests. This is not the bread of the servants or serfs made from poorly or slightly sifted wholemeal flour. At Corbie, the monks and their dependents eat 450 loaves of white bread per day (1 muid gives 30 loaves/breads of 1.5kg according to Adalhard). Each loaf contains an average of 1.73 litres or 0.56kg of spelt flour. The leavened and baked white bread weighs about 800g (if we apply a modern ratio: 710g spelt flour => 1kg bread).

Annual supplies of malt and flour to the abbey of St Bertin between 844 and 859					
Abbey's estates	Numbers of farms	Muids of malt/year	Muids of flour/year	Litres of malt/year	Litres of flour/year
Quelmes (Kelmis), 650 ha	15 manses	150	90	7,800	4,680
Moringhem (Morningehem), 754 ha	12 manses with work chores	0	0	0	0
Acquin (Atcona) et Selem 1033 ha	24 manses	240	144	12,480	7,488
Bayenghem-lès-Éperlecques (Beingavilla), 1059 ha	8 free tenants. 2 days/week a carriage chore	0	0	0	0
Coyecques (Coiac), 690 ha	21 manses (6 free, 15 servile)	210	126	10,920	6,552
Ruminghem (Rumingahem), 109 ha	2 manses	20	12	1,040	624
Poperinge (Pupurninga), 2398 ha	47 manses	470	282	24,440	14,664
Passendale (Pascandala), 83 ha	3 manses	30	18	1,560	936
Wizernes (Weserinio), 789 ha	18 manses	180	108	9,360	5,616
Audrehem (Aldomhem), 767 ha	15 manses	150	90	7,800	4,680
Escalles (Scala), 454 ha	16 manses	160	96	8,320	4,992
Guines (Gisna), 945 ha	16 manses	160	96	8,320	4,992
Thérouanne (Teruanna), 290 ha	10 manses	100	60	5,200	3,120
Tubersent (Thorbodeshem), 589 ha	18 manses	180	108	9,360	5,616
Total vol. (muids/litres)		2050	1230	106,600	63,960
Total weight (kg)				63,960	*31,980
* 1 muid = 52 litres of grain or flour. 1 litre of dry crushed malt \approx 0.6kg. Average volume weight of flour \approx 0.5kg (Appendix 9.1).					

Table 8: annual deliveries of malt and flour to the abbey of St Bertin according to [Ganshof & al. 1975](#).

If we apply these ratios to the abbey of St Bertin, 1,230 muids give 36,900 loaves, or 101 loaves of 1.5 kg/day⁶³. The consumption of flour in St Bertin is lower than in Corbie, but not for malt. However, [Table 8](#) may not capture all the

⁶³ Or this calculation: 1kg of baked bread requires 710g of spelt flour. 31,980kg of flour at St Bertin = 45,042 loaves of 1kg/year, or 126-127/day. However, the abbeys eat bread of various sizes (900g, 1.1kg or 1.3kg) and qualities. These assumptions based on white spelt bread from Corbie should be taken with a pinch of salt!

grain estates owned by St Bertin, or some of the grain due to this abbey may be traded.

Fees discharged in malt are sometimes paid by farms, as can be seen in St Bertin or in the polyptych of Saint-Amand which mentions a large number of manses taxed at 4, 5, 6, 8 and up to 10 muids of malt per year, this being often imposed on the millers. On the lands of the [Prüm abbey](#) (Rhineland-Palatinate), two mills owe 10 muids of malt, two others 40, two others only 5 muids. In 770, the charter of Count Boson in favour of the abbey of Gorze mentions two mills which owe 42 muids of flour and 10 muids of malt each (*Farinarios duos: unus solvit modios XLII de farina et decem de brasio; alius vero modios xx de farina et decem de brasio*. [Guérard 1844](#), t. 1/2 712).

A Carolingian mill is multi-purpose: providing flour for the bakery, grinding raw grain and crushing malt for the brewhouses ([Champion 1996](#), 68). We know that spelt and oats were delivered in the form of raw grain crushed by millers, or by tenants with hand mills. The millers are required to deliver the *annona* (ears of cereals), the *annona viva* (threshed and winnowed grains), the *mixtura* or *annona mixtura* (a mixture of grains or meslin), and the *multara* (grinding, milling, that is flour with bran).

The Statutes of Corbie speak of an obligation on millers in relation to flour and malt. They must possess a specimen of the new 52-litre muid, introduced by Charlemagne before 794, in order to properly measure the volumes of flour and malt they produce or which pass through their hands (*et secundum haec modia quantum eis convenit sic solvant inantea eorum censum sive de annona sive de brace*, [Levillain 1900](#), 359). Far from being mere mill attendants, millers are true craftsmen who also work for themselves, receiving, selling or exchanging grain in various forms ([Verhulst & Semmler 1962](#), 243-244).

4.4 The malthouses (*malatura*) and maltsters (*braciatores*)

The malthouse (*braiserio domus, malatura*) is more rarely mentioned than malt in texts. We find its trace at Liège in a testament of 1281 ([Deckers 1970](#), 455 n. 43) and under the pen of Adalhard for the abbey of Corbie.

The workload of maltsters and millers can be assessed using data from St Bertin ([Table 8](#)). For this abbey, 196 tenants have to collectively produce 106,600 litres of malt and 63,960 litres of flour each year on its estates, or respectively 543 litres/day and 326 litres/day. This is quite a lot considering the techniques and means of that time.

Each tenant does not deliver 540 litres of malt every day. The malt deliveries are grouped on a weekly or bi-weekly basis. To understand their rationale, the technical principles of malting must be explained. Malting barley, spelt, wheat, oats or rye involves five operations, which do not differ from one cereal to another: soaking of the raw grains, sprouting in the dark, drying, degerming and crushing. Soaking and germination take about 5-6 days. Drying requires firewood and an oven to produce hot air through a grid made of wood, clay or horsehair. Drying the sprouted grains requires a gentle, continuous temperature, without direct heating that would roast the grains and destroy the amylases, which is the main benefit of the malting process.

Archaeology has not found any traces of these installations, which must have been made of wood and vegetal or animal fibers at that time⁶⁴. Instead, archaeologists have discovered hearths dedicated to drying sprouted and unsprouted grains. Sprouted grains are not dried under the sun as in the hot countries of Africa or West Asia, nor in the open air. The sprouted grain, still wet, is the target of moulds. A mouldy malt will give a beer with a putrid taste. Degerming is done by rubbing the dried grain between the hands or by stirring it in a wooden tub. The malt grain has become crumbly. Crushing requires only a simple hand grinder or pestle. The entire malting cycle takes 6-7 days ([4.1.2](#)).

Let's go back to the malt deliveries to St Bertin. The abbey should theoretically receive $2050 \text{ muids} / 365 = 5.6$ muids of malt every day ([Table 8](#)), which is almost a complete cart (*corbe*) of 12 muids every two days. Given the geographical distance and the clustering of the villages ([Map 6](#)), the 196 tenant-maltsters take it in turns to deliver 10 muids of malt (10x52 litre bags), which is the malting product of one week⁶⁵. The rotation of malt deliveries among the 196 tenants guarantees that the abbey receives a cartload of malt every 2 or 3 days,

⁶⁴ The abbeys perfectly mastered the technique of hypocausts, dormitory floors under which hot air circulated from a fireplace (Plan of St Gall). As for the Carolingian palaces, they had not forgotten the Gallo-Roman thermal bath technique. These installations were restricted to luxury housing, not to technical buildings (a priori).

⁶⁵ In the assumption that the tenants and their wives malted the grain themselves.

provided that detailed accounts are kept at the abbey gate, at which the monks are experts.

In addition to the work of malting, each tenant or his wife had to grind 312 litres of flour per year (1 to 2 weeks of work), as well as other chores. This double obligation (10 muids of malt + 6 muids of flour = 16 muids) makes it possible to organise the delivery of 3 carts to the abbey every 2 days. This same tenant family had to cultivate his 16.5-hectare tenure to support his own members and obtain the grain needed for the abbey's flour and malt, the wood and the tools of his trade. The wife had to deliver flax spindles, chickens and eggs to the abbey. For the Poperinge estate, 4 married women of servile status had to deliver 10 muids of malt: *Illae IIII ancillaea parant de brace modia X*. Women maltsters therefore worked on the domains of this abbey (below).

Map 6: location of the manses owing malt to the abbey of St Bertin
(base map from [Mériaux 2000, 378](#))

Levies of malt owed to the abbey of St Bertin between 844 and 859



These calculations highlight the complex organisation of deliveries of grain, malt, flour, beer (see below), wood, etc. for the benefit of a Carolingian abbey from its domains, some of which were several dozen kilometres away or separated from it by high reliefs, as was the case with Tubersent to the east of Thérouane. [Map 6](#) locates the 14 manses of the 196 tenants-maltsters around St Bertin Abbey. Six are within 10km, grouped around St Omer, three between 10 and 20km. The remaining five are more than 40-50km away. Of these, Poperinge, Passendale and Tubercen deliver or sell malt locally.

In the 8th and 9th centuries, the region of St Omer, populated by Saxons and Frisians, is the object of an intense Christianisation policy ([Meriaux 2000](#)). The abbey of St Bertin and the bishopric of Thérouane, which encompasses the present-day Nord-Pas de Calais, combine their efforts ([Map 6](#)). It is also a region of dynamic trade with areas along the Channel and North Sea coasts, and with Kent on the English coast, less than 50km away by sea. Near the port of Quentovic, the abbey of St Bertin owns the Tubersent estate (Thorbodeshem, 589 ha), more than 50km as the crow flies from its abbey, separated from it by the small mountains of Haut-Artois. Its 18 manses must deliver 95hl of malt and 56hl of flour each year ([Table 8](#)). This malt and flour are not carried to St Omer, but used locally in trade with Quentovic. The abbey only receives its market value. This implies that maltsters and millers are involved in this trade. The same reasoning applies to the estates of Scala (Escalles, 454 ha) and Gisna (Guines, 945 ha), each having 16 farms (manses).

The case of the Pupurninga estate (Poperinge, 2398 ha) is striking. It is the largest. Its 47 manses provide the largest volumes: 244hl of malt, 147hl of flour. But it is situated more than 45km from St Bertin as the crow flies. Here again, local use of the malt brings the abbey the benefit of its "market value". Pascandala (Passendale, 83 ha and only 3 manses) is even further east (60km), in the middle of the Frisian country.

Conversely, the fees for the Morningehem estate (Moringhem, 754 ha, 12 manses), which adjoins the abbey, are not calculated in malt or flour, but in terms of weekly working days for transporting the malt and flour supplied by the nearest manses toward the abbey.

Despite this heavy annual workload, these 196 'free' tenants, who are at once farmers, maltsters, millers, poultry and pig breeders and wood gatherers, are able to conduct their own business among themselves and with the inhabitants of neighbouring estates. Some may have become maltsters (*braciatores*), if not full time, then at least enough to barter their malt for other supplies. These *braciatores* may be women (*infra*), and the brewers (*cambarium*) may also be women brewers, that is *brewsters*, a forgotten English word, or *brasceresce/bresceresse* in old French ([4.6](#)).

There is mention of malt delivered by millers or at least by mills that also serve as granaries. The miller is not necessarily the one who malts the grain. He does, however, have stocks of grain. Milling, malting of the grain and crushing of the malt are complementary technical activities as we have mentioned. Malting is carried out either at the mill or at the brewery. The only technical constraint concerns the drying of the germinated grains, which requires a heating device and firewood. The other operations only require simple tubs (soaking, degerming) or a clean surface sheltered from the sun (sprouting).

There is a third place where grain is malted: the domestic realm. Women have to make malt for the abbeys, alongside flax, wool, eggs or bread. The monastery of St. Michael (Staffelsee, Bavaria) has, among others, an estate with 19 servile manses: *"There are also 19 servile manses, all occupied. Each of these gives one sucking pig each year, five chickens and 10 eggs, feeds four of the lord's pigs, ploughs half a plough-land, does labour service for three days a week, does carrying service, and gives a pack-horse. His wife also makes one piece [camisilem = tunic or shirt] of linen and one piece of woollen cloth, prepares malt and bakes bread."* (Uxor vero illius facit camisilem I et sarcilem I, conficit bracem et coquit panem, [Guérard 1844](#) t. 2, Appendix 299). Every woman in the 19 servile households made malt and baked bread for the church. This confirms the technical link between baking bread and drying sprouted grain to produce malt. The text does not say whether these 19 women worked in their own huts (the ordinary family house for the poor and working peoples) or used a common oven, nor how much malt was supplied. For the same Staffelsee estate, the text mentions another estate with 72 feed-manufacturers (provendiers). They provide to the monks 12 muids of malt (624 litres), a textile workshop where 24 women work, and a mill that must deliver 12 muids of grain per year.

4.5 The brewhouses (*braciarium, braxatorium, camba*)

A brewhouse, less cumbersome to build than a watermill, nevertheless generates a more substantial income for an abbey. It brings in more than double the amount of grain, malt or beer, such as in St Pierre de Lobbes or Montier-en-Der ([Champion 1996](#), 68).

Before the Carolingians, a brewery is referred to by the periphrases "*place, workshop where beer is cooked*" (locus, officina ubi cerevisia coquitur). "Brewery: a place where beer and bread are cooked" (Camba: Officina ubi cervesia aut panis coquitur), is the definition given by the Supplements to the Capitularies of the

Pippinids and Carolingians⁶⁶, a technical connection between baking and brewing repeatedly noted in the documents.

The word *camba* is originally found in the act of Charles the Bald of 862, which assigns to the conventual manse of the abbey of St Denis the royalties that the monks can collect on the mills and breweries (*de molendinis et cambis*) within a monastic estate that includes 44 localities and about as many mills and breweries⁶⁷. *Camba* is also found in texts from 866 (or perhaps 805), although its oral use predates these texts. They also use the words *braciarium*, *braciatorium*, *braxatorium*, *bassina*⁶⁸. The brewer's tools are rarely mentioned: *braxina cum ustensilia*, *caldaria* (cauldron). The ecclesiastical texts are not interested in or concerned by the brewing techniques. These scarce and poor references make it possible to imagine brewing methods by infusion (hot water poured over the grains and malt for steeping in troughs, as in the St Gallen plan) or by decoction (cauldron for direct heating of the mash water + malt + grains), without knowing the details, which must be reconstructed thanks to the St Gallen plan, and slightly later texts such as the Tretiz (*Diagram 10*), or other later illustrations⁶⁹.

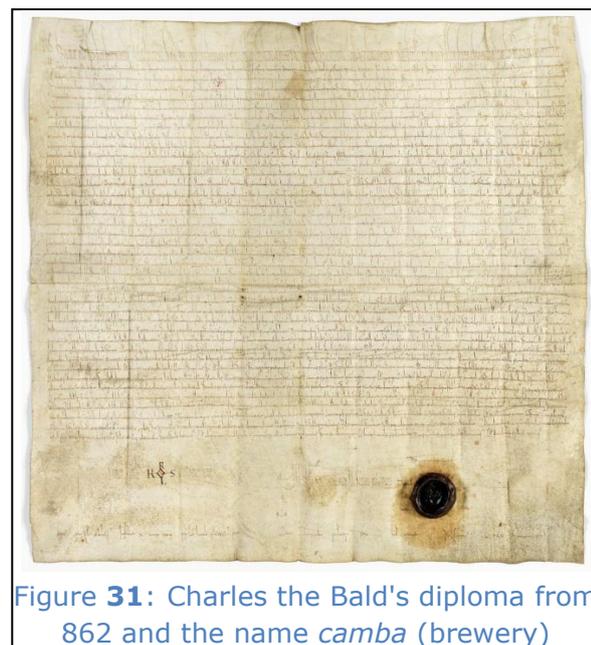


Figure 31: Charles the Bald's diploma from 862 and the name *camba* (brewery)

The Statutes of the Abbey of Corbie offer little information on breweries. The writ *Of Mills and Brewhouses* (*De molinis vel cambis*) written by Abbot Adalhard is fragmentary, the part relating to breweries (*cambis*) being lost. Another brief by the same author describes the management of malt produced on the Corbie estates (**4.1.2**).

A brewery was set up on the Coyecques estate belonging to the abbey of St Bertin. The brewer must pay a royalty of 4 coins to the abbey (*Camba I ; soluit solidos IIII*). This brewery is linked to a mill which must deliver 30 muids of flour

⁶⁶ *Additamenta ad Pippini Karoli M. Capitularia*, M.G.H., t. I, Cap. Reg. Franc., p. 251, 2.

⁶⁷ <http://www.cn-telma.fr/originaux/charte3019/> l. 11. The monks' manse is only a tiny part of the vast domains owned by St Denis, of which the abbot owns the largest share.

⁶⁸ In the 12th century, the term *braxina* appeared, then *cambe* and *bressine* in the 13th century in Romance-speaking countries, *bruwers huse* (brewer's house) or *panhus* in Germanic-speaking countries ([Deckers 1970](#), 451-452).

⁶⁹ We cannot subscribe to J. Decker's opinion which considers "that the technique used in the Mosan valley in the Middle Ages was similar to that used elsewhere and did not differ much from that in force today" ([Deckers 1970](#), 456). From the 12th century onwards, the beer trade in northern Europe and on the shores of the Baltic transformed the brewing methods: larger brews, hopping, greater control of fermentation, long-distance maritime transport of beer barrels, etc. The 18th and 19th centuries revolutionised malting and brewing techniques. As for the 20th century, it offered to brewers-malters a powerful scientific arsenal (biology, enzymology, chemistry, genetics, etc.). Beer brewing no longer leaves anything to the slightest chance.

(*Molinum I ; soluit modia XXX*), a small production compared to the 60 muids for each mill of Bayenghem-lès-Eperlecques belonging to the same abbey ([Ganshof 1975](#), 135).

The donation of the Quincy estate (canton of Montmédy, Meuse, France) to the Abbey of Gorze (770) mentions breweries (*camba*) ([Urion 1966](#), 137).

The Polyptychs of the abbeys of [Prüm](#), Lobbes and Montier-en-Der record their breweries and mills as early as the 9th century. The Prüm estates extend over the Ardennes plateau and bear witness to the expansion of the Carolingian agrarian economy in the 9th century ([Despy 1968](#), 154-155). One of these estates, Villance, is very large and has gained farmland by clearing and colonising the forest. In Villance itself, the cultivated land of the reserve of [Prüm](#) covers about 500 bunders (685 ha). It has two mills, three breweries, meadows and a parish church. Oats are the main crop. *"There is a seigniorial manor in Villance; seven seams [tracks of land] are attached to it: the first at Rotunda Hasila, where one can sow [lacuna] muids of oats, the second called Merilonis Cruce can be sown with [lacuna] muids of oats, the third at Hulsiz, where one can sow 400 muids, the fourth at the place called Albieg, which can be sown with 400 muids, the fifth at the place called Reimanbarba, 250 muids can be sown there, the sixth borders the spring called Scaitla, [seeds] 60 muids, the seventh at the place called Ruchengas, [seeds] 30 muids ; a meadow [provides] 100 carts [of hay]. There are 2 mills there, which pay 40 muids in various cereals; 3 breweries [bratsinas] which render (a yield) of 300 muids of oats [156 hl]; a forest where 1000 pigs can be fattened. There are 47 other ingenuiles manses there [farms with free peasants]. Of these, 44 ¾ are officially allocated and are located in the following places ..."⁷⁰.*

Another brewery gives back 50 muids of oats when it is in good state (*Est brasina una si restaurata fuerit debet solvere de avena modios L.* (Prüm register c. XLVI, p. 680.) [Guérard 1844](#), T. 1/2 711-712). These breweries deliver (*render*) each year the volume of beer brewed with 300 or 50 muids of oats (156 or 26hl), a beer whose density and therefore volume is unknown. It should be noted that a monk-gatekeeper or cellarer of [Prüm](#) must know the density of the beer supplied by the brewers in order to calculate the equivalent in oats used, that is 156 or 26hl of oats⁷¹.

Tavigny, another estate belonging to the abbey of Prüm, also has two mills and one brewery ([Despy 1968](#), 160). Despy has pointed out the many references to royalties paid in silver denarii by the abbey's tenants, including brewers and millers. From the 9th century onwards, the activity of the millers, brewers and other craftsmen in the Ardennes along the Meuse and Rhine rivers, led them towards local trade and exchanges based upon the flow of money. This economy contrasts with the autarkic mode of production in other parts of the Carolingian world at that

⁷⁰ Excerpt from the Prüm polyptych, Bref XLV, Villance, [Prüm](#), Rhineland-Palatinat, eastern Ardennes, Germany, polycarolingien.free.fr/article.php3?id_article=18 tr. Beer-Studies.

⁷¹ Alternatively, breweries could deliver raw oats directly. However, we have already noted that manses where a brewery operates are not devoted to growing grains but to beer brewing. Another explanation: the brewer is involved in the grain trade and barter his beer for oats. This enables him to deliver oats to the abbey.

time. Millers and brewers were undoubtedly at the forefront of this regional economy in the Belgian Ardennes.

The estates of the abbey of Lobbes-Thuin (on the river Sambre, Hainaut province, Belgium) offer an example of a slightly different organisation between the grain sources, the brewers and the abbey. The polyptych written in 868-869 mentions 31 active breweries on 2/3 of the estates. The latter cover a total of 2,500 ha, which means about 12 breweries per 1,000 ha of arable land. 85% of the seigniorial reserves and 79% of the land cultivated (manses) by tenants had a brewery ([Verdoot 2013](#), 202). What was the status of these brewers? Were they mere attendants supplying all the beer produced to the monks, and were the stewards and the abbey's intermediaries responsible for distributing it? Or were they brewers producing on their own account, in return for a monetary payment or a share of the brew given to the abbey or the local lord? Were they proto-craftsmen brewers free to pursue a local trade in malt and beer with peasants from neighbouring villages or cities? Or a mixture of these options depending on the interests of the local lords, abbots or bishops? (See [4.6](#))

The polyptych of Lobbes provides a clue for the year 889. In his estate known as Castillon, the steward (*maior*, 'mayor') and the brewer (*cambarium*) shared a manse, while the brewery was located in the reserve of the estate: « *Est in villa Castilion mansus indominicatum [...] Camba I, [...] est unus [mansus] inter majorem et cambarium* » ([Devroey 1986](#), 23). The brewer is granted only half of the manse and is exempted from the royalties that are usually due from a tenant. He is assigned exclusively to the brewery and must deliver a part of his brews to the abbey. He remains free to trade the remaining beer for grain to brew that the half manse (8 ha) cannot supply in full, and for the necessities of his life. This is one of the possible statuses of a brewer mentioned below, that of a proto-craftsman caught in the web of obligations woven by the Carolingian aristocratic society ([4.6](#)).

Of the 21 breweries of Lobbes abbey counted in 868/869, 9 have to pay the abbey a pound of silver. If the average annual beer production of these breweries exceeds the amount owed to the monks, the surplus beer must be bartered locally for the supply of the abbey's servants (*familia*) and for payment in kind to the day labourers cultivating the land or performing various tasks. Of the 12 breweries that do not pay a pound of silver, some owe a percentage of the beer brewed. They deliver it to the monks and the rest for the internal running of the estate. Those whose royalty system is not specified probably follow the same distribution. A brewery on the Hergies estate owes neither royalties nor cens: *Est in villa Arelgeias [...] camba I sine anuali [sic] censu*. Verdoot suggests this brewhouse is either under construction or abandoned ([Verdoot 2013](#), 203-204).

In all cases, the brewery supplies beer to the stewards, tenants and serfs who work in the vicinity. The transport of beer to the abbey is carried out by breweries in the immediate vicinity of the abbey. Brewers from afar do not bring beer but grain (oats in Prüm, various cereals in Lobbes) or pay money. The management

of breweries and the nature of their fees (beer vs. grain-money) is based on the fact that the grain for brewing must converge towards the brewery, regardless of the scheme, the location of the brewery or the status of the brewer. Where do they come from?

- Either from the grains harvested on the estate's reserve. Stewards and tenants take them to the brewer who must brew beer for them.
- Or from the grains harvested in the abbey's fields, part of which was used by the monks to brew their beer. This management is widely documented by the polyptychs and censuses of the abbeys.
- Or from the grains that the brewer can barter or buy, often in association with the miller, to brew beer "on his own account".

In all these cases, the abbey takes its share, in the form of grain, malt or finished beer, or even pounds and denarii of silver if the brewer is involved in the beer trade. The difficulties inherent in transporting Carolingian beer and the geographical distance of the breweries from the abbeys no doubt dictate these organisational choices. The fact remains that breweries, like mills, are a profitable investment for the abbeys. They are also profitable for the secular lords who carry out this policy on their own estates, a policy they probably initiated. The abbeys simply continued the economy and technical organisation of the estates they inherited from lay lords.

The chief manse houses the master's court and its outbuildings, well-constructed buildings, sometimes in stone as in Annapes (*Brevium Exempla*), a great luxury at a time when all buildings and even some abbeys were built in wood with thatched roofs. The ancillary buildings are barns, cellars, stables, sheds for domestic slaves (*servi infra casam dominicam residentes*). All around are workshops where women weave (*genitia, lavoratoria*), breweries, mills, dairies, saltworks and fish ponds, forges, carpentries, cooperages, etc. According to P. Toubert, "*The term *cambae*, which sometimes designates them, probably has a more general meaning than that of brewery and connotes the complex functions of manufacture, concentration, and storage of surpluses of the domanial tax system.*" ([Toubert 2004](#), 54).

In Prüm, tenants are required to prepare malt, brew beer and deliver it to the abbey without being called maltsters or brewers. The manses of St. Amand each owed 25 or 30 situlas of beer (*cervisia*) per year, small volumes (1 situla = 26 litres). This suggests that brewing beer, like making malt, was also a domestic activity. Beer was brewed in the huts of the tenants or prebendaries by men and women who were neither brewers (*cambarium*) nor beer experts (*siceratores*).

Brewers can also be identified by the mention of inns (*caupona*) that brewed and served beer. A census of the abbey of Stavelot-Malmédy (Belgium) mentions a "*cortil de caupone*", an inn-brewery enclosure on the Louveigné estate. It pays only one obolus per year to the abbey when other tenants pay 2 to 4 deniers ([Schroeder & al. 2014](#), n. 142). This innkeeper-brewer is liable for other services, such as the delivery of beer or spent grains (dregs) to the abbey (4.8).

4.6 The brewers (*cambarius, siceratores*) and their social status

The Capitulary of Villis speaks of "masters who make good beer" (*magistri qui cervisam bonam facere*), assigned to the emperor's personal estates and placed under the authority of a palace steward (chap. 1). These masters in good beer work for the palace and its stewards when the imperial court travels, which is often the case: "That each steward, when he is on service, shall have his malt (*bracios*) brought to the palace; and with him shall come master (*magistri*) who can make good beer (*bona cervisa*) there." Capitulary De Villis §61. In the service of the palaces, the county courts and the Carolingian aristocracy, this beer "technician" remains socially dependent on his masters. He does not buy his grains or sell his beer. He brews for his master. The Carolingian rural economy with its very brutal personal power relationships has its dark side. The proliferation of capitularies, writs and civil or monastic regulations reveals the extent of abuse and prevarication. Within such a vast empire, the multitude of intendants, mayors and officers responsible for controlling its good management are suspected of misappropriating local resources for their own benefit. "Mayors are never to be chosen from among powerful men, but from men of more modest station who are likely to be loyal." orders the Capitulary De Villis (§60). Brewing and bartering beer on their own account tempt overly powerful middlemen who can extort grain, malt and the work of the brewer-maltsters or female brewster-maltsters.

Brewers work in or near the abbeys, as in the examples of Corbie, St Bertin or Stavelot. They are closely dependent on the abbey, which grants its land, controls the grain trade, levies tithes and cens, and ultimately supervises almost all economic activities. The brewers are specialised suppliers, like the millers or maltsters. However, between the 8th and 11th centuries, they cannot be considered as independent brewer-craftsmen, free to trade their beer, except when the regional context lends itself to it, as in the Prüm abbey's domains of the Ardennes.

Regardless of their technical skills, both brewers and millers are still serfs or free tenants, but nevertheless dependent on an abbey or master for whom they must work. Under the Carolingians, there are neither brewers' guilds nor free brewers allowed to run their businesses. The technical know-how belongs to the labourers (*laborantes*) but it does not grant them any political power. The relative social emancipation of the brewer-malters and millers only starts in the 12th century. Even then, they remain legally bound to a bishop, an abbey or a lord, but can run their own beer business in one urban context (5.2). The social developments of the central Middle Ages (11^e-13^e) should not be applied to the earlier Carolingian period (8^e-11^e).

The brewers work in the context of the seigniorial reserve, the *terra indominicata* at the heart of all *villae*. This centre of operation includes a farmyard (*tuninus dominions*), a garden (*ortus*), often a mill (*molinis*) and a brewery (*camba*)⁷². The brewers who work for the abbey within its walls or in the vicinity are called the "*master/estate brewers*" (*bratsatores dominici*, [Guérard 1844](#), T. 1/2 713) as mentioned in Corbie.

There are other situations in which beer is supplied to the beneficiaries of an estate. It is not brewed by a professional brewer but by families of farmer-tenants, often the wife, whose master sets the obligations: volumes and quality of beer to be brewed, supplying calendar and so on.

As with the making of malt (4.1.2), the domanial system of Wissembourg (Alsace, 60km north of Strasbourg, France) stipulates that beer can be supplied by peasant families, brewed by women or men in their homes. It is therefore a domestic beer. The polyptych of Wissembourg (818-819), lists 25 domains of this royal abbey and the annual fees it requires. Malt, beer and bread are often mentioned, along with wine. There is no mention of brewers or millers. Malt, beer and bread are made by the families of peasant farmers on their farms. The polyptych explicitly associates women with the production of beer and bread for the Hassloch and Eysersheim estates ([Table 9](#)). These women also make linen clothes, shoes, and deliver chickens and eggs.



Figure 33: women spinning and carding of wool to weave clothes ([Luttrell Psalter, 1320](#))



Figure 32: women shearing sheep, carrying water ([Luttrell Psalter](#))

In Wissembourg, supplies of wine are both more frequent and more voluminous than those of beer. However, brewing also developed here with a strong domestic dimension. The beer is brewed in the farmhouses, usually by the women, and then brought to the abbey. The regularity of the brews and the density of the monks' beer could not be guaranteed. The example of Wissembourg shows that the abbey does not manage their beer supply in the same way throughout the Carolingian Empire.

⁷² *Aucas autem et pulli que in tuninis dominicis nutriti fuerint, de hortis vero ..., de molinis ..., de cambis quoque.* [Levillain 1900](#), quoted by [Verhulst & Semmler 1962](#), 237 n. 170. [Beer-studies.com](#) (2021)

Table 9: charges in beer and malt due to Wissembourg abbey recorded in its polyptych

(le.ac.uk/hi/polyptyques/wissembourg/latin2english.html)

No 7 Edesheim (24½ farms)	<i>Twice in Winter they owe a fortnight's service, after which they are to tend to the vineyards and elsewhere as necessary. 12 each owe 15 situles [of wine or beer], 13 owe 7 situles [of wine], and 14 owe 20 situles of beer [cervisa].</i>
No 11 Hassloch (60½ farms)	<i>... At harvest time they are to collect up hay and grain. They are to pay barefrida for the service of the king and abbot in their provinces. <u>Their wives are to prepare bread and beer [panem et cervisam].</u></i>
No 13 Mutterstadt (16½ farms)	<i>In terms of service, they owe the same as Eysersheim ... Apart from this, their wives do not make cloth, nor do the men provide watch, nor [wives] prepare bread or beer [nec panem et cervisam parare] [as Eysersheim below].</i>
No 14 Eysersheim (10½ farms)	<i>... They each owe 5 chickens, 15 eggs, make one tribute of suckling pig at Easter, provide 1 cartload of wood, are to provide watch, are to prepare bread and beer [panem et cervisam parare] ...</i>
No 15 Lamsheim (8 farms)	<i>... Each gives 5 denarii for the army and every year proceeds with his plough, and only once prepares 10 muids of malt for beer, and when needed prepares bread [semel de brace .X. modios ad cervisam parare, et panem quando opus est parare] ...</i>
No 16 Littersheim (15 farms)	<i>... Also, they are to prepare 10 loaves of bread plus beer [decem panem et cervisam parare], to provide watch when ordered, and twice a year to proceed with the plough...</i>
No 17 Westhofen (43½ farms)	<i>... The aforementioned 18 farmsteads, who must give 20 situles, and prepare bread and beer [et predicti .X. et .VIII., qui situlos .XX. dare debent, panem et cervisam parare ...] ...</i>
No 18 Weinholdsheim (21½ farms)	<i>... 1 half-a-farmstead pays 10 liquid measures of wine and provides ½ service, is to prepare bread and beer [panem et cervisam parare], ...</i>
No 20 Bruschal (20 farms)	<i>... Each farmstead serves 3 days a week. From these there are 15 who pay 15 situles of beer [de cervisa situlos .XV], 5 chickens and 15 eggs. 5 others pay 20 situles of beer [de cervisa situlos .XX], 3 chickens and 15 eggs... Apart from this there are 3 pay 7½ situles of beer, [de cervisa situlos .VII. et dimidium] and in 1 year they pay 2 chickens and the next year they pay 3 chickens, 15 eggs, and give service like those mentioned above ...</i>
No 21 Öwisheim (8 farms)	<i>... each farmstead gives 1 fattened pig, 1 cartload of beer [de cervisa .I. carratam], 1 muid of wheat, 5 chickens and 15 eggs. ... 5 others who each likewise owe 3 days service per week, pay 15 situles of beer [de cervisa situlos .XV], 1 measure of wheat, and at Easter pay 5 denarii, 3 chickens and 15 eggs ... They are to prepare bread and beer every year [panem parare, et semel in anno cervisam preparare].</i>
No 23 Zaisenhausen (23 farms)	<i>Each week they give 3 days' service. 19 farmsteads each one provide 20 situles of beer [de cervisa unusquisque situlos .XX]. Twice a year they proceed with their plough to the monastery.</i>
No 24 Witegowenhusen (11 farms)	<i>Each is to pay 15 situles of beer [et unusquisque de cervisa situlos .XV]. At Easter 9 of them each pay 1 tribute of suckling pig, plus 2 chickens. Each is to prepare bread and white grain by order.</i>
No 25 Renningen (22½ farms)	<i>Each week each farmstead provides 3 [days] service. 2 farmsteads provide 20 situles of beer and the other [20] provide 15 [situles of beer] [et .II. ex illis de cervisa uterque situlos .XX. et alii omnes situlos .XV.]...</i>

At St. Gallen in 759, a man named Hetti obtains a precariate from the abbey, namely a time-limited right to live on a piece of the abbey land. In return, he must deliver 30 shekels of beer, 40 loaves of bread, offal (*frisginga*), and work 3 days per year for the monks.⁷³ This situation is reminiscent of Wissembourg Abbey.

To sum up, in the Carolingian period, beer is produced by brewers (*siceratores*), by the monks' servants when the abbey has one or more breweries within its walls, by the tenants (*prebendarii*) in the service of the abbey when the beer is brewed nearby, and finally by free or servile peasants and their wives who have to brew themselves the beer that the abbey requires.

The monks get their beer in the form of royalties in kind, or purchase/barter it for grain. The Benedictine monk brewing his own beer is the stuff of legend under the Carolingians (and later on in medieval times).

As for the aristocratic families, their numerous servants brewed beer for them. For example, in 1177, Alard, bishop of Cambrai, reported that Beatrice de Boussu, widow of Gossuin de Mons, had put an end to a dispute against the priory of Aymeries. Among the objects of the dispute were a mill and a brewery built and used by this noble family. The conciliation charter states that "*the monks had to grind in this mill without millstones, which Beatrice had not been able to keep. They also acknowledged that the brewery (camba) was free and the brewer (cambarium) who remained there was exempt from all fees.*"⁷⁴

A long poem written around 1234-34 by Walter of Bibbesworth, bears witness to this. A part of the poem is dedicated to the vocabulary of brewing ([appendix 9.7](#)). This valuable document confirms the mastery of certain brewing techniques in the 13th century. The malting and infusion of the wort are described in detail. The author stops there and confesses that he knows nothing more about the other operations carried out by a brewster. Walter of Bibbesworth certainly saw how to brew, but he never brewed himself, nor did Dionisie de Munchensi, the dedicatee woman of his poem. In 13th century Essex, this work was performed only by servants or by a skilled female brewer with whom an aristocrat needs to speak to about her craft in order to manage the estate properly.

⁷³ In eam vero rationem, ut perprecariam de vobis hoc recipiam, et annis singulis persolvam census inde, id est cervisa siclas XXX, panes XL, frisginga trimissa valente, unius hominis anni vertente operas tres (Hermann Wartmann. Urkundenbuch der Abtei Sanct Gallen Jahr 700-840, Höhr: Kloster St. Gallen, Antiquarische Gesellschaft in Zürich, 1863, p. 27).

⁷⁴ Monachi in ipso molendino sine moltura molere debebant, quod nequaquam sepefata Beatrix facere poterat. Cambam quoque ipsorum recognovit esse liberam et cambarium in ea manentem ab omni exactione liberum. telma.irht.cnrs.fr/outils/chartae-galliae/charte211108 ou www.diplomata-belgica.be/charter_details_fr.php?dibe_id=3389 Beer-studies.com (2021)

4.7 Ingredients and seasonality of the beer

A polyptych from Fulda Abbey (near Kassel, Germany) states that 40 servile dependents provide it with enough *oats to make 7 carradas of beer* (7*416 =2912 l) (*avenae ad VII carradas cervisiae*). The cartulary of Saint-Père de Chartres (France) mentions *two mills giving 12 muids of oats to make beer*. The register of the Prüm Abbey (Rhineland-Palatinate, Germany) quoted above mentions three breweries brewing 300 muids of oats, another one 50 muids. The Polyptych of St. Germain (France) speaks of an *oat fee charged to those who brew beer in Boissy* ([Guérard 1844](#), T. 1/2 711).

Are we to conclude that Carolingian beer was brewed mainly with oats? Obviously not. We have already mentioned the many sources of malt (4.1.2): spelt, oats, wheat, rye probably, and barley more rarely, under the Carolingians. The relationship between malt and beer is obvious. The relationship between raw grains and their proportion in the brewing and composition of beer is less so. The documents provide little evidence.

The inventory of the grain storage of the royal domain of Annapes gives some indications (*Brevium Exempla*, ca. 800-814). It reflects a privileged lifestyle: "*We found on the crown estate of Asnapius a royal house, well-built of stone, with three chambers; the whole house surrounded by galleries, with 11 rooms for women; underneath, one cellar; two porches; 17 other houses inside the courtyard, built of wood, with as many rooms and with the other amenities all in good order; one stable, one kitchen, one bakehouse, two barns, three haylofts. A courtyard with a strong palisade and a stone gateway with a gallery above from which to make distributions. A smaller courtyard similarly enclosed with a palisade, well ordered and planted with various kinds of trees.*". These grain storehouses illustrate the diversity of cereals in the 9th century. They are directly related to the mills and breweries of this royal estate: "*90 baskets of old spelt from the previous year, which will yield 450 measures of flour; 100 modii of barley. In the present year there were 110 baskets of spelt: of these 60 baskets have been sown, and we found the rest [in store]; 100 modii of wheat: 60 have been sown, and we found the rest 98 modii of rye, all of which has been sown; 1,800 modii of barley: 1,100 have been sown, and we found the rest; 430 modii of oats, one modius of beans, 12 modii of peas. From the five mills, 800 smaller modii: 200 modii were given to the workers on the home farm, and we found the rest. From the four brewhouses [cambis], 650 smaller modii [650*52=338 hl]"⁷⁵. The kind of the 338 hl of grain found in the four breweries is not specified. It can be assumed that these grains are those of the reserves, that is of 4 species: spelt, barley, rye and oats. With*

⁷⁵ Brevium Exempla 25, le.ac.uk/hi/polyptyques/brevium/latin2english.html
Beer-studies.com (2021)

338hl of grain found in the breweries and converted into malt, the royal estate can brew a volume equivalent to 560hl of 6% alc beer.

The economy of beer follows the same economic and technical rules as that of bread. Beer is brewed with the grains available according to the region, the season, the year and the climate. Ecclesiastical texts are misleading. Their regulatory nature ignores the agricultural hazards and famines suffered by the populations, from which the monks and the royal estates protect themselves through the tithes and grain royalties they require.

Seasonality of beer? For whom?

In the domains of Saint-Maur abbey, the tenants of the Fleury estate owe 3 days of work per week, and receive, during the month of March, bread, vegetables and beer; during the month of May, bread and cheese, and during the month of October, bread with wine, if they could be given this beverage ([Guérard 1844](#), T. 1/2, 762). Beer is probably not available all year round. The shortage between the spring and late summer harvests means a temporary scarcity of grain, hence of beer, for the population, but not for the aristocracy and monks, who have well-stocked granaries, as in Annapes.

4.8 The management of the brewing spent grain (*draime*)

The draff (*draime*, *draune*) refers to the grain residues exhausted by the brewing process and recovered at the bottom of the troughs or tubs after drawing off the sweet supernatant, the wort (*succo*). Rich in cellulose and proteins, the spent grain has been used since ancient times to feed livestock. In the event of a severe shortage, the brew was stopped or the poorest people ate the draff!

When wet, the spent grain takes up a volume equivalent to the grains poured for a brew (raw grains + malt). Wet spent grain corrupts quickly (fungi, chemical decomposition, rotting). After drying and compacting, its volume is reduced by at least half and it can be stored for some time. In medieval Europe, wet draff was dried in the same way as sprouted grain for making malt, in an oven or on a hot hearth, if it was not fed to the animals straight away⁷⁶.

The recycling of brewers' grains and milling bran explains why brewers and millers are often indebted to chickens, geese and ducks fed with a mixture of grains and bran, at a rate of about 5 to 10 birds/year, and to the eggs laid by their barnyards.

The dried spent grain is also supplied to abbeys. It is part of the services requested from the tenant-brewers. Delivered near the abbey, it is used to feed

⁷⁶ The technical constraints are identical in Europe for sprouted and spent grain: drying in the open air under the summer sun is exceptional, especially because birds love these grain delicacies.

the poultry, pigs, cows, oxen and sheep raised by the abbey in its immediate vicinity. The St Gall plan ([Diagram 2](#) & [Diagram 10](#)) has a large area set aside for raising chickens, cows and sheep. A census of the Louveigné estate belonging to the abbey of Stavelot-Malmédy (Meuse, Belgium) written between 1071 and 1105 specifies that the inn-brewery (*caupona*) must deliver 100 muids of draff (*draime*) each year on St André's day (30 November)⁷⁷. In view of the large volume to be delivered (52hl), this spent grain that has to be stored is probably dried at the source, in other words by the inn-brewery. The brewery does not brew 100hl of grain + malt (double the volume of the dried grain) in one go. The spent grain from many brews is stored before a single delivery on 30 November. The text does not specify whether the delivery is made at the gate of the Stavelot abbey, 30km away, or to the farmers near the brewery.

Another explanation for the production of such a large volume of spent grain may be an exceptional volume of beer brewed to celebrate St Andrew's Day. When brewed, 100hl of grain \approx 6000kg (1 litre of malt \approx 0.6kg) provide about 290hl of brethren's beer (\approx 6% alc.; [Table 2](#)). Does the feast of St Andrew involve the distribution of beer to all the dependents, tenants, serfs and lords of the abbey's estates, in addition to the monks' personal consumption?

⁷⁷ In festo sancti Andrei, de unoquoque manso VII masoerios et dimidium, IIII modios frumenti, dimidio uno II modios, et de caupona C modios draime. [Schroeder & al. 2014](#), Table 1, p. 45 & n. 142.
Beer-studies.com (2021)

5 Brewing beer on a scale of many estates

The economic organization of the brewery involving several estates as it existed between the 8th and 12th centuries can be summarised. The term "brewery" refers here to the full spectrum of activities: the entire brewing process, the barter, sale or supply of beer and its ingredients, the social status of brewers, millers and maltsters, and the economic exchanges induced by the whole beer brewing process, including the recycling of spent grains.

Our reconstitution is based on the classic Carolingian domanial system: a landed estate of fields, grasslands, fallow land, forests, rivers and marshes. This domain includes farms (**manses**), one or more villages, a seigneurial court (**curtis**), a church or an abbey. Free or servile tenants cultivate the manses (10 to 30 manses per estate). The reserve is held by the noble and/or ecclesiastical owner for his personal use (hunting, forests, mines, quarries, water mills, breweries, river ports, ...) and on which he installs millers, brewers and various crafts.

We aim to visualise all the exchanges which condition the brewing of beer produced within an abbey, in its vicinity or on its more or less distant estates. The beer is drunk by everyone: nuns and monks, the family of the lord and his relatives, the pilgrims and the sick welcomed to the abbey, the free or servile tenants of the domain, the prebendaries and servants of the abbey. Beer can be traded locally or bartered for grain/water/wood.

Is there room within an estate for a brewery linked to urban centres between the 8th and 11th centuries, beyond the service of the imperial palaces and the residences of the counts? We have no evidence of such a venture. In northern Europe, the Gallo-Roman villa and its grip on intensive cereal crops deteriorated in the 6th century with the decline of the economic and military organisation that had given rise to it: feeding the Roman armies and cities that were controlling the conquered territories. The Gallo-Roman stone city, the result of the forced labour of thousands of slaves and the exploitation of quarries and forests, is replaced by forts, huts, and wooden dwellings. The palaces and aristocratic residences are made of wood. The new town of the early Middle Ages (7th-10th century) grows very slowly near the river junctions, the centres of political power and the bishoprics. Periodic markets are organised in the heart of the large estates that control economic exchanges and take profits from them (tonlieu, octroi = customs duties). Craftsmanship serves war, pomp and the needs of the aristocracy. Merchant exchanges and the monetary economy are still in limbo and mainly rely on the surpluses generated by the agricultural estates. The fairs at the origin of regional trade (in grain, honey, wine, fabrics, madder, pottery, metal tableware, weapons, ...) and long-distance trade (wine from the fair of St Denis sold in England, for example) are under the control of the bishoprics, which are granted privileges and tax exemptions (e.g. that of tonlieu). Trade in the early Middle Ages is largely a trade without cities. The situation evolves in the 12th century.

The economically autonomous craftsman, able to brew and sell his beer on his own account, appears in the 13th century among large villages and towns at a time when grain is widely traded, when workers are gradually emancipated from the shackles of serfdom, and when beer can be traded in quantity and quality. The grain trade and the growing importance of towns and cities lead to the emergence of a long-distance beer trade in the 12th century, which is its natural extension.

The rules of the brewers' guilds only appear later with the rise of the merchant cities in the 13th century. However, these brewers' guilds remain under the patronage of a royal authority, strictly controlled by the urban elites and enclosed in the system of banalities (rights to use a mill, an oven, a well, or any device built by a lord). This system quickly becomes a new urban authority powerful enough to regulate and control the trades. By way of example, the "ban of St Omer" in 1270 limits the type of cereals that can be used by brewers and maltsters: *Nul brasseres d'ale ne puet meire en s'ale autre chose ke blei avoine et orge* (No brewer of ale can put in his ale anything else than wheat, oats and barley)⁷⁸.

This slow socio-economic evolution is visualised using two diagrams and one map below. The first diagram under Charlemagne ([Diagram 11](#)). The second one shows the same kind of economic exchanges during the 12th century when the city takes its rise and with it the urban brewery ([Diagram 12](#)). The third historical step ([Map 7](#)) is based on Joseph Decker's exceptional study of beer-making in the Middle Meuse Valley, and its clear evolution between the years 800 and 1350. Around 1200, the number of breweries increases with the emerging towns ([Table 10](#)). Around 1350, the Mosan territory is covered with breweries ([Map 7](#)).

Some archaeological finds in the Netherlands complement these illustrations.

5.1 Organisation of the brewery in Charlemagne's time

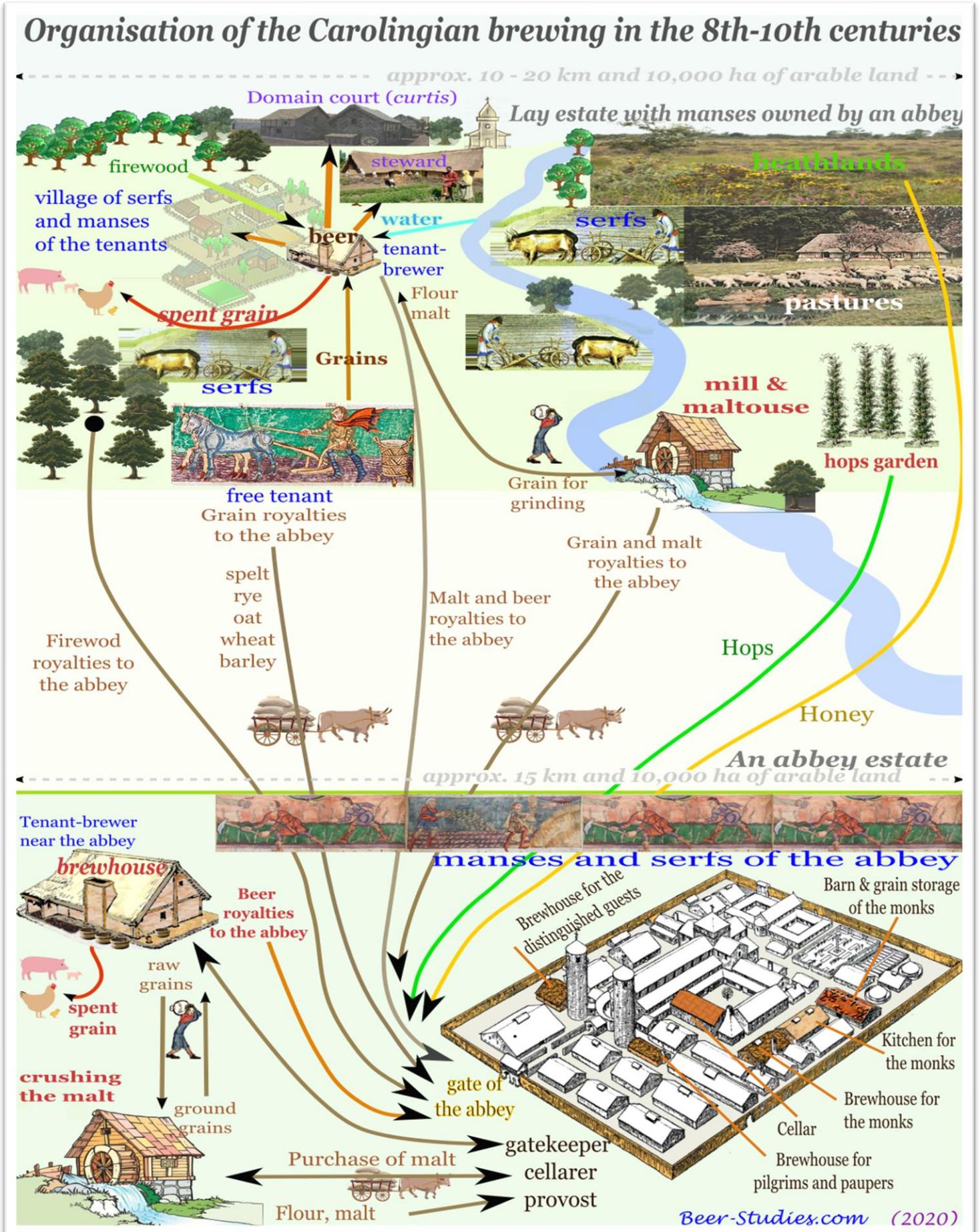
The diagrams below ([Diagram 11](#)) show the economic flows within a typical estate, while integrating inter-farm exchanges. The latter exist, given the small average surface area of a typical estate (100 to 300 ha) and the resources needed to brew beer, notably firewood and peat, or for cooperage in areas without forests (rarely) and peat bogs. By their very nature, such schemes erase all the regional cultural differences, which are numerous in the midst of the vast Carolingian empire, and the different economic organisations suited to the history of the territories, their human settlements and their ecological systems.

The main features are as follows:

⁷⁸ Reg. Aux bans, A. St Omer A B XVIII, 16, n° 195, Godefroy, *Dictionnaire de l'ancienne langue française et de tous ses dialectes du IX^e au XV^e siècle*. Complément sub *braceor*. micmap.org/dicfro/search/complement-godefroy/braceor
Beer-studies.com (2021)

1. All raw materials converge on the abbey. They feed a seigneurial or count's court if the owner is not an abbey, which is the most frequent case. The ecclesiastical lands (abbeys, bishoprics, churches) cover barely 10% of the cultivated land of the Carolingian empire (4.1).
2. Services (malting, milling, brewing, gathering, boiler making, cooperage, etc.) benefit the lay lord or the abbey, when the tenants live nearby. Wood for drying malt and cooking wort is local, but ecosystems and deforestation lead to cutting and transport over medium distances. Wood cutting and carting (carriage with oxcart) are often linked.
3. All these brewing ingredients converge at the gate of the abbey under the supervision of the provost who organises all activities outside the abbey. These ingredients are received by the monk-gatekeeper, who is responsible for checking and recording them. The monk-cellarer takes his part in ensuring the brewing of the beer inside the enclosure.
4. Malt, flour and beer produced far from the abbey or the count's court are also consumed locally. These products are subject to royalties (cens, tithes). There are exchanges (barter, sale) between millers and brewers (both are also maltsters) on the one hand and the tenants and dependents who live and work on the estates on the other.
5. The technical mill-brewery complex is already in place under the Carolingians. This strong economic and technical coupling is one of the starting points of their respective evolutions from the 12th century onwards (5.2).
6. The numerous areas of fallow land, marshes, forests, moors and heaths constitute the "reserves" of an estate. They are sources of aromatic plants for preserving beer. Hops are grown here and there on hop fields, but the main source is wild hops, which are picked like the other aromatic plants for the brewery. Their supply is often associated with the millers in the texts. We have shown a hop field near the mill.
7. The heaths and forests are suitable for beekeeping. As with herbs and hops, honey is harvested from 'wild' hives. Beekeeping is developing. Honey is used in the composition of the *cervisia mellita*.
8. Where beer is brewed, the spent grain feeds small livestock (poultry), large livestock (beef), and pigs if the latter are not left to feed in the forests.

Diagram 11: overall organisation of the brewery in the 8th-10th centuries



5.2 Organisation of the brewery from the 12th century

The main features are as follows ([Diagram 12](#)):

1 – The so-called classical or bipartite Carolingian agrarian domain (reserves + manses) as described by the Capitulary De Villis or the Polyptychs does not reflect the organisation of the urban centres and ports whose economic dynamism is affirmed in the 11th century. It is based on contracts, monetary exchanges and 'employees', as in Austrasia, the historic heart of the Carolingian empire ([Map 1](#)). The economic links between the trades have become stronger: brewers, millers, coopers, bakers. Royalties are paid in money and no longer in kind.

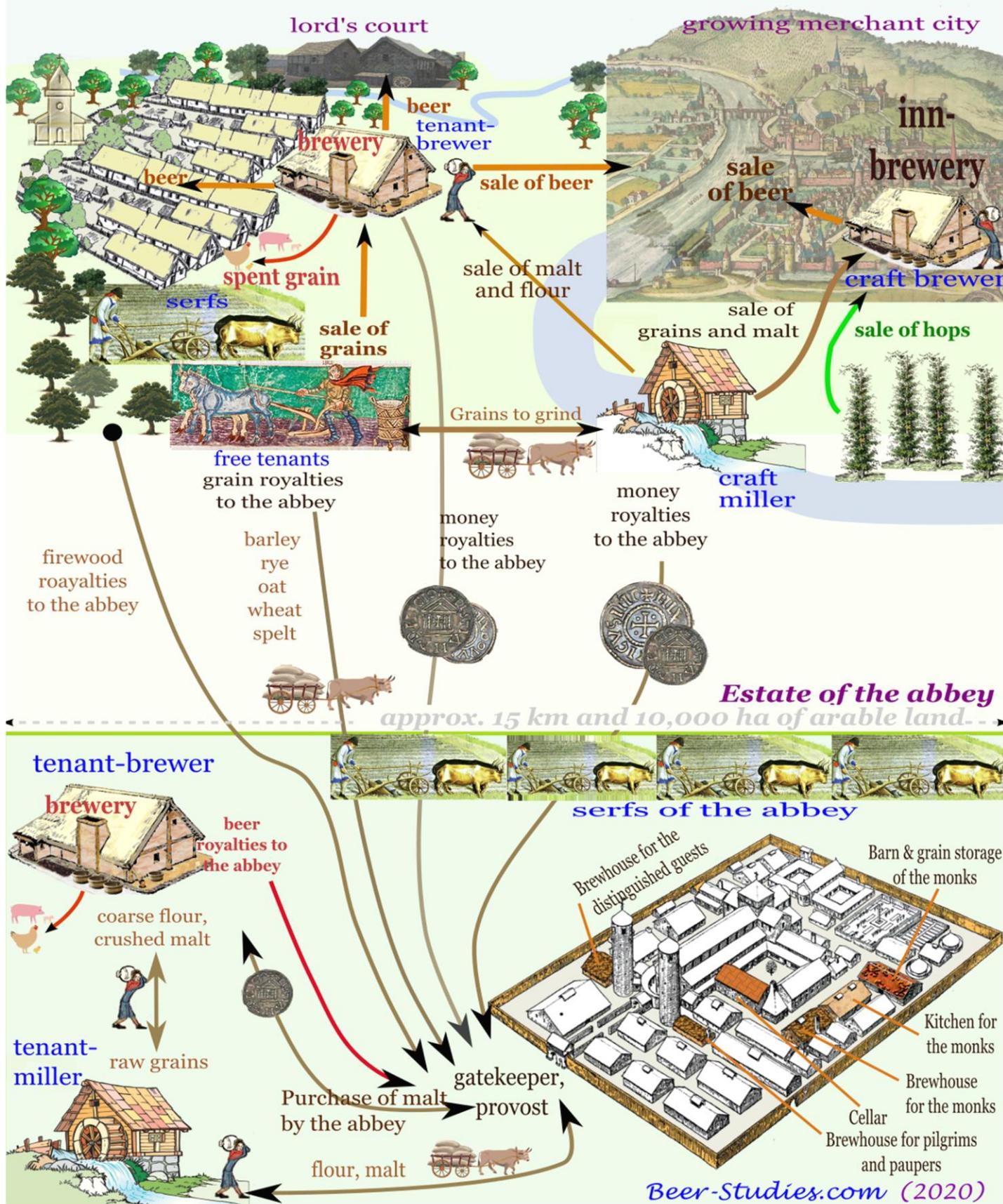
2 – A feudal system emerges in the 12th century as a consequence of the dissolution of the Carolingian imperial project and the resulting territorial and political fragmentation. The former imperial nobility claims hereditary rights over lands granted in usufruct. The system of banalities is set up, and firstly concerns ovens, mills and breweries. The economic role of the abbeys diminishes. The European population increases from 35 to 80 million between 1000 and 1347. The general organisation of brewing changes as a result of a new cereal economy. Land clearing and cereal cultivation speed up. The relative abundance of grain, its medium-distance trade, the development of technical facilities (mills, breweries, bakeries), and the creation of new taxes on the processing of grain (milling, beer, bread) stimulate the beer trade.

3 - The number of breweries increases in the 12th century and so does the number of emancipated brewers who can brew and sell beer without the direct control, obligations or services claimed by an abbey or a count (cens, royalties, tithes). Under the legal and fiscal protection of the new local powers, small nobility or urban elite, the brewer manages his own business, a "[camba/caupona](#)" that becomes a brewery/inn.

4 - The 12th century witnesses the emergence of craft brewers, first in towns, then in rural areas. This slow professionalisation disrupts the organisation of the late Carolingian brewery. Having become an economic player, the craftsman-brewer buys his grains, makes his malt or has it malted by a craftsman-maltster, cooperates with a miller, a baker, a wood merchant and a cooper. He has to sell his beer, sell his spent grain, manage his business and balance his accounts. His range of action widens with larger volumes sold over a wider area. Brewing a beer that can be stored and transported well become one of his concerns. The technical solution? In ecclesiastical cities such as Liège or Metz, dominated by a bishop, it would be the gruit inspired by current recipes based on fermentative and aromatic plants ([4.2](#)). Elsewhere, in the Hanseatic cities or Flanders, it will be hops ([4.1.5](#)).

Diagram 12: overall organisation of the brewery around 1250-1300

Evolutions of the Carolingian brewery in the 12th-13th centuries



5.3 Beer brewing in the Mosan basin between 800 and 1350

In 1970, [Joseph Deckers](#) published a remarkable study tracing the evolution of brewing in the river Meuse middle valley between 800 and 1350. After having scoured all the available documents (charters, polyptychs, censuses, notarial acts, donations, etc.) mentioning breweries, brewers, or duties to be paid on beer, he drew up a list of 211 localities spread over four chronological periods: 800-1000, 1000-1200, 1200-1300 and 1300-1350 ([Table 10](#)). J. Deckers located them on a map that we have digitised, coloured and enriched with its rivers, towns and abbeys ([Map 7](#)).

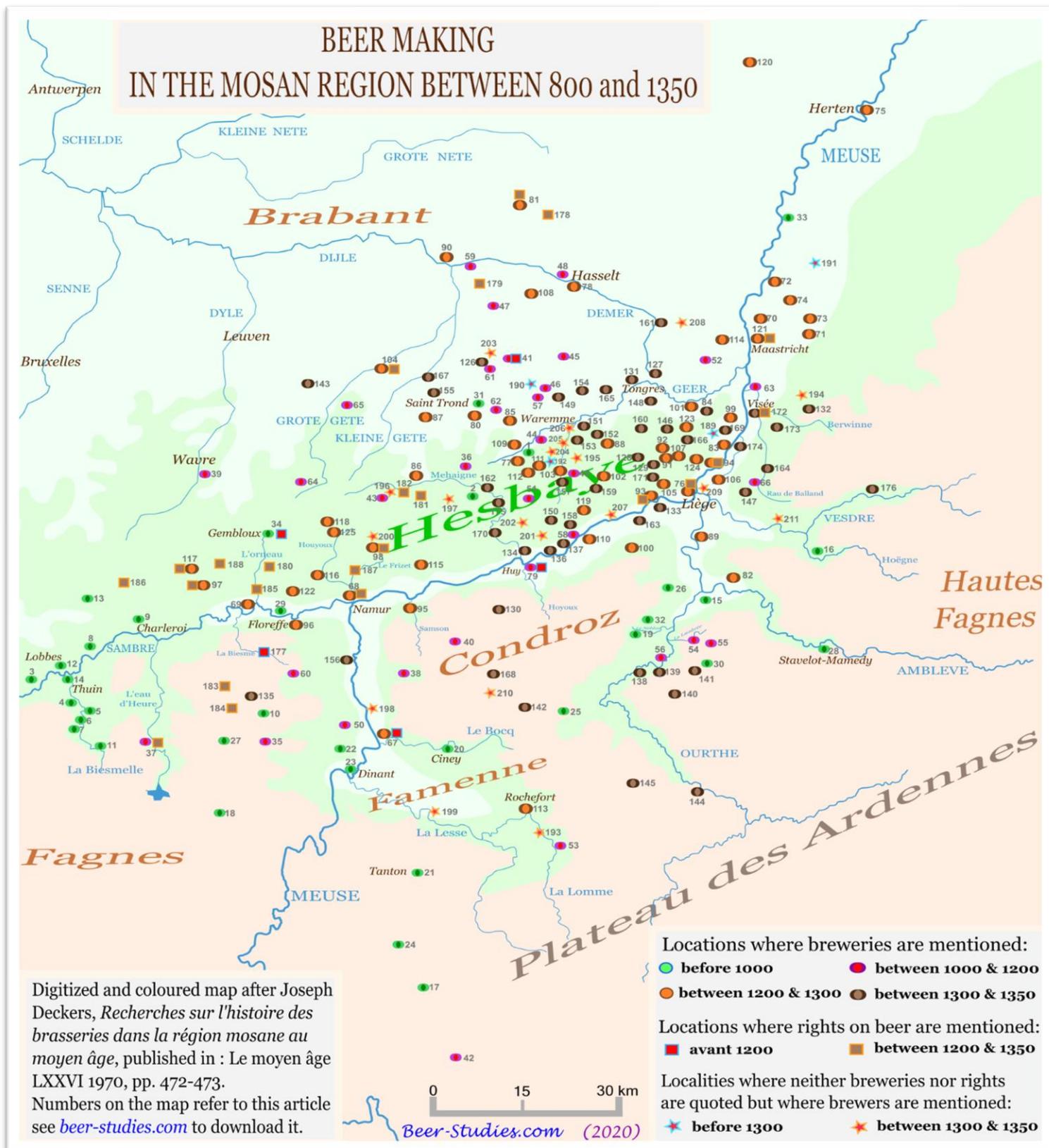
	Number of breweries	Locations with breweries
800 - 900	20	16
900 - 1000	24	18
1000 - 1100	33	19
1100 - 1200	26	13
1200 - 1300	178	60
1300 - 1350	101	50
	Locations with brewers	Additional locations / y. 800-900
900-1200	6	0
1200- 1300	26	4
1300 -1350	41	19
	Locations with beer-duties	Additional locations / y. 800-900
900 - 1200	8	1
1200 - 1350	26	11

Table 10: Brewing locations in the Mosan region (after [J. Deckers 1970](#))

What does it show? Between 800 and 1000, the modest number of breweries increases regularly. They are still linked to the foundation of new abbeys or to the increase in their land holdings (Hobbes, Thuin, Gembloux, Florennes, Waulsort, St Trond, Stavelot-Malmédy, etc.). The development of the breweries is conspicuous from 1200 onwards and gains speed after 1250. Around 1350, there are almost 400 breweries in the Meuse valley, which are very unevenly distributed. Most of them are concentrated in Hesbaye, a rich cereal-growing area on the left bank of the Meuse, between Namur and Liège. The term *camba* can refer more broadly to a hostelry or inn serving food and fermented beverages. This gives a new scope to J. Decker's results. If the brewery, a brewhouse in the strict sense of the word, becomes the focusing point of a set of services extending as far as beds, stables, and meals, this means that cereals are at the centre of an economy turned towards their trade and their processing.

The plan of the St. Gallen hostelry includes a brewery, a kitchen, a cellar, beds, a stable, a henhouse (3.3). Its secular version is a village courtyard containing a mill, a brewery, a kitchen, a stable, a hostelry, a wheelwright's workshop and all the grain and wood stocks needed to run this complex, which is undoubtedly the model copied by the monks.

Map 7: breweries in the Mosan region between 800 and 1350 after Decker's map



Unsurprisingly, the vast majority of breweries are located along the waterways. Deckers points out that, with rare exceptions, the beer is sold within the village or town, within a radius of a few kilometres at most. The breweries in the market towns (Liège, Namur, Maastricht, Huy, St. Trond) operate by district. Medium-distance trade in beer is still rare in the region. Even after 1300, the hopping of beer, which is supposed to improve its preservation, does not seem to have stimulated a trade that has remained local despite good waterways.

The development of the brewery fosters the creation of new rights to be paid: **grutum** on the supply of **gruit (4.2)** and **cambagium** on the beer produced (Deckers 1970, 479). Cities and small towns set up new taxes to finance their infrastructures (ramparts, bridges, roads, public warehouses, river ports, etc.).

5.4 The organisation of the brewery in Flanders

The survey by Deckers shows that the economic situation of the brewery changed very rapidly after 1250. The Carolingian documents, which focus on the management of ecclesiastical estates between the 9th and 11th centuries, depict a fixed situation for the brewery of the abbeys. However, aside from the ecclesiastical world, a profound evolution is taking place. The town brewer, freed from his economic and social dependence on an abbey or a lord, runs his own business. He joins forces with the maltster, the baker and the miller, as they were already doing previously owing to technical constraints. In the Meuse valley, the urban brewery flourishes in the towns mentioned above. The evolution of brewing after 1250 is beyond the scope of this study, as is the status and work of those who will become workers or master brewers, soon to be organised into guilds.

Can the case of the Mosan valley be generalised to the whole Carolingian world?

In the context of cities and merchant ports, certainly, at least in the northern regions, exemplified by Dordrecht in the Netherlands (Figure 34).

The same is true of the rich cereal-growing regions. Wherever grain is abundant, medieval beer brewing takes off. We often read that brewing developed where there are no vines. The Moseland was in competition with wine, caught between the vineyards of the Moselle and the Rhine. The rise of the brewery is not explained by a lack of wine but by the abundance of cereals, the

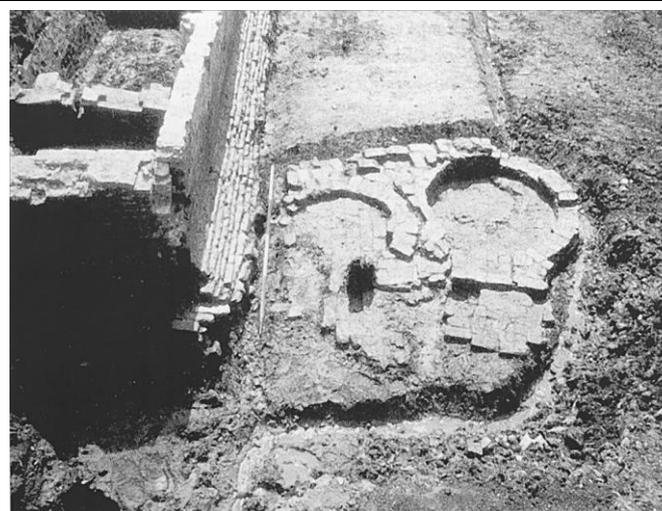


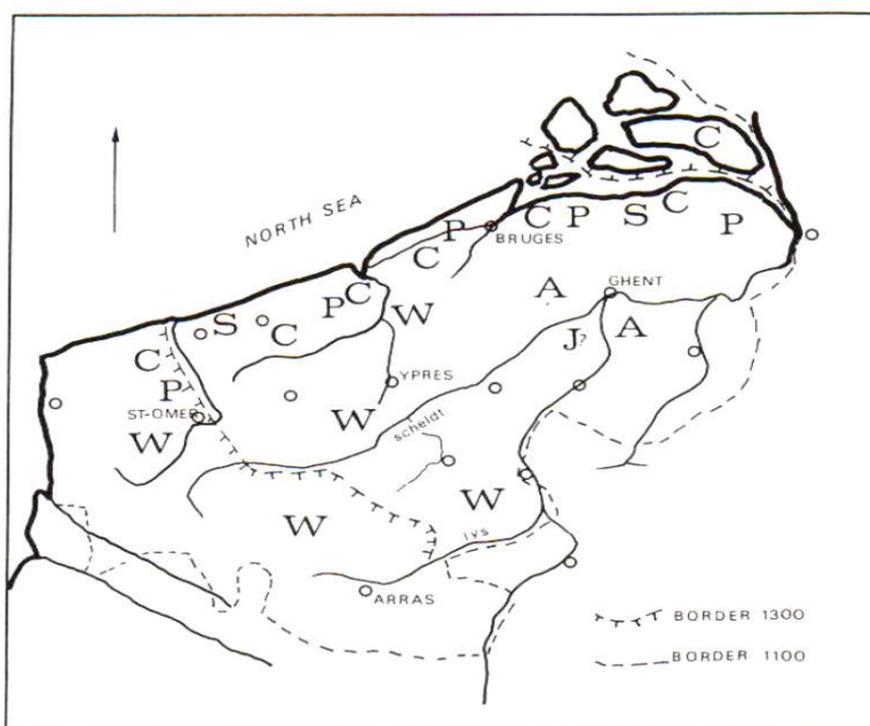
Figure 34: 2 fireplaces for brewing pots, mid 13th century. Excavation in Dordrecht, Netherlands, 1969

grain trade and their processing. In other words, the Meuse Valley can be compared to the fertile Parisian basin, the Champagne region or the Loire Valley⁷⁹. It is not an exceptional case, no more so than the Alsatian estates of Wissembourg, where beer and wine coexist without competition (4.6 and Table 9).

It is unfortunate that since 1970, Joseph Deckers has not been followed in his approach and method by other medievalists to explore and map other regions. The documentary sources of the early Middle Ages are only waiting for their regional studies (Metz, Strasbourg, Cambrai, Reims, St Denis, Flanders, Rhine valley, Moselle, etc.). Fifty years after J. Deckers' article, it is still impossible to go beyond the horizon of the agricultural estate, the *villa*, in the study of the Carolingian brewery. Such a change of scale would bring its share of surprises.

The picture is not as bleak. Erik Thoen and Tim Soens have studied the specialisation of Flemish rural economies in the 10-11th centuries, to explain why Flanders was one of the outposts of European trade. They note that farmers participate in the specialisation of agriculture, which fuels the emergence of pre-industrial production of goods such as textiles and beer. Some regions specialise in the production of grain, others in the production of peat, which was very useful for making malt and cooking beer, and others, such as Ghent, in brewing beer (Map 8). This early development of the craft brewery and the beer trade in Flanders confirms the economic development noted by Deckers for the Middle Meuse basin from the 13th century onwards.

Map 8 : regional specialisation in Flanders in the 'elite directed' specialisation system with peasants supported by communal authorities, c. 10th to c. 11th century. A = Beer production mainly around Ghent. P = Peat production. W = cereals growing mainly for bread. Erik Thoen, Tim Soens 2017. Fig. 3, 132



LEGEND: W = cereals for bread, C = cattle breeding products (cheese, butter, wool, leather, meat), P = peat, S = salt, J = pork, A = Ale.

⁷⁹ The abbeys of St Denis and St Germain drink beer as much as wine (4.1.2). Beer-studies.com (2021)

Archaeology provides examples of domestic breweries, which were brewing devices installed in wooden and thatched houses that also served as living quarters. In Zutphen in the Netherlands, a domestic brewery dating from 1284 has been reconstituted: a cauldron on a dirt floor, a barley storehouse on the first floor and a lot of pottery (Unger 2001, 18). It was destroyed by fire, one of the common calamities threatening malting and brewing houses at that time. This permanent danger explains the location of the brewhouses on the outskirts (*suburbium*) of important cities.

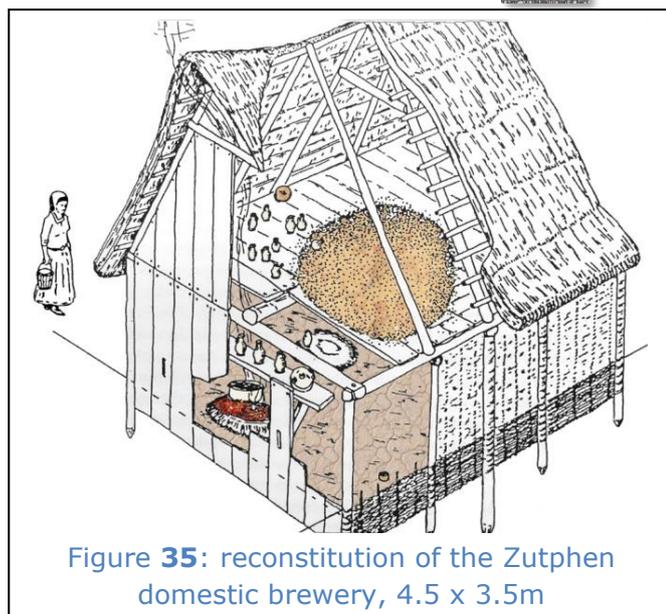


Figure 35: reconstitution of the Zutphen domestic brewery, 4.5 x 3.5m

Another archaeological find near Groningen sheds light on brewing methods in the 13th century, just before the rise of urban brewing in Holland. Fifteen-metre long houses built on small mounds of bog (*terps*) contained 100-150 litre pots made to be heated on a hearth and placed on clay stands. They were supplemented by clay filters with a spout at the bottom, a pierced board used as a filter with straw, and mortars for the grains. This is a brewing device. A nearby well provided fresh water. This technical apparatus is a witness to the methods used when brewing was still halfway between domestic brewing with the use of pottery, and artisanal brewing which adopts large wooden vats and metal cauldrons of greater capacity (Figure 8). At that time, the 100-150 litre pots have reached the technological limit of refractory ceramics (Vilsteren, 1992).

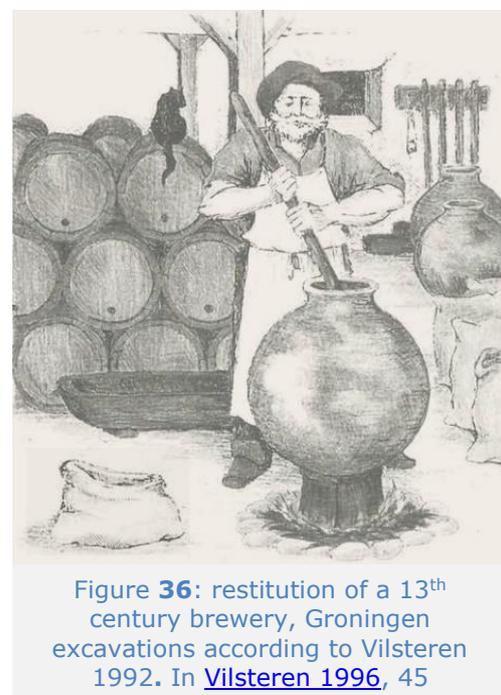


Figure 36: restitution of a 13th century brewery, Groningen excavations according to Vilsteren 1992. In Vilsteren 1996, 45

On a broader geographical scale and for a longer time span, the [Richard W. Unger's studies published in 2001](#) and [2004](#) are indispensable and invaluable. Unger has outlined when, how and why the breweries of the Hanseatic cities of Germany exported their beers to the cities of the Baltic and North Sea coasts as early as the 13th century. These towns gradually take over and become beer exporters themselves in the following centuries, especially the towns in the Netherlands, then those in Brabant, and finally the towns in the Ardennes and the Rhine. The dynamism of their commercial breweries extends the brewing landscape drawn by the ecclesiastical sources of the 8th-12th centuries, with a concentration of abbeys brewing beer between the Rhine and the Seine and on the other side of the Channel. What has evolved:

- The volume of beer brewed: the breweries in Hamburg, Hanover, Lübeck, Gdansk, Bremen, Wismar, Göttingen, Antwerp, Ghent, Bruges, Haarlem,

Leuven and Gouda brew millions of hectolitres every year ([Unger, 2004](#), 118-119). A part of this production is sold in the cities, another part is exported. We are far from the few hundred hectolitres brewed each year by or for the Carolingian abbeys.

- The organisation of the brewing process and the commercial circuits: the raw materials used by the brewery converge on a Carolingian abbey which processes them and consumes the beer on the spot. Carolingian beers travel little. From the 14th century onwards, the merchant towns of northern Europe export their beer several hundred kilometres away. This large-scale distribution of beer implies a technology that makes it possible to preserve the beer, a well-organised transport network (usually by river and sea), intermediaries and commercial agents in each destination town, and brewers organised according to the constraints of their trade and no longer according to the social constraints of the Carolingian semi-servitude imposed on those who brew the beer, whether for secular or ecclesiastical drinkers.

5.5 Did monks revive the brewing of beer in Europe?

The literature harps on the same story. During the Carolingian period the monks resurrect a brewing tradition that had languished under the Merovingians. The multiplication of the foundations of abbeys and monasteries between 750 and 850 would have placed in their hands a brewing technique constantly improved thanks to the material means they had at their disposal and to the learned written culture that monks alone mastered since the fall of the Roman Empire. This view is flawed by a double bias:

1) The period between the collapse of the Roman Empire in the 5th century and the advent of the Carolingians in the 8th century is sparse in written documents. However, archaeology shows that beer brewing is alive and well at that time and refutes its supposed eclipse. Beer does not disappear from the texts (cf. Columban, Gregory of Tours, Venance Fortunat⁸⁰). The brewing of beer is ongoing in the villages and courtyards (*curtis*) of the large agrarian estates ([chap. 1](#)). Alamanni, Bavarians, Saxons or Carolingians would not have given beer an important place in their customs or their Capitulars if this beverage was not already familiar to their ancestors.

⁸⁰ [Venantius Fortunatus](#) (530-609), poet of Italian origin, relates that the queen [Radegonde](#) (519-587) known for her piety, refuses to drink fermented beverages at the royal table in Poitiers: “*She did not drink any beverage except water sweetened with honey or pear cider, but she did not touch pure wine, mead or cloudy beer [cervisaeque turbidinem].*” (Vita Radegundis, XV.35). For Columban and Gregory of Tours, see above [2.3](#) and [1](#).

2) The economic weight and political power of abbeys are undeniable, but too often confused with their supposed technical role. In most fields, ecclesiastics did clerical work, wrote, prayed and managed technical tasks, but they did not do material work themselves. Inventive activity and techniques were in the hands of the laity, whether it was brewing beer or building an abbey, tilling lands or working generally.

5.5.1 Resurrection or perpetuation of brewing in the 9th century?

To envisage the rebirth of brewing in Western Europe during the 9th century implies its virtual disappearance between the end of the Late Roman Empire (476) and the advent of the Carolingians (751). This eclipse is not attested, quite the contrary. First of all, it is important to catch what is meant by "brewery": any place and installation where beer is brewed. Under the Merovingians (481-751), beer is rarely traded as it is in Gallo-Roman times ([Laubenheimer 2003 & 2015](#)). The great ruined cities are deserted, the Roman legions and their concentration of beer-drinkers no longer exist ([Romano-Brittonic tablets of Vindolanda](#)), the economic networks that linked the old Gallo-Roman villae have disappeared. Each domain, each county, each kingdom lives in almost self-sufficiency. One would look in vain for a *merchant economy of beer* during the Merovingian period. This does not mean that beer brewing disappeared. Beer is brewed to fuel the feasts of the Frankish aristocracy. The supply of grain and the work of brewing stem from service obligations owed by serfs or dependents to their master. Beer is brewed in a domestic context: a rich or poor house (farm, court, palace, abbey, lord's residence, etc.) where masters and servants live together.

Merovingian written sources are sparse but remain largely unexploited as far as brewing is concerned. The few mentions of beer brewing are of a technical nature. There is mention of '*workshop where beer is cooked (brewed)*' (*officina ubi cerevisiam coquitur*). Unsurprisingly, they are more numerous in the northern regions (Germania, Saxony, Friesland, Belgian Gaul, etc.). Brewing traditions are alive and well in these countries where the old religions are still practised.

We know of another precious text from the beginning of the 8th century. In 716, the Merovingian king Chilperic II (c. 671-721) confirmed the concession to the abbey of Corbie of important royalties in kind collected near Marseille (France). Each year, envoys from the abbey come here to collect "10,000 pounds of oil, 30 muids of garum, 30 pounds of pepper, 150 pounds of cumin, 2 pounds of cloves, 1 pound of cinnamon, 2 pounds of spikenard, 100 of almonds, 10 of pistachios, 100 of olives, 50 of hidrio aromatics, 150 of chickpeas, 20 of rice, 10 of golden pepper, 10 seoda skins (parchment), 10 Cordoba skins, 50 papyrus rolls" ([Levillain 1902](#), 198 ; [Pirenne 1930](#), 204). Mediterranean products, also spices and papyrus from Egypt. Under the Merovingians, maritime trade and Byzantine merchants were active all over the Mediterranean Sea. The European economy was not inward-looking, at least not in the case of the royal courts and abbeys.

That is not all. To make the round trip between Corbie near Arras and Fos near Marseille, 10 envoys, 15 carts and numerous servants travel more than 1000km southward and back. The king grants the envoys of Corbie a *perpetual tractatus*, a safe-conduct which authorises them to travel and to requisition in inns, towns and relays for travellers all that they need at the expense of the kingdom and without paying the *tonlieu*, a heavy local tax on men and their goods conveyed from place to place. Among these food requisitions, beer and wine are included. At each stopover, the 10 envoys of the abbey could claim: “1 muid of wine, 2 muids of beer (*cervisa*) [\approx 100 litres], 10 pounds of bacon, 20 weights of meat, 12 pounds of cheese, 20 pounds of peas, 1 kid, 5 chickens, 10 eggs, 2 pounds of oil, 2 ounces of cumin, salt, vinegar, oil and sufficient wood.” This list is astonishing: the abbey's commercial agents feast on rare spices. The fact that beer and wine are included at every stopover – twice as much beer as wine – shows that beer did not disappear from the Merovingian landscape. The brewing territory even extends as far as Marseille, via the river Rhone valley!

This diploma of 716 is suspected to have been falsified by a copyist monk at the end of the 8th century, in order to have Pepin the Short and Charlemagne validate ancient privileges granted to the abbeys of Corbie and St Denis by the Merovingian kings Childéric II (655-675) and Clotaire III (657-673). The date of its writing is questioned, not its content, which compiles original acts now disappeared. The mention of beer and wine granted to the agents of the abbeys of Corbie and St Denis travelling to Marseille or Fos retains all its historical value.

Archaeological excavations say much the same thing. The Gallo- or Belgo-Roman brewing traditions are not interrupted (Deckers 1970, 448). Among the Alamanni or Burgundians, further north in Ireland, among the Angles, the Frisians or the Danes, beer remains the main fermented beverage at that time, alongside mead. The Carolingian Empire extends to the banks of the Elbe and the middle Danube basin. However, historical studies of brewing in the medieval period are scarce for Central Europe ([Map 9](#)).

The temporary eclipse of brewing would only concern the southern regions that were formerly Visigothic and wine-producing (Aquitaine, Vasconia, Septimania, present-day Provence, Hispania). Archaeological excavations in these regions do not look for traces of brewing, based on a prejudice too often shared by archaeologists: wine in the south, beer in the north!

5.5.2 Technical progress driven by the monks?

The abbeys encourage the brewing of large volumes of beer simply because of the consumption of the nuns and monks gathered in the same place and allowed by the monastic reform to drink beer at a rate of 1 to 1½ litres per day (2.4). If we consider an average number of about 100 monks or nuns per abbey around

850 (Appendix 9.6), a single abbey orders the brewing of about 500hl of beer per year, very little compared to an industrial production, but a lot regarding the Carolingian economy. However, the daily consumption of beer is not confined to the clergy. The Carolingian aristocracy, the lesser nobility enriched by war and the merchants, manages the brewing of beer for themselves. This is evidenced by the written wills of laymen who donate their own breweries and mills set up on their estates to monasteries or priories⁸¹. Or the plan of St. Gall which foresees a brewery as large as the one portrayed for the monks, for its hostelry and its lay noble guests.

The impact of the monastic brewery on Carolingian brewing techniques at large stems from its sedentary nature, the production of several types of beer for an average of 300 people (monks + servants) living in the same place. The raw materials converging at the abbey gate allowed regular brews throughout the year and increased the technical experience of those brewing (Diagram 11). The abbeys have the financial means to install the best possible equipment (hydraulic mills, ovens, copper or brass vats, barrels, etc.). They mobilise the best brewing techniques (raw materials + equipment). This does not imply that monks are the source of the practical knowledge of brewing.

The Capitulary De Villis (§ 45) ordered the stewards of the imperial estates to bring 'masters of the beer' to the palace. These were laymen, not monks. Did the monks brew their own beer in their abbeys? This is doubtful. Nuns and monks employed numerous prebendaries and servants working near them or in the vicinity of the abbey. St Gall's plan foresees that they sleep on the premises, in each workshop (chap. 3).

The provost, cellarer and gatekeeper supervise the brewing and control the use of grain, malt, wood and water, as indicated in the Corbie Instructions. This supervision does not make them master brewers. Adalhard clearly stipulates that all the abbey officers (provost, porter, cellarer, hospitaller, chamberlain, etc.) must supervise the work and be assisted by (lay?) helpers in all their manual tasks.

Nevertheless, the Capitulare monasticum of 817 stipulates for the monk "*And in the kitchen, in the bakery and in other workshops, to work with his own hands and to wash his clothes when necessary*"⁸², that is, when there are no more servants to do it. *Other workshops* include the brewery. There is an account that seems to say that the monks are attached to the work they do in the brewery and

⁸¹ The overwhelming majority of Carolingian sources are of ecclesiastical origin. Secular documents have come down to us when they are closely related to the interests of the abbey that archived them. This distorts our view of the Carolingian world and attributes many of its developments to ecclesiastical initiatives alone. The medieval history of brewing does not escape this bias. It wrongly gives the monks the benefit of all its technical developments. Careful studies of the rural world have shown that the major technical developments have been the work of peasant communities since the early Middle Ages: horse-tilled land, triennial rotation, new crops, cultivation on terraces, Catalan forges, etc.

⁸² 5. Ut in coquina, in pistrino, et in caeteris artium officinis, propriis operentur manibus, et vestimenta sua oportuno tempore lavent. dmgh.de/mgh_II_1/index.htm#page/201/... Beer-studies.com (2021)

bakery of their monastery. In 812, the monks of Fulda complained to Charlemagne about their abbot Ratger, who, among other grievances, deprived them of their customary rights to work in the bakery and brewery ("**pistrinum et bratiarium**"), in order to force them to take part in the construction of the new basilica, the first monumental transalpine basilica 98m long⁸³. One cannot conclude that these monks make beer and bread with their own hands. Rather, their petition expresses the desire for a monastic life centred on liturgy and prayer, far from the exhausting prestige manual tasks required by their abbot. To put it another way, these monks want to go from the refectory to the bakery and the brewery, each week in turn, to supervise the work of the servants as prescribed by the Benedictine rule, rather than playing the role of foremen and workers under the sun or in the rain.

The technical improvements attributed to the monks are the result of the work of dependants brewing on behalf of an abbey, inside or outside its enclosure. These lay brewers have found inside and around the abbeys the material means, the regularity and quality of supply which have favoured the perfection of their malting and brewing processes. Monasteries and abbeys, often founded in rural areas, are economic poles focused on their own needs. With significant material resources and stable structures, these institutions trade their good quality resources (grain, wood, salt, crafts, etc.) and run their well-built facilities (mills, ovens). This is the real origin of the technical improvements known in Carolingian times. [Max Nelson \(2005\)](#) noted that monks buy beer in addition to having it brewed within their monasteries. The texts speak of breweries (**cambae**) run by laymen operating on the abbey's agricultural estates, often several dozen kilometres away, as we have seen above (**4.5 & 4.6**).

Even abbeys with breweries on their premises receive beer brewed by those who, for various reasons, owe a cens in kind. This is even the case for St. Gall. In 769, a precarious contract stipulates that Chrodhoch and his wife Raginswinda must deliver to the abbey each year "*20 barrels of beer, 1 maldrum (unit of measure) of bread and a piglet worth one saiga*" until their death. If a son is born and succeeds them, he must deliver the same rent. The last surviving spouse shall deliver an increased cens of "*30 barrels of beer, 1 maldrum of bread and a piglet worth 4 denarii*". This implies: 1) that the couple brews beer themselves or have it brewed by a layman. 2) that the monks of St. Gallen drink beer which does not come from their brewery (it is not known whether St. Gallen has a brewery in 769)⁸⁴.

⁸³ J. Semmler, Studien zum Supplex Libellus und zur anianischen Reform in Fulda, Zeitschrift für Kirchengeschichte 69 (1958), 268-298. [Horn & Born 1979](#), I 189-190, II 264. de.wikipedia.org/wiki/Supplex_Libellus

⁸⁴ St Gall no. 55 (21 October 769): ... *And this is what they gave to us in the villa Baldinga and its marca (i.e. within its confines): whatever we seem to have there, excluding their servant Waldilana. And this is the census which they ought to pay every year: 20 barrels of beer and 1 maldrum (a unit of measure) of bread and a piglet worth one saiga. And if they should bring forth a son, let him do the same, and if not after the death of both [Chrodhoch and Raginswinda] let those goods return to the monastery without any hindrance, and may they come to no person by exchange or sale or donation, but may the* [Beer-studies.com](https://beer-studies.com) (2021)

The role of the monks in the improvement of brewing techniques can be summed up by the economic weight of their abbeys and the specifications of the abbots who were anxious to provide the best beer for their community. This led to the control of malting, fermentation and the storage of beer in barrels, and perhaps the widespread use of hops from the 13th century onwards. But these specifications did not imply brewing oneself, quite the contrary. The aristocratic culture of the Carolingian clergy considered manual work to be a vulgar task⁸⁵.

The only technical impact that can be credited to the abbeys derives from the brewing of three types of beer: that of the monks, that of the guests, and the beer for the common people. Each type of beer has its own quality of grain and malt, but above all a different density of wort, and ultimately a different percentage of alcohol (Table 2). The alcoholic content of beer depends on many factors: the initial quality of the grain and malt, the ratio of raw grain to malt and grain to water, the brewing method, the boiling of the wort, the quality of the water, and finally the fermentation and storage methods. It is a more complex technique to master than winemaking. Controlling the density of fermentable sugars in the wort and alcoholic fermentation were difficult technical problems at the time, but could be overcome by experience and empirical methods.

Ensuring consistent grain/malt/finished beer ratios has stimulated a specific knowledge of how to reproduce without accidents each step of a long chain of operations from malting to fermentation. Brewers measure grain proportions and apply recipes (see a brewer's weighing scales Figure 4).

Achieving three different ratios for different brews throughout the year is not a simple technical matter to be solved. The Benedictine Rule imposes measure in everything, neither too little nor too much: a beer that is neither too strong (risk of drunkenness) nor too weak (not restorative enough) for the brethren. To guarantee this "good density" all year long, whatever the nature of the cereals (barley, spelt, oats, rye), the variable quality of the grains (old, dirty, more or less mouldy, etc.), and that of the malt and the water, the brewers need to define brewing ratios or recipes. Scattered references show that the monks and their abbots were concerned about the quality of the brew of the brethren, as drinkers and good managers of their granaries, but not as brewers. In the present stage of research, no text says whether the technique of the "right density" was mastered, a fortiori whether it was mastered by laymen or by monks.

monastery itself hold them firmly and stably in perpetuity. And if one of them [i.e. Chrothoch or Raginswinda] should survive the other, let the census be increased; that is, to 30 barrels of beer and 1 maldrum of bread and a piglet worth 4 denarii. And if anyone should want to break this charter, let him pay 2 ounces of gold and 4 pounds of silver to the fisc (treasury) ... www.charlemagneurope.ac.uk/charter-basics/

⁸⁵ A medieval monk works to humble himself from a Christian perspective of mortification, not to share the common fate of the laborers.

A line of thought leads us back to St. Gall. Why have three different breweries in this abbey when one centralized brewing facility was sufficient to produce three different kinds of beer for its requirements?

Since ancient times, brewers have used the same equipment to vary the quantity and quality of grain and water to adapt the density of the wort. They also know how to wash the spent grains to obtain a low-sugar juice and a low-density beer. The Carolingian brewers were familiar with this technique. Abbot Haito planned three different breweries not for technical but for ideological reasons: three isolated breweries in three spaces assigned to three distinct rules of life (for details see chap. 3). The Carolingian monks were not inclined towards the technical perfection of the vulgar things, beer or food, apart from when it concerned their economic management, as shown by the learned calculations of the abbot of Corbie. They reserved art, knowledge and technical improvements for sacred objects and the construction of the House of God, the *Domus Dei*.

In short, the monastic breweries did not save, revive or reinvent brewing in the early Middle Ages, as is often stated. This view is based on two recent historical periods. The first was the period of Martin Luther (1483-1546) and the Reformation, when monks became concerned with the ordinary life of the faithful and broke with the aristocratic mores of the Roman Church. Luther's wife used to brew beer in the common house for the monk, who was no longer confined to a monastery but lived among his own people. And there were times in the 18th and 19th centuries that saw the abbeys lose their vast agricultural estates. Forced to work, the monks had to handle the mashing rake to enter a market economy and sell "abbey beers" to the laity⁸⁶.

Since the Carolingians, and probably before them, technical developments in brewing in Europe have been accomplished by lay brewers, merchants and craftsmen, in large cities such as those of the [Hanseatic League](#) (1241-1648)⁸⁷. We agree with R. Unger's conclusion on this point: "*The source of the urban brewing industry was not the presence of brewhouses in monasteries or episcopal households, regardless of the technical influence such establishments could or did have. It was rather the transfer of traditional brewing practice from the countryside to the cities by rural migrants, the people who formed the population of European towns in the twelfth and thirteenth centuries. Brewers continued in towns the same practices that they had followed in the countryside, at least initially.*" ([Unger 2004](#), 38)

⁸⁶ This development occurred in the German states before reaching Belgium, the Netherlands, and northern France several decades after the French Revolution.

⁸⁷ The question of the technical nature of the gruit, the *grutum*, could modify this statement if it turned out that the gruit was used as a beer ferment and not simply as an aromatic adjuvant (4.2). Still, this *grutum* would be a technical invention of laymen monopolised by ecclesiastics to create a commercial privilege, the right of gruit.

It would be tedious to recount all the clichés relating to the "monks' beer", which supposedly originates in the Middle Ages.

The monks drank beer from the very first centuries of monasticism in Egypt and Western Asia ([Nelson 2018](#)). A primary cliché leads us to believe that monks started beer drinking with the Carolingians, a few centuries later in Western Europe. Here is a short selection of other clichés:

"The brethren nicknamed the beer 'liquid bread', it complemented their frugal diet." This "liquid bread" is a modern expression coined by historians to describe Mesopotamian or Egyptian beers; an expression then applied to medieval beers⁸⁸. The monks' diet was not as frugal as one might think. They associated beer with bread (not "liquid bread") to justify drinking it on days of Lent and penance.

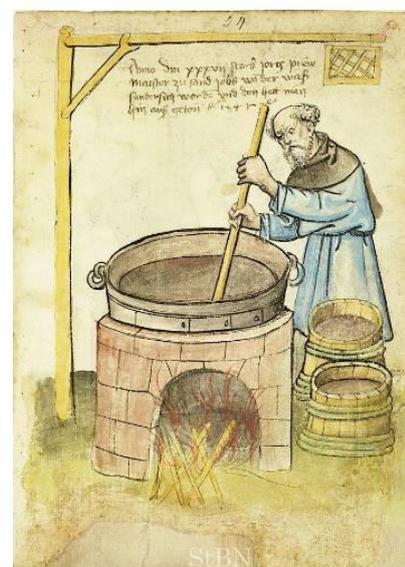
"An abbess, Hildegard of Bingen, discovers the aseptic and healing virtues of hops". Hildegard of Bingen lived between 1098 and 1179, two or three centuries after the first mentions of hops and a hop garden in the Carolingian documents. Another Germanic legend!

"It was in 1260 that the first professional brewer appeared in Alsace, the monks now sharing their knowledge with profane (sic!) brewers". (fr.wikipedia.org). The monks rarely brewed. The technical knowledge was in the hands of the tenants brewing for the abbeys and those of the *siceratores*, master brewers (?) brewing for the Frankish aristocracy, before, during and after the Carolingian rule. The *siceratores* appear in the documents long before 1260.

In 1388, the wealthy merchant Konrad Mendel had a retirement home built to house and feed twelve needy old craftsmen from Nuremberg and to provide it with capital for permanent upkeep. Since about 1425/26, each "Mendel brother" has been depicted with a full-page portrait in the Mendel house book (hausbuecher.nuernberg.de). The oldest of them, "brother" Jorg, master brewer, died in Nuremberg in 1437⁸⁹. He is a lay brewer, not a monk! The word *bruder* (brother) expresses the necessary social and technical solidarity of craftsmen practising their various trades in an urban medieval context.

And even a Brewmaster Monk in World of Warcraft!

An enduring legend!



⁸⁸ *šikaru* in Akadian or *hnkt* in Egyptian do not mean "liquid bread" either.

⁸⁹ The caption on the parchment above his portrait depicting him as a brewer stirring the wort in a cauldron: *Anno d(omi)ni xxxvii starb Jorg prew maister zu sand Jobs wa(n) der waß sunder sich worde(n) und den hett man hin auß geton d(er) 124 prud(er)*. "In the Lord's year [14]37, Jorg the brewmaster died in Saint Jobs, while he was a leper and was taken away by his 124 brothers."

6 Brewery and hostelry in the Carolingian Empire

The plan of St. Gallen includes a hostelry and a brewery for distinguished guests. This arrangement, which was found in all the abbeys, was a response to the general obligation to receive, feed and soothe the Carolingian aristocracy during their numerous journeys. The Carolingian dynasty had favoured religious orders since [Pépin III The Short](#) (r. 751-768). The abbeys established in the four corners of the empire are a powerful tool for unifying conquered territories, controlling populations and managing the economy of kingdoms (6.2).

6.1 The obligatory hospitality of Benedictine abbeys

The hospitality offered by the abbeys results from the duty of charity. Whoever knocks at the gate, rich or poor, must be helped. This hospitality is extended to travellers, pilgrims, paupers and the sick. They are welcomed during the day (the abbey closes its gate at night), receive a ration of bread and beer, can spend the night and must leave the next day. The abbey is not an inn. The poor and the sick are accommodated for longer periods but in limited numbers, 12 at the most in Corbie according to the strict instructions of its abbot (2.4).

This Christian hospitality is coupled with a political hospitality. An abbey is located in a strategic place on the land of an ecclesiastical or lay aristocracy. An abbot is both a religious and civil potentate. Around the abbey, land is cleared, cultivated, and the territory and its inhabitants are taken over. In short, an abbey is a central point of colonisation. An abbey is not only a storehouse of grain, food and fermented beverages, but also a political anchor in a territory that is partly hostile to the Carolingian power and the presence of monks. A document explains the extraordinary economic privileges granted to the great royal abbeys and their role in the trade circuits and supply of the Carolingian elite.

[Marculf](#), a Frankish monk of the second half of the 7th century, compiled a collection of *formulae* relating to the customs of the Merovingian period around 650-655. Among these forms, the *Summation for the legates or minimum standard produced for them* (*Tractoria legatariorum vel minima facienda istius instar*) lists all the foodstuffs that a special envoy, legatee or ambassador can claim at each step of his journey. Among them "... *as many as needed of loaves of bread, muids of wine, muids of beer (cervisa), pounds of bacon, meat, pigs, lambs, geese...*". Next on the list are garum, honey, vinegar, spices, vegetables, dairy products, cheese and all kinds of rare foods, services for horses and carts⁹⁰. These

⁹⁰ dmgh.de/mgh_formulae/index.htm#page/49/mode/1up et [Guérard 1844](#), 1/2 p. 805.
Beer-studies.com (2021)

forms, constantly revised by the Carolingians, illustrate the organisation set up by the empire to control its territories.



Figure 37: party of women and men of the nobility on their journey (Luttrell Psalter, 1320)

The *Tractoria*, both a safe-conduct for travelling through the empire and an inventory of the food, beverages and services that an envoy and his retinue might legitimately require at each stop, states several facts:

1 - The aristocracy travelled all year round to the four corners of the empire, less so in winter, on horse and cart, for their wars and diplomatic or family affairs. This is not the case for peasants and tenant families, who are legally bound to the land of their mistresses and masters and cannot move freely. On its own land, the aristocracy consumes its resources. But on imperial lands or those of other aristocrats, they demanded everything from the inhabitants and indulged in many abuses. The Carolingian capitularies tried in vain to limit these extortions. The successors of Louis the Pious (r. 814-840) were quick to abuse monastic hospitality, if we are to believe the abbots who complained that the food and beverage supplies were literally plundered by nobles travelling in great company.

2 - According to the *Tractoria*, beer and wine (one should understand beer or wine or both) are beverages available everywhere in the imperial lands. These are the two main fermented beverages mentioned in the text. Depending on the region and local resources, cider, perry, blackberry wine, mead, more or less fermented honeyed infusions and probably other local fermented beverages should be added to the list (9.5).

3 - The accommodations are close together. How close? The Bavarian Law forbids requiring serfs of a church or settlers to do carriage (*angaria cum carro*) more than 15 *lingas* (≈ 33 km) from their manse (Guérard 1844, 1/2 799), or 2 days of travel with a yoke of 2 oxen⁹¹. The delegations travel by horse and cart with weapons, luggage and provisions carried on ox carts. The average distance between two halting points is 30-50km, covered in two to three days.

4 - Large, fixed brewing facilities are only found in cities, palaces, abbeys and county courts. When the aristocracy, delegations or imperial envoys (*missi dominici*) move with their retinue of servants and serfs, everything needed for drinking and eating is brought in carts between two halts or two abbeys. The

⁹¹ Average speed of a present-day harnessed ox = 2.6km/h. A horse is faster but gets tired more quickly. The load of the carts was about 300kg, except for the large carts carrying whole families and their luggage.

brewery and the brewers follow with the stewardship and the utensils conveyed in carts. Wine in small barrels and also beer.

5 – The *Tractoria* foresees oats for the horses and fodder for the oxen. A *paraveredi* service replaces tired horses with fresh post horses. The hostelry of St. Gall has a large stable for the horses of travellers and another building reserved for the abbey's horses.

The abbeys thus serve as inns, for the Carolingian nobility only (not for the paupers), both lay and ecclesiastical. Having a brewery reserved for imperial officers and the aristocracy is part of the ordinary services and duties provided by an abbey.

This duty of hospitality has a downside. The abbeys maintain a hostelry within their walls for guests with unruly morals, accustomed to noisy feasts where beer flows freely. The collective drunkenness of the secular people causes the abbeys to spend a lot of money on fermented beverages. When the imperial court or those of the counts travel to the provinces of the empire, the most prestigious abbeys serve as a pantry, a cellar and a guesthouse. A single visit in a year can empty the storerooms of an abbey. The abbot Adalhard calculates a large surplus of grain for Corbie to cover unforeseen expenses of bread and beer each year ([Devroey et Schroeder 2017](#)).



Figure 38: monks, women and men of the nobility at table, and servants serving them food and beverages. Monks belong to the aristocratic social class. (Luttrell Psalter, 1320)

6.2 The meshing and controlling of the territories by the abbeys

Bishops, abbeys, priories and parish churches experience an extraordinary development under the Carolingians. It is promoted and supervised by the imperial power and the Frankish aristocracy. Donations of agricultural estates including the working inhabitants customarily attached to them, construction of abbeys, political, material and financial protection, all increase. Tithing for the benefit of the clergy is made compulsory throughout the empire by Pepin the Short in 765.

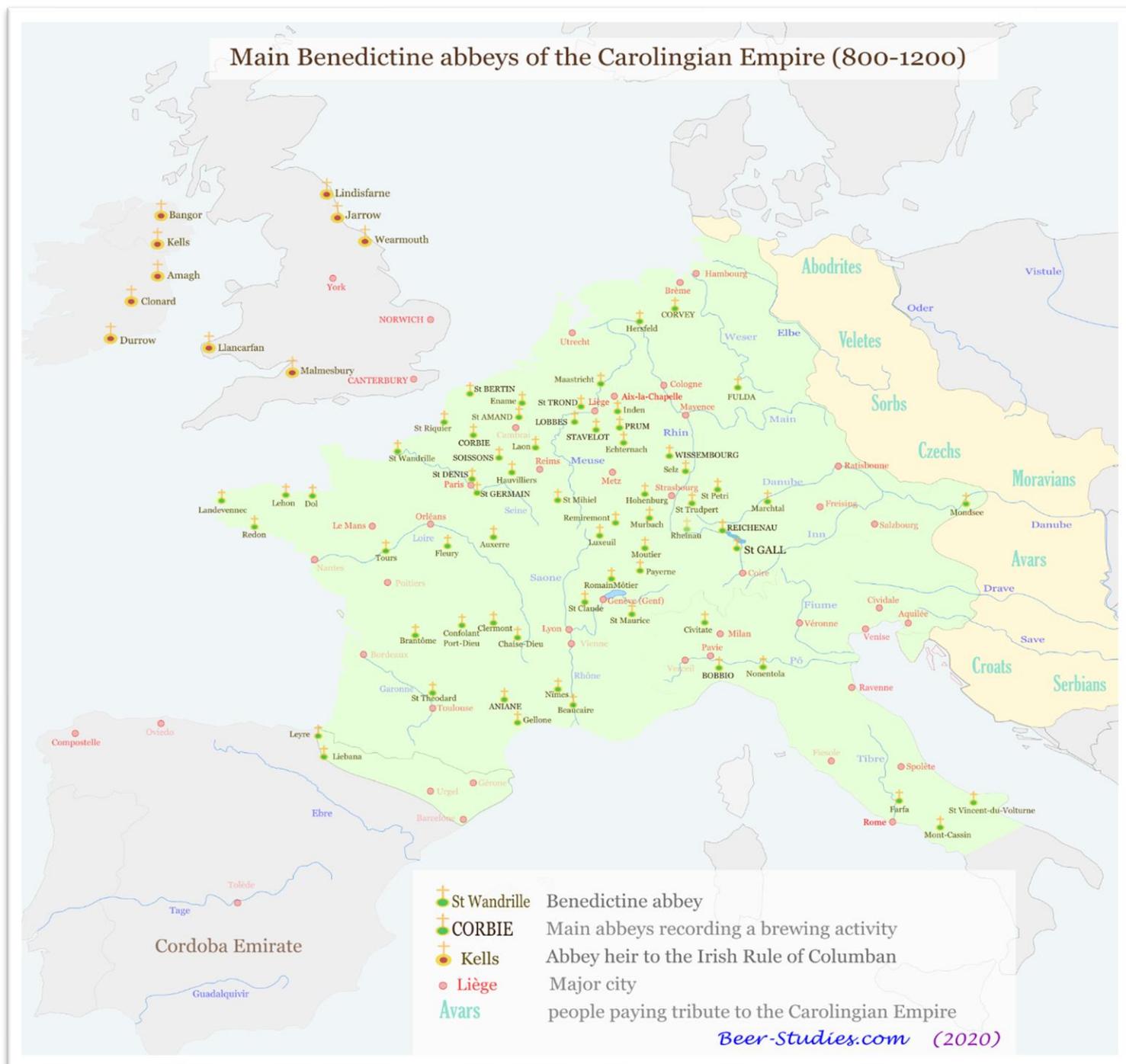
Map 9 of the main Carolingian abbeys shows a relatively tightly woven network of the empire, less than 30-50km between two abbeys, with the cities ruled by bishops and the numerous churches interspersed between them (not shown on the map). The empty areas are inhospitable regions (mainly marshes on the Atlantic or Mediterranean coasts, in Sologne, Flanders, Friesland or the Po valley, mountainous areas, etc.). Abbesses and abbots could easily travel with their retinues from one religious institution to another throughout the empire.

Yet the abbeys are not just guesthouses with supplies of bread and beer. The Carolingian Empire attempts to control vast territories inhabited by peoples with very heterogeneous customs and habits. The alliance of the Franks with the papacy adds to their economic and military superiority a religious and political legitimacy in which the abbeys are the local actors. In practice, the clergy alone has the intellectual capacity to manage such an empire or to supervise the imperial administration. The political management of the empire implies travelling through its territories, informing, investigating, tracking down revolts and secessions. It requires a network of regional relays devoted to imperial policy. The abbeys and bishoprics make up the backbone of this network, and are provided with the material means to accommodate guests and imperial envoys, to transmit information, write letters, memoranda and annals, copy documents and archive them in their monastic libraries⁹².

Brewing and serving beer to guests who belong to the same aristocratic milieu as the abbesses and abbots is a domestic function in the service of a much broader political purpose: that of the Carolingian dynasty (to control its territories and their peoples) and that of the clergy (to extend the power of the church and the papacy). This was not without conflict between these two powers. The clergy claimed independence from the secular power, preferring to place itself under the distant authority of the pope. In the wake of the *Capitulare monasticum*, Louis the Pious has the *Notitia de servitio monasteriorum* written around 818. It lists the 84 abbeys that are free to elect their abess or abbot, beneficiaries of an estate exclusively dedicated to their maintenance, in theory protected from the prevarications of laymen or Frankish authorities ([Lesne 1920](#)). The 'free' election of abbesses and abbots is a sensitive issue. These 84 Benedictine establishments

⁹² [Notker the Stammerer](#) (*Notker Balbulus* 840-912), a monk of the Abbey of St. Gallen, is credited with the writing of the *Gesta Karoli Magni*.
Beer-studies.com (2021)

are divided into three classes according to their wealth, their ability to make contributions to the Carolingian dynasty and to support the service of the ost (*militia*) required of all free men whatever their occupation. The 1st class, 14 richest abbeys, must contribute fully. Those of the 2nd class (16 abbeys) contribute according to their means. The poorest (3rd class, 54 abbeys) are exempt from all charges and will pray for the emperor, his family and the kingdom. These 84 abbeys cover almost all the geographical territories of the empire⁹³.



Map 9: main Benedictine abbeys of the Carolingian Empire, England, Ireland and northern Spain

⁹³ The list excludes establishments that do not follow the rule of St Benedict and those run by laymen or de facto secular abbots appointed by the emperor or a Frankish count.
Beer-studies.com (2021)

7 Conclusions

7.1 The results achieved and the current overall picture

The monastic environment is an invaluable source of information. We have a better and better understanding of how brewing was organised within the Carolingian ecclesiastical domains. Three zones can be identified in concentric circles around the abbey, each with its own operating "rules":

1. The abbey proper, of which the plans of St Gall, Canterbury or Norwich are the best examples. Granaries, malting, milling and brewing workshops, an herb garden and a cellar are all available inside the abbey for the use of the nuns and monks, prestigious guests, travellers and pilgrims. These brewing workshops function thanks to the work and know-how of the many servants who depend on the abbey, supervised by the cellarer and the gatekeeper.
2. The abbey estate (approx. 25,000 ha) which surrounds the abbey and provides it with the basic necessities under the supervision of the provost and the intendants (*mayors*). There are mills and breweries that work for the abbey. The provost calls on them to get grain, malt, flour, beer, firewood, herbs, hops, etc. when the abbey's stocks are not sufficient or when the abbey does not have a brewery within its walls. Corbie abbey seems to illustrate this case. The abbey's domains remain under the strict socio-economic control of its abbess or abbot.
3. The farther estates are mainly used for the rent, namely to enrich the abbey through royalties in kind and money (*cens*, tithes). The breweries, malthouses and mills installed on these more or less remote agricultural estates are involved in the local trade on which the abbey withdraws its tithe. Here, the logic of economic exchanges governed by regional customs prevails, open to the emerging cities, towns and other large neighbouring agricultural estates. These estates belong to a lay aristocracy that often comes into conflict with the abbots and bishops over economic or political disputes. The mills, breweries and malthouses slowly evolve into small, autonomous 'crafts' in these complex mosaic borderlands of customary rights over land, people and their products.

The economic and cultural significance of beer is comparable to that of wine, at least in the northern part of the Carolingian Empire.

For example, the Abbey of St Denis (Paris), so often cited as an example of an abbey thriving on the wine trade, makes an equally large place for beer and brewing. The supply of hops and malt for St Denis mobilises unexpectedly distant

resources over 90km from Paris ([Table 6](#) and [Map 2](#)). The annual consumption of beer and wine is equivalent in volume. Yet wine seems to be omnipresent in the texts. Every time a vineyard occupies a piece of land, the polyptych mentions it and the equation vine = wine is verified. But every time a field is sown with cereals or harvested, or an abbey barn is filled with ears, the documents do not mention beer. Beer, the result of long and complex grain processing, is only mentioned if its consumption by clerics is deemed worthy of interest by the writers of the document, in fact rarely. Details about the Carolingian brewery can only be gleaned from economic or technical texts, those that describe the daily management of things and people, such as the Directives of Abbot Adalhard. The historian must follow the technical processes of brewing step by step in order to be able to identify the presence of beer. This is seldom done. The compilation of brewing vocabulary is no longer sufficient to detect the presence of beer brewing, especially if one is content with the indigent ecclesiastical Latin! Walter of Bibbesworth's *Tretiz* shows that the Roman, Anglo-Norman and Germanic vernaculars had a very precise technical vocabulary to designate the operations and ingredients of beer brewing ([appendix 9.7](#)). [J. Decker's](#) study has demonstrated its usefulness in initiating a regional history of beer under the Carolingians ([5.3](#)).

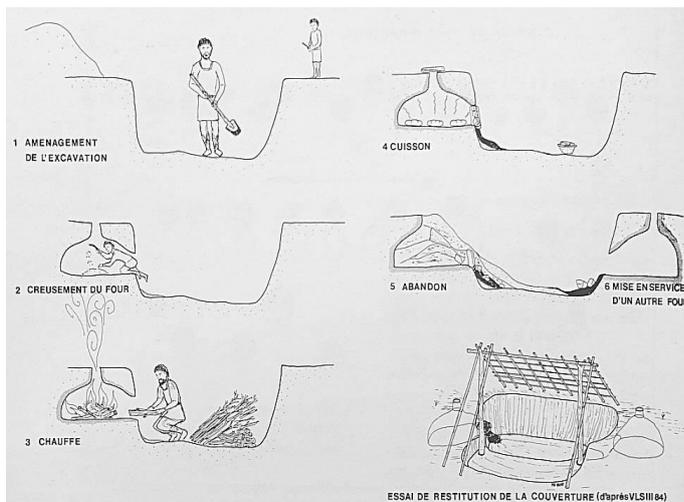
Archaeology can make up for the relative silence of the texts for exactly the opposite reason to that which masks the presence of beer in the writings, namely the weight of the brewing techniques. Brewing required heavy installations that left lasting traces in the habitat and domestic open spaces. [Joseph Deckers \(1970\)](#) reported some of these archaeological findings. [Van Zeist \(1991\)](#) noted the presence of malted barley in northern Europe in the medieval period. [R. Unger \(2001](#), pp. 18-19, 36) illustrated other examples for Holland ([Figure 35](#) for Zutphen and [Figure 34](#) for Dortdrecht).

The discovery of malted barley grains and hops at Villiers-le-Sec (7th-10th centuries) and Baillet-en-France (10th-11th centuries) confirms that these two villages, owned by the abbey of St Denis, brewed beer. Charred remains of husked barley and hops were found at both sites. This evidence, together with the ovens, cooking facilities, spouted jugs and narrow-necked globular pots, points to brewing activities closely tied to bread-making ([Ruas 1988](#), 206).

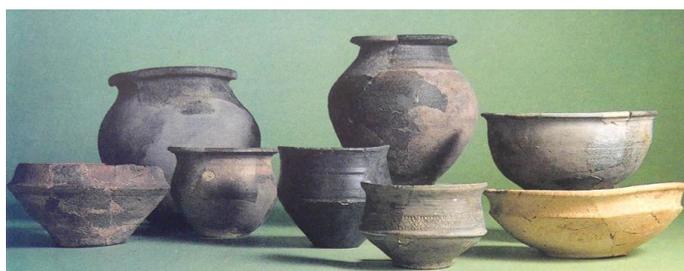
The carpological remains of Villiers include rye, oats, wheat, husked barley, millet, broad beans, peas, and hops. Numerous underground grain silos outside the houses have been found in Villiers, Baillet and Belloy-en-France ([Cuisenier, Guadagnin 1988](#), 219-200 Fig. 61, 63, 64). Their useful capacity: between 0.5 and 1.5 m³. The catalogue of pottery, the contents of which have unfortunately not been analysed, includes numerous jugs with spouts and globular pots. The bakery-kitchen of Villiers-le-Sec could have served as a brewery, given the predominantly domestic medieval production method and the technical coupling of brewery and bakery ([Figure 39](#)).



Remains of a bakery-kitchen and a probable brewery of Villiers-le-Sec, 8th century (*Un village au temps de Charlemagne*, 1988, cat. 182).



Reconstitution of an oven, Villiers-le-Sec 8th century (*Un village au temps de Charlemagne*, 1988, fig. 84).



Carolingian pottery from Villiers-le-Sec (*Un village au temps de Charlemagne*, 1988, p. 23).

Figure 39: the most significant remains discovered at Villiers-le-Sec (8th century)

7.2 Problems and unresolved issues.

What was drunk far from the abbeys, the count's houses and the imperial court? Was there another way of brewing beer that was more in keeping with the way of life of the peasants, the gatherers of food plants, the inhabitants of forests, marshes or mountains?

The geography of beer and human geography under the Carolingians remains largely unknown. The general map of the empire (Map 1) compared to the small, well-documented area between the Seine and Rhine rivers shows that 80% of the Carolingian territories remain unmapped with regard to brewing. Worse, 80%-90% of the population pass under the radar of ecclesiastical documents that are not concerned with describing how the poorest, the peasants or the artisans live. These texts were written to describe and guarantee a way of life that ensured abundance and luxury for women and men belonging to the aristocracy: bread-making cereals (spelt or wheat), wine and beer, meat, fish, eggs and dairy products, vegetables, fruit, aromatic and medicinal herbs in profusion. This was not the case for the majority of the population, who lived far from the cities, abbeys and Carolingian courts.

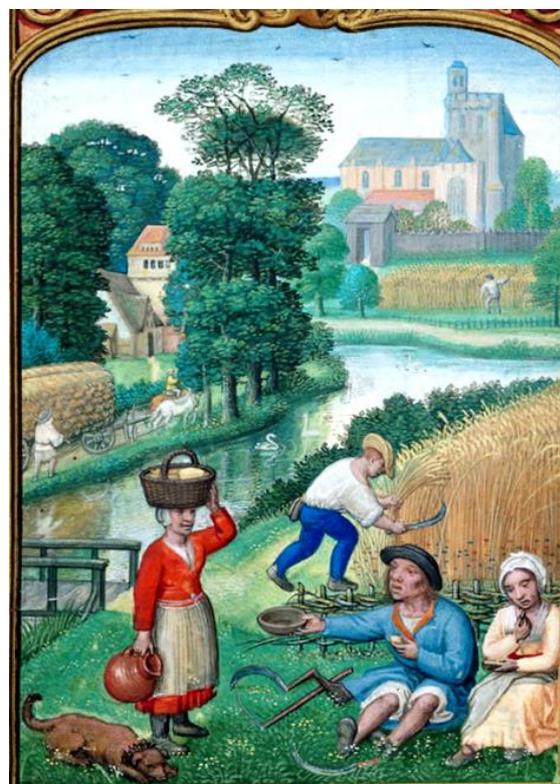


Figure 40: a very late illustration of harvesters eating and drinking in front of a church. Golf Book p. 15, 1540. British Library

This discrepancy between the privileged diet of the nuns and monks and the diet of the majority can be partly filled by archaeology. The analysis of dumps, food waste, and latrines, provides information about the actual diet of villagers living far from the centres of Carolingian power. Several facts can be pointed out:

- The sources of starch are much more diverse and 'wild' than the texts indicate. Gathering and semi-cultivation⁹⁴ were general practices at a time when the seigniorial regime had not yet monopolised all natural resources to the detriment of peasant communities.
- The food is largely made up of 'wild' plants: tubers (parsnips), so-called minor cereals or grasses, starchy fruits (chestnuts, etc.).
- Fermented beverages are more varied than the mead-beer-wine trilogy. Berries (blackberries, strawberries, raspberries, redcurrants, etc.), fruits (plum, arbutus, medlar, elderberry, corm, quince, fig, peach, apple, pear, etc.) are used to make wines. *Moratum*, a blackberry wine, provides an

⁹⁴ The gathering of 'wild' grains and tubers in areas that had become fallow following the retreat of cultivation in the 6th and 7th centuries.

example of such fermented berry-based beverages, albeit served at the table of the nobility⁹⁵. Dried fruits (chestnuts), broad beans, vetches and peas are sources of starch neglected by the history of brewing. Finally, starchy tubers such as parsnips may have been used to brew beer. All these plants have been identified by archaeobotanists in medieval Western Europe ([Ruas 1992](#), [Van Zeist 1991](#)).

- Brewing techniques are more advanced than the paucity of ecclesiastical Latin vocabulary would suggest. The vernacular languages use very precise terms to describe the brewing operations and ingredients ([appendix 9.7](#)). This linguistic arsenal reveals a state of the art far removed from the rudimentary descriptions provided by the history of medieval techniques. The monks who write are not the men and women who brew beer. The technical expertise lies with those who work but do not write.

The book of the Carolingian brewery cannot be closed without exploring the territories where the presence of beer has gone unnoticed⁹⁶. In all historical contexts where the great diversity of sources of starch and natural sugars (berries, fruits, honey) is combined with the needs of a population that feeds itself partly by gathering and harvesting, beer is to be sought in the pots in which porridges, soups or crumbled breads are cooked. When prepared with starch and fermented, they are thick, sour beers.

Technically, these starch-based porridges ferment when they are cooked, cooled and then kept for some time: alcoholic fermentation, but also lactic and acetic fermentation occur. The bread and malt beer that abound in ecclesiastical texts are a luxury way of converting starch sources into fermented food and beverage, given the work required (cultivation, milling, malting, brewing, cooking) and the selection of certain bread-making cereals (wheat, spelt). "*This predilection marginalizes minor cereals, consumed in porridges and soups rather than in the form of bread, leguminous plants, and chestnuts; although these are still, in the 12th-13th centuries, essential components of the diet of certain social groups, especially peasants, they hardly appear in the marketplace, nor in written sources. This situation is even more true in the early Middle Ages.*" ([Menant 2007](#), 8). The **pulmentum** of the religious communities is a luxury polenta-soup, made of semolina and well-cooked vegetables. It is not the beer porridge we think of.

At the other end of the social scale, fermented porridges are the panacea for two closely related vital problems: drinking and eating. You can put everything provided by nature into these porridges, without heavy grinding, shelling and complicated cooking. They can be prepared into simple pots, without expensive

⁹⁵ The recipe for *moratum* is given in a 9th century manuscript: "*How to make morato: 4 muids of wild blackberry juice, 1 muid of honey. Mix, pour into a jar; and, if desired, add only cinnamon, clove, balsamite, lavender.*" (*Morato quomodo facias : Jus morae campestris modia IIII, mel modium I. Commiscis, recondis in vas pigato ; et, si volueris, mittes cenamo, gariofile, costum et spicanardi tantum*). Note the addition of honey, a source of sugars and wild yeasts.

⁹⁶ The modern definition of beer blinds historians who are looking for a fermented beverage close to its current formula: beer made from malt, exclusively alcoholic (without acidity), excluding any other vegetable source of starch.

cauldrons and tedious cooking. Lactic, alcoholic and acetic fermentations do the work of breaking down the indigestible cellulose and saccharifying the raw starch in that order. Acidic fermentations 'digest' the toughest plants.

Beer is never far away when these fermented mashes are watery enough. It cannot be the clear, filtered beer of the monks, akin to the one we know. It cannot be the beverage we drink from a glass. But it is technically a beer.

Historically, the fermented porridges belong to the family of 'primitive' concoctions that form the basis of all fermented beverages (beer, wine, mead). They blur the modern boundary between solid food (bread) and beverage (beer). From the 7th century until at least the 10th century, the forest (*silva*) and the pastoral area (*saltus*) were as important as the cultivated area (*ager*) for food resources. 'Wild' foods are found here more than the wheat for bread and malted beer of the rich monasteries.

The split between the dietary mores of the humblest and the aristocratic tastes is described by the Capitulary De Villis. Its concern is the hygiene of hand (or feet)-made fermented food and beverages: "They are to take particular care that anything which they do or make with their hands – that is, lard, smoked meat, sausage, newly-salted meat, wine (*vinum*), vinegar (*acetum*), mulberry wine (*moratum*), boiled wine (*vinum coctum*), garum, mustard, cheese, butter, malt (*bracios*), beer (*cervisas*), mead (*medum*), honey (*mel*), wax and flour – that all these are made or prepared with the greatest attention to cleanliness." (Capitulary De Villis §34). Servants and dependents originating from a rural world accustomed to eating and drinking whatever nature offered could not have the same dietary delicacies as the Carolingian nobility.

From a sociological point of view, fermented porridges are part of the dietary arsenal of populations that live in highly hierarchical societies and are forced to gather and collect food and drink in a 'wild', 'free' and open environment, far from cities, centres of power and political coercion. During the High Middle Ages, which we are concerned with here, these human groups live (or take refuge) in regions of difficult access (forests, marshes, high valleys, mountains) or in countries that have been left abandoned. It is here that we must look for the other face of the brewery during Carolingian times.



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9 Appendices

9.1 Calculating the volume of malt brewed/type of beer

All our calculations are based on a 52 litres *modius* and its sub-units ([Hocquet 1985](#) & [Table 1](#)).

Specific weight of grains

Wheat = 75 to 80 kg/hl.

Rye = 75 kg/hl.

Spelt = 35 to 40 kg/hl (because of adherent husks). ([Devroey & Mol 1989](#), 20). Hulled spelt = 50 kg/hl (hulls and husks = 25 to 30% of the grain weight)

Barley = 65 kg/hl

Buckwheat = 65 kg/hl

Oats = 55 kg/hl

FAO/INFOODS density database. Release 2.0 (2015)
www.fao.org/3/a-i3057f.pdf

Specific weight of flours and malt

1 litre of oat flour ≈ 0.7 kg.

1 litre of barley flour ≈ 0.7 kg.

1 litre wholemeal rye flour ≈ 0.65 kg.

1 litre buckwheat flour ≈ 0.6 kg.

1 litre of wheat or spelt flour ≈ 0.5 kg,

1 litre of dry barley malt ≈ 0.6 kg (vol. over 15% / raw grain)

1 litre of crushed dry barley malt ≈ 0.55 kg. (vol. sup. 4% to 10%)

When the Polyptychs and Carolingian censuses give volumes of raw grain intended for brewing beer, they concern small quantities (a few litres). Conversely, the volumes of malt are often large (several tens or hundreds *muids*). We have therefore simplified the calculations by considering that malt and raw grain have the same weight by volume.

Conversion kg malt => hl beer of defined density (% vol. alc.)

Calculation of the amount of malt needed to brew 100 litres of beer at three final densities (% vol. alc. or abv): high, medium and low. The alcohol densities are an estimate. They are not documented in medieval sources ([2.6](#) for explanations about the three adopted values: 6%, 4% and 2% abv).

The ratio according to current standards is calculated with the formulas explained here in French saveur-biere.com/fr/magazine/je-brasse/4/quelle-quantite-dextrait-ou-de-malt. Then the medieval ratio is doubled / modern ratio to take into account the less efficient medieval malts, a less controlled method of infusing the malt, and approximate temperature control and fermentation techniques. The results:

Weight of malt brewed / hl of beer brewed. See Table 2			
	<i>Brethren's beer</i> (6%)	<i>Medium beer</i> (4%)	<i>Weak beer</i> (2%)
Modern ratio	17kg of malt	11kg of malt	6kg of malt
Medieval ratio	34kg	22 kg	12kg

Our assumption and starting point for the calculations ([2.6](#)):

A range of 3 Carolingian beers	Brethren's beer = 6% vol. alc.	Medium beer = 4% vol. alc.	Weak beer = 2% vol. alc.
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Theory for converting a final alcohol content (abv) to an initial malt volume:

1) Calculate the abv according to Plato scale ($^{\circ}\text{P}$): $^{\circ}\text{P} = \% \text{ vol. alc.} \times 2$.

6% abv beer = **12** $^{\circ}\text{P}$ (4% = **8** $^{\circ}\text{P}$; 2% = **4** $^{\circ}\text{P}$);

2) Convert the $^{\circ}\text{P}$ into Balling degree $^{\circ}\text{B}$ (density of sugars):

$\text{D}(\text{ensity}) = 1 + (^{\circ}\text{P} / (258.6 - (0.88 \times ^{\circ}\text{P})))$

Example 1: $\text{D} = 1 + (12 / (258.6 - (0.88 \times 12))) = 1 + (12 / 248.04) = 1.048$

Example 2: $\text{D} = 1 + (8 / (258.6 - (0.88 \times 8))) = 1 + (8 / 249.56) = 1.032$

Example 3: $\text{D} = 1 + (4 / (258.6 - (0.88 \times 4))) = 1 + (4 / 255.08) = 1.016$

3) Convert the density D into $^{\circ}\text{B}$: $^{\circ}\text{B} = ^{\circ}\text{P} \times \text{D}$.

Example 1: **12** \times **1.048** = **12.57** $^{\circ}\text{B}$

Example 2: **8** \times **1.032** = **8.25** $^{\circ}\text{B}$

Example 3: **4** \times **1.016** = **4.06** $^{\circ}\text{B}$

4) Calculate the **dried extract** according to the volume of beer to brew Vf : $^{\circ}\text{B} \times (\text{Vf in ml} / 100)$. The calculation is done for 100 liters in ml.

Example 1: **12.57** \times 100000 ml/100 = 12.57 g \times 1000 = **12570**g of extract (\approx 12,5kg) for 100 litres of 6% alc. beer.

Example 2: **8.25** \times 100000 ml/100 = 8.25g \times 1000 = **8250** g of extract (\approx 8.25 kg) for 100 litres of 4% alc. beer.

Example 3: **4.06** \times 100000 ml/100 = 4.06g \times 1000 = **4060** g of extract (\approx 4 kg) for 100 litres of 2% alc. beer.

5) Turning the dried extract into the needed quantity of malt Qmalt . It depends on the malts, their moisture content (H), e.g. 4.5% for Pilsen malt = 0.045, their dry extract yield (R), that of Pilsen malt is 81% = 0.81:

Qmalt = Extract/ ((1 - H) x R). Rounded up to the nearest kg.

Example 1: Qmalt Pilsen = **12570** / ((1 - **0.045**) x **0.81**) = 12570 / 0.77
= 16324g of malt for 100 litres, **17kg by hl.**

Example 2: Qmalt Pilsen = **8250** / ((1 - **0.045**) x **0.81**) = 12570 / 0.77
= 10714g of malt for 100 litres, **11kg by hl.**

Example 3: Qmalt Pilsen = **4060** / ((1 - **0.045**) x **0.81**) = 4060 / 0.77
= 5272g of malt for 100 litres, **6kg by hl.**

Pilsen malts are very efficient, malted with six-row barley cultivars optimised for brewing (low level of proteins, high level for amylases). This is not the case with medieval malts malted with spelt, wheat, oats or rye. We double the amount of malt to accommodate these historical factors. This gives 32kg of medieval malt per hl for a beer 6% abv, 22 kg/hl for 4% abv, 12 kg/hl for 2% abv. The latter could be brewed by washing the spent grain with hot water instead of using fresh malt.

Finally, the weight of malt must be converted into volume. The Carolingian texts give the quantities of grain, malt and beer with the 52 litres muid unit.

Ratio volume of medieval malt / muid of beer by their gravity. See Table 2				
	A	B	C	D
Beer grades according to alcohol content by volume	Kg modern malt/hl	Kg medieval malt/hl	Vol. medieval malt/hl *	Vol. medieval malt/muid of cervisa**
	Calculation	A x 2	B x 1.53	C x 52 / 100
Brethren's beer (≈ 6% alc.)	17 kg/hl	34 kg/hl	52 l malt/hl	≈ 27 litre malt/muid
Medium beer (≈ 4% alc.)	11 kg/hl	22 kg/hl	34 l malt/hl	≈ 18 litre malt/muid
Weak beer (≈ 2% alc.)	6 kg/hl	12 kg/hl	18 l malt/hl	≈ 10 litre malt/muid

* 1 litre of malt ≈ 0.65kg => 1kg of malt = 1.53 litres ** 1 muid = 52 litres.

Table 11: ratio of medieval malt to muid of beer by its gravity

9.2 The aromatic plants listed by the Capitulary of Villis

The list of 76 plants to be cultivated in the gardens of the imperial estates given by the [chapter LXX of Capitulary de Villis](#). In beige, the plants used in medieval brewing after the Carolingian period. The texts of this period do not mention any plants for beer, except cereals, the mysterious fruit and hops.

Capitulary	Vernacular name	Scientific name	Family
<i>Lilium</i>	Madonna Lily	<i>Lilium candidum</i>	Liliaceae
<i>Rosas</i>	Rose	Rose	Rosaceae
<i>Fenigrecum</i>	Fenugreek	<i>Trigonella foenum-graecum</i>	Fabaceae
<i>Costum</i>	Costmary, balsam herb	<i>Tanacetum balsamita</i>	Asteraceae
<i>Salviam</i>	Common sage	<i>Salvia officinalis</i>	Lamiaceae
<i>Rutam</i>	Common rue	<i>Ruta graveolens</i>	Rutaceae
<i>Abrotanum</i>	Lemongrass or aurone	<i>Artemisia abrotanum</i>	Asteraceae
<i>Cucumeres</i>	Cucumber	<i>Cucumis sativus</i>	Cucurbitaceae
<i>Pepones</i>	Melon	<i>Cucumis melo</i>	Cucurbitaceae
<i>Cucurbita</i>	Calabash or gourd	<i>Lagenaria siceraria</i>	Cucurbitaceae
<i>Fasiolum</i>	Cowpea	<i>Vigna unguiculata</i>	Fabaceae
<i>Ciminum</i>	Cumin	<i>Cuminum cyminum</i>	Apiaceae
<i>Rosmarinus</i>	Rosemary	<i>Rosmarinus officinalis</i>	Lamiaceae
<i>Careiium</i>	Caraway, meadow cumin	<i>Carum carvi</i>	Apiaceae
<i>Cicerum italicum</i>	Chickpea	<i>Cicer arietinum</i>	Fabaceae
<i>Squilla</i>	Sea squash	<i>Drimia maritima</i>	Hyacinthaceae
<i>Gladiolum</i>	Iris	<i>Gladiolus</i>	Iridaceae
<i>Dragantea</i>	Tarragon, estragon	<i>Artemisia dracunculus</i>	Asteraceae
<i>Anesum</i>	Green anise	<i>Pimpinella anisum</i>	Apiaceae
<i>Coloquentida</i>	Coloquint	<i>Citrullus colocynthis</i>	Cucurbitaceae
<i>Solsequiam</i>	Marigold	<i>Calendula officinalis</i>	Asteraceae
<i>Ameum</i>	Khella	<i>Ammi visnaga</i>	Apiaceae
<i>Silum</i>	Skirret	<i>Sium sisarum</i>	Apiaceae
<i>Lactuca</i>	Lettuce	<i>Lactuca sativa</i>	Asteraceae
<i>Git</i>	Nigella or Black Cumin	<i>Nigella sativa</i>	Ranunculaceae
<i>Eruca alba</i>	Rocket	<i>Eruca sativa</i>	Brassicaceae
<i>Nasturtium</i>	Watercress	<i>Nasturtium officinale</i>	Brassicaceae
<i>Parduna</i>	Common burdock	<i>Arctium lappa</i>	Asteraceae
<i>Puledium</i>	Pennyroyal	<i>Mentha pulegium</i>	Lamiaceae
<i>Olisatum</i>	Alisanders, horse parsley	<i>Smyrniolum olusatrum</i>	Apiaceae
<i>Petreselinum</i>	Parsley	<i>Petroselinum crispum</i>	Apiaceae
<i>Apium</i>	Celery	<i>Apium graveolens</i>	Apiaceae
<i>Levisticum</i>	Lovage	<i>Levisticum officinale</i>	Apiaceae
<i>Savinam</i>	Savin juniper	<i>Juniperus sabina</i>	Cupressaceae
<i>Anetum</i>	Aneth	<i>Anethum graveolens</i>	Apiaceae

Capitulary	Vernacular name	Scientific name	Family
<i>Feniculum</i>	Fennel	<i>Foeniculum vulgare</i>	Apiaceae
<i>Intubas</i>	Chicory endive	<i>Cichorium intybus</i>	Asteraceae
<i>Diptamnum</i>	Fraxinella	<i>Dictamnus albus</i>	Rutaceae
	Cretan dittany	<i>Origanum dictamnus</i>	Lamiaceae
<i>Sinape</i>	White mustard	<i>Sinapis alba</i>	Brassicaceae
<i>Satureia</i>	Summer savory	<i>Satureja hortensis</i>	Lamiaceae
<i>Sisimbrium</i>	Hedge mustard	<i>Sisymbrium officinale</i>	Brassicaceae
<i>Mentam</i>	Peppermint	<i>Mentha piperita</i>	Lamiaceae
<i>Mentastrum</i>	Spearmint	<i>Mentha spicata</i>	Lamiaceae
<i>Tanazitam</i>	Tansy	<i>Tanacetum vulgare</i>	Asteraceae
<i>Neptam</i>	Catnip, catswort	<i>Nepeta cataria</i>	Lamiaceae
<i>Febrefugiam</i>	Chamomile, camomile	<i>Matricaria chamomilla</i>	Asteraceae
<i>Papaver</i>	Poppy	<i>Papaver</i>	Papaveraceae
<i>Beta</i>	Chard, beetroot	<i>Beta vulgaris</i>	Chénopodiaceae
<i>Vulgigina</i>	European Asparagus	<i>Asarum europaeum</i>	Aristolochiaceae
<i>Mismalvas</i>	Musk-mallow	<i>Malva moschata</i>	Malvaceae
<i>Alteas</i>	Marshmallow	<i>Althaea officinalis</i>	Malvaceae
<i>Malvas</i>	Common mallow	<i>Malva sylvestris</i>	Malvaceae
<i>Carvitas</i>	Wild carrot	<i>Daucus carota</i>	Apiaceae
<i>Pastenacas</i>	Parsnip	<i>Pastinaca sativa</i>	Apiaceae
<i>Adripias</i>	Garden purslane	<i>Atriplex hortensis</i>	Chénopodiaceae
<i>Blidas</i>	Wild pigweed, chickweed	<i>Amaranthus blitum</i>	Amaranthaceae
<i>Ravacaulos</i>	Kohlrabi, German turnip	<i>Brassica oleracea</i>	Brassicaceae
<i>Caulos</i>	Cabbage	<i>Brassica oleracea</i>	Brassicaceae
<i>Uniones</i>	Onion	<i>Allium cepa</i>	Alliaceae
<i>Britlas</i>	Chives	<i>Allium schoenoprasum</i>	Alliaceae
<i>Porros</i>	Leek	<i>Allium porrum</i>	Alliaceae
<i>Radices</i>	Radish	<i>Raphanus sativus</i>	Brassicaceae
<i>Ascalonica</i>	Shallot	<i>Allium ascalonicum</i>	Alliaceae
<i>Cepas</i>	Bunching onion	<i>Allium fistulosum</i>	Alliaceae
<i>Alia</i>	Garlic	<i>Allium sativum</i>	Alliaceae
<i>Warentia</i>	Dyer's madder	<i>Rubia tinctorum</i>	Rubiaceae
<i>Cardones</i>	Cardoon, Artichoke	<i>Cynara cardunculus</i>	Asteraceae
<i>Fabas majores</i>	Broad beans	<i>Vicia faba</i>	Fabaceae
<i>Pisos mauriscos</i>	Peas	<i>Pisum sativum</i>	Fabaceae
<i>Coriandrum</i>	Coriander	<i>Coriandrum sativum</i>	Apiaceae
<i>Cerfolium</i>	Chervil	<i>Anthriscus cerefolium</i>	Apiaceae
<i>Lacterida</i>	Spurge	<i>Euphorbia lathyris</i>	Euphorbiaceae
<i>Sclareiam</i>	Clary sage	<i>Salvia sclarea</i>	Lamiaceae
<i>Jovis barba</i>	Houseleek, "on the roof of the house" (Capitulary)	<i>Sempervivum tectorum</i>	Crassulaceae

Laurel (*Laurus nobilis* L.) and thyme (*Thymus serpyllum* L.) are not found in the Capitulary, but quoted in St Bertin Polyptych and by [Behre 1999](#), 43 Table 1.

9.3 Garden plants in the ideal plan of St Gall's Abbey

The St Gall plan names the aromatic and medicinal plants planned for the abbey garden. They meet the needs of the 'ideal' abbey and the customs of the Lake Constance region. This list partly overlaps with the list given in the Capitulary of Villis (9.2). In beige, the plants used in brewing.

St Gall plan	Vernacular name	St Gall plan	Vernacular name
Vegetables			
<i>Cepas</i>	Onion	<i>Alias</i>	Garlic
<i>Porros</i>	Leek	<i>Ascolonias</i>	Shallots
<i>Apium</i>	Celery	<i>Pdcrosolium</i>	Parsley
<i>Coliandrum</i>	Coriander	<i>Cerefolium</i>	Chervil
<i>Andcum</i>	Dill	<i>Lactuca</i>	Lettuce
<i>Papauer</i>	Poppy	<i>Sataregia</i>	Pepperwort
<i>Radices</i>	Radish	<i>Pastinachus</i>	Parsnip
<i>Magones</i>	Poppy	<i>Caulas</i>	Cabbage
<i>Bdcas</i>	Chard	<i>Gitto</i>	Fennel
Medicinal plants			
<i>Lilium</i>	Lily	<i>Saluia</i>	Sage
<i>Rosas</i>	Rose	<i>Ruta</i>	Rue
<i>Rosmarino</i>	Rosemary	<i>Gladiola</i>	Iris
<i>Menta</i>	Mint	<i>Pulegium</i>	Pennyroyal
<i>Sata regia</i>	Pepperwort	<i>Sisimbria</i>	Watercress
<i>Fasiolos</i>	Climbing beans	<i>Cumino</i>	Cumin
<i>Fena greca</i>	Greek hay	<i>Lubestico</i>	Lovage
<i>Costa</i>	Costmary	<i>Feniculum</i>	Fennel
Trees and berries			
<i>Murarius</i>	Mulberry	Usage : vin de mûres, <i>moratum</i>	
<i>Nugarius</i>	Walnut		
<i>Laurus</i>	Laurel	<i>Malarius</i>	Apple
<i>Castenarius</i>	Chestnut	<i>Perarius</i>	Pear
<i>Persicus</i>	Peach	<i>Prunarius</i>	Plum
<i>Auellanarius</i>	Hazelnut	<i>Sorbarius</i>	Service tree
<i>Amendelarius</i>	Almond	<i>Mispolarius</i>	Mistletoe

Table 12: after [Walter Horn et Ernest Born 1979](#) (vol. III Appendix I, pp. 83-88). In beige, the plants used in brewing in Middle Age

9.4 Herbal additives for beer and gruit in the Middle Ages

After [Behre Karl-Ernst 1999](#), *The history of beer additives in Europe - a review*. *Vegetation History & Archaeobotany* 8 :35-48 (Tables 1, 2 & 3).

Table 1. Other plant species used for beer flavouring in Middle age Europe	
<i>Anchusa officinalis</i> L.	<i>Phyllitis scolopendrium</i> (L.) NEWM.
<i>Artemisia absinthium</i> L.	<i>Picea abies</i> (L.) KARST.
<i>Artemisia vulgaris</i> L.	<i>Pimpinella anisum</i> L.
<i>Asarum europaeum</i> L.	<i>Potentilla anserina</i> L.
<i>Calluna vulgaris</i> (L.) HULL.	<i>Prunus avium</i> L.
<i>Citrus limon</i> BURM.	<i>Prunus spinosa</i> L.
<i>Cnicus benedictus</i> L.	<i>Quercus</i> sp.
<i>Euphrasia rostkoviana</i> HAYNE	<i>Rosmarinus officinalis</i> L.
<i>Foeniculum vulgare</i> MILL.	<i>Rubus fruticosus</i> L.
<i>Fragaria vesta</i> L.	<i>Rubus idaeus</i> L.
<i>Geum urbanum</i> L.	<i>Salvia officinalis</i> L.
<i>Hyssopus officinalis</i> L.	<i>Sambucus nigra</i> L.
<i>Inula helenium</i> L.	<i>Sanicula europaea</i> L.
<i>Juniperus communis</i> L.	<i>Stachys officinalis</i> (L.) TREV.
<i>Laurus nobilis</i> L.	<i>Szygium aromaticum</i> (L.) MERR. et PERRY
<i>Lavandula angustifolia</i> MmL.	<i>Teucrium scordium</i> L.
<i>Majorana hortensis</i> MOENCH	<i>Thymus serpyllum</i> L. (Serpolet, Elfin or Wild Thyme)
<i>Melissa officinalis</i> L.	<i>Veronica officinalis</i> L.
<i>Mentha pulegium</i> L.	<i>Vinca minor</i> L.
<i>Mentha spicata</i> L.	<i>Zingiber officinale</i> ROSCOE
<i>Origanum vulgare</i> L.	

Table 2. Plants used for medicinal beers (as far as not yet included in table 1)	
<i>Acorus calamus</i> L.	<i>Hypericum perforatum</i> L.
<i>Carum carvi</i> L.	<i>Iris</i> sp.
<i>Cinnamomum aromaticum</i> NEES	<i>Ledum palustre</i> L.
<i>Cinnamomum verum</i> PRESL.	<i>Meum athamanticum</i> JACQ.
<i>Elettaria cardamomum</i> (L.) MATON	<i>Myristica Fragrans</i> VAN HOUTTE
<i>Galium odoratum</i> (L.) SCOP.	<i>Petroselinum crispum</i> (Mill.) A.W. HILL
<i>Hepatica nobilis</i> MILL.	<i>Polypodium vulgate</i> L.

Table 3. Poisonous plants used to brew empowering or psychotropes beers	
<i>Lolium temulentum</i> L.,	<i>Atropa bella-donna</i> L.,
<i>Anamirta cocculus</i> ,	<i>Datura stramonium</i> L.
<i>Hyoscyamus niger</i> L.	<i>Amanita muscaria</i> L (fly agaric)



The plants used to make gruit are known from the accounts of the gruihouse (gruithuis or gruuthuus) in Germany and the Netherlands between 1339 and 1590 (+ Osnabrück and Tecklenburg in the 17th century).

Purchases by gruit houses in various cities currently in the Netherlands and Germany

Herbs and spices										Other		
Bog myrtle	Porsh	Bekeler	Sharpe tongue	Resin	Hops	Juniper berry	Anise	Koemps	Kerse	Peat	Malt	Vezen

City	Years available	Gruit produced until	<i>Myrica gale</i>	Wild rosemary	Laurel berry	Laserwort					Caraway ?	Cherries or candles?			Wheat?
Deventer	1339-48	1348	X		X	X	X						X	X	
Wesel	1342-81	1431	X		X	X	X						X		
Dortmund	1390-99	1544 *		X	X	X		X						X	
Köln	1391,1393	1581?	X		X				X	X	X			X	
Zwolle	1398-1411	1411	X		X	X	X								
Duisburg	1417	c. 1450	X			X	X					X			X
Münster	1481?	1590		X	X	X									
Osnabrück	?	c. 1618**		X	X	X	X								X
Tecklenburg	17 th cent.	17 th c.		X	X	X									

* Reintroduced in 1545 upon request

** gruit deemed 'bad' already in 1456

After lostbeers.com

After lostbeers.com/gruit-nothing-mysterious-about-it See also lostbeers.com/fact-check-where-did-gruit-occur

Verberg Susan "The Rise and Fall of Gruit". The Brewery History Society, Brewery History (2018) 174, 46-78. Table p. 60. academia.edu/35704222/The_Rise_and_Fall_of_Gruit and Susan Verberg academia.edu/36526760/Gruit_Ale_version_1 for experiments about brewing with the old gruit herbs and resin.

And verlorenbieren.nl/gruit-er-is-niets-geheimzinnigs-aan for the chart and some nice illustrations of the gagele or porsch (*Ledum palustre*), the bog myrtle (*Myrica gale*) and the serpentian (*Laserpitium Siler*).



9.5 Plants used for tonic beverages (Lorsch Pharmacopoeia)

From the 9th century onwards, the clerics publish calendars of dietary practices including infusions based on wild or cultivated plants. These beverages, often supplemented with honey, may be slightly fermented. The clergy's taste for these infusions indicates a preference for fermented or unfermented flavoured beverages, including flavoured beer. Modern literature describes medieval beer as a thick, bland beverage before the widespread use of hops from the 14th century onwards. Is this true? Infusions of aromatic or medicinal plants say otherwise. These plants are used by everyone depending on the season and the local vegetation. The monks simply collect them or grow them in a garden so as not to leave the enclosure of their abbeys. Carolingian beers are flavoured and more varied than one might imagine.

Did these same plants play a role in fermentation techniques or the saccharification of raw grains? This is hard to ascertain without written sources. Cf. the issue of gruit 4.2 & 9.4. The [Lorsch Pharmacopoeia](#) offers a very interesting illustration of the degree of technical mastery achieved by the monastic communities. Moulds on dried cheese rinds + sheep dung and honey are used to heal deep wounds and ulcers (folio 31v). The science of antibiotics was not born, but the pragmatism of the monks and their extensive libraries of Greek and Latin texts helped them to search remedies for many ailments in a benevolent God's created world⁹⁷. These same monks could have discovered that by mixing cooked starch with certain roots, bulbs or tubers, they could cultivate moulds that convert starch into fermentable sugars and then make beer ferments. In other words, one of the possible recipes and uses of gruit⁹⁸.

The [Lorsch Pharmacopoeia](#) is the oldest medical manuscript for clerical use, written around 785 in the imperial abbey of [Lorsch](#) (Germany). Its *varia* chapter lists the recommended infusions for each month of the year on folio 8r ([Stoll 1992](#), 76). Part of this list of plants overlaps with those given in the Capitulary De Villis (9.2) and St. Gall plan (9.3).

The folio 8r lists the 12 months of the year and the plants to be used in infusion, drunk with or without honey.

⁹⁷ A knowledge of medicine and medical practice were not self-evident for all the members of the church. A refractory current condemns these practices borrowed from the pagan world and advocates allowing what is interpreted as God's will.

⁹⁸ "The same applies to ulcers on the tibias of the lower limbs; they heal quickly, even if the bones are already visible: Rub a rind of dry cheese and softer sheep dung in equal parts, and add a little honey: healing takes place in 20 days." (Fol. 31v. nbn-resolving.org/urn:nbn:de:bvb:22-dtl-0000003730#0068)
[Beer-studies.com](https://www.beer-studies.com) (2021)

Which beverage should we use each month.

(Lorsch Pharmacopoeia, folio 8r)

<i>January</i>	<i>Ginger, rhubarb</i>
<i>February</i>	<i>Agrimony, celery seed</i>
<i>March</i>	<i>Rue, lovage</i>
<i>April</i>	<i>Betony, burnet-saxifrage</i>
<i>May</i>	<i>Absinthe, fennel seed</i>
<i>June</i>	<i>Sage blossom, juniper</i>
<i>July</i>	<i>Celery blossoms, enantis (wild vine flowers)</i>
<i>August</i>	<i>Pennyroyal</i>
<i>September</i>	<i>Costus, mastic</i>
<i>October</i>	<i>Clove, pepper</i>
<i>November</i>	<i>Cinnamon</i>
<i>December</i>	<i>Spikenard</i>

Source: StaatsBibliothek-Bamberg (SBB)

nbn-resolving.org/urn:nbn:de:bvb:22-dtl-0000003730#0021

This same manuscript in the Bamberg library also contains a copy of a letter written by Anthimus (ca. 511/34), a Greek physician of Byzantine origin, to the Frankish king Theodoric I (486-533). This letter deals with dietetics (*De observatione ciborum epistula ad Theodericum regem Francorum*, fol. 72r to 75r). In the chapter on beverages (*potus*), Anthimus gives the following advice (f. 72v):

"Drinking beer [ceruisa], mead [medus] and wormwood infusion [aloxinum] is best for all, for beer, when properly brewed, is a blessing and produces strength, as does the barley infusion we make. [though of a generally cold character]."

Similarly, a well-prepared mead, if it contains a lot of honey, is very beneficial." (Already quoted in 4.1.6 for honey).

The Anthimus' barley infusion refers to the many barley-based recipes (infusions, gruels) given by the medicine of Hippocrates, Discorides or Gallien.

9.6 The average number of monks/nuns in Benedictine abbeys

This table does not include the myriad of servants and provenders working for the abbeys, who are more numerous than the nuns (**N**) or monks (**M**).

Abbey	Location	Period 1	Staff	Period 2	Staff	Period 3	Staff
N-Dame	Soissons, France		416 N				
St Denis	Paris	826	116 M	838	126 M		
St Germain	Paris	circa 815	212-250 M	829	120 M	841	122 M
St Wandrille	Normandy	7 ^e s.	300 M				
St Remi	Reims, France	circa 800	416 M				
St Nicaise	Reims, France					1243	80
St Pierre	Corbie, France	822-826	150-200 M				
St Riquier	Somme, France	833	400 M				
St Bertin	Omer, France	circa 820	83 M	1288	50 M		
St Vaast	Arras, France	9 ^e s.	112 M				
St Pierre	Jumièges, Seine-Maritime			1258	49 M		
St-Pierre de Lobbes	Hainaut, Belgium	circa 850	71 M				
St Martin	Tournai, Belgium	1269	66 M / converts				
St Benoît	Fleury sur-Loire			1299	45 M		
St Aubin	Angers, France	1038	57 M	1060	78 M	1082	60 M
St Benigne	Dijon, France			1211	50 M		
Marmoutier	Alsace, France	853	116 M				
St Seine	Côte-d'or Burgundy	circa 1100	40 M	1230	20 M		
St Pierre-St Paul (Bèze)	Côte-d'or Burgundy	circa 1100	60 M	1225	30 M		
St Martin	Lyon, France			1250	30 M		
L'île Barbe	Lyon, France			1279	40 M		
Lérins	Nice, France			1237	19 M		
Mt Cassin	Mt Cassino Italy			1220	44 M		
Fulda	Cassel, Germany	822-844	600 M	9 ^e s.	270 M	13 ^e s.	18 M
Prüm	Trier, Germany	862-883	66 M				
Kornelis Münster	Aachen Germany	817	30 M				
St Maximin	Trier, Germany	7 ^e s.	100 M				
Tegernsee	Bavaria	circa 750	150 M				
St Gall	Konstanz, Switzerland	816-836	140-180 M	841-872	103 M	896	103 M
Wearmouth + Jarrow	Northumbria, England	circa 700	600 brethren				



9.7 The Tretiz on the Cerveise, composed by Walter of Bibbesworth around 1234-35

The author sent his 'sister' Dionisie de Munchensi, heiress of vast Welsh, Scottish and English (Essex) estates, a didactic rhyming text so that her children could deepen their knowledge of French, a language familiar to the Anglo-Norman court nobility at that time ([Rotwell 2009](#)). The vocabulary covers everyday items (animals, plants, objects, clothes, houses, etc.) and common techniques (agriculture, breeding, cooking, brewing, etc.). This long poem does not claim to be exhaustive. The conversations of the English nobility and the necessary management of their lands with their peasants do not compel them to know all the technical details. This invaluable poem provides us with the rich French vernacular vocabulary used at the beginning of the 13th century. This language is not to be found in the Carolingian and later Latin texts.

The section devoted to the brewery has 55 lines, or 57 in the so-called 'Femina' version. They are given below according to Rotwell's edition of the text, accompanied by a double translation into modern French and English. The following table explains the specific vocabulary of beer brewing in the text (coloured words). [Sayers \(2009\)](#) has made its detailed analysis.

	Old 13th French (Tretiz)	Translation into current French	Translation into current English
	Ore le fraunceis pur breser brece e bracer cerveise :	Or le français pour malter, faire le moût et brasser la cervoise :	Now the French for malting, mashing and brewing ale:
1	Puis ki desore suffist	Comme désormais il suffit	Since it will henceforth suffice
	Le fraunceis qe vous ai dist,	Le français que je vous ai dit,	The French that I have told,
	Ore ferreit bien a saver	Alors on ferait bien de juger	Yet we should well know
	Cum l'en deit breser e bracer	Comme l'on doit malter et brasser	How to malt and brew
5	A la manere ke hom fest serveise	A la manière dont on fait la cervoise	The way people make ale
	Pur fere nos noces bien a ese.	Pour faire nos noces bien à l'aise.	To make our wedding feasts enjoyable.
	Allumés, auncele, une frenole.	Torches, bols, feux de joie.	Torches, serving bowls, and rush lights
	Quant averas mangé de kakenole.	Quand tu auras mangé des gateaux épicés.	When you will eat a spice-cake.
	En une cuve large e leez	Dans une cuve profonde et large	In a deep and wide vat
10	Cel orge la enfondrez ,	Faites-y tremper votre orge,	Steep your barley,
	E quant il est bien enfondré ,	Et quand elle est bien trempée,	And when it is well steeped,
	E le eauwe seit descouelé ,	Et que l'eau en soit écoulée,	And the water has been drawn off,
	Mountez dune cele haut soler,	Monter alors sur le haut plancher,	Go up then to that high loft,

	Si le facez bien baler,	Que vous avez bien balayé,	Which you have swept out well,
15	E la coucherez vostre blé	Et là étendez votre grain	And there spread out your grain,
	Taunt cum seit bien germee ;	Jusqu'à ce qu'il soit bien germé ;	Until it has fully germinated.
	E de cele heure apeleras	Et de ce moment on appellera	From that moment on you will call
	Breez qe einz blé nomaz.	Malt qui avant se nommait grain.	Malt what was formerly called grain.
	Le breez de vostre mein movez	Le malt avec votre main remuez	Stir the malt with your hand
20	En mounceus ou est rengez,	En tas y est rangé,	In piles it is stowed,
	E puis le portés en une corbail	Et puis portez-le dans une corbeille	And then carry it in a basket
	Pur enseccher au torrail ,	Pour sécher à la touraille,	To dry in the oast (kiln),
	Car corbail ou corbailloun	Car corbeille ou paneton	For basket or bucket
	Vos servirunt tut a foisoun.	Vous serviront tous à foison.	Will all serve you a lot.
25	Puis serra le brez molu	Puis le malt sera moulu	Then the malt will be ground
	E de eauwe chaude bien enbu .	Et d'eau chaude bien imbibé.	And well infused with hot water.
	Si le lessez descoure ataunt	Aussi laissez-le couler un peu	So let it flow a little,
	Hors de keverel maintenant	Hors de la cuve à trempe maintenant	Now outside the mashing vat
	Taunt cum la bresceresce entent	Jusqu'à ce que la brasseur accorde	Until the brewster sees that
30	Ki ele eit bersil a talent.	Qu'elle a le moût désiré.	She has the desired wort.
	E puis le berzize prendra	Et puis le gruit prendra,	Then she will take the gruit,
	De forment ou orge ki ele a,	De blé ou d'orge qu'elle a,	Of wheat or barley that she has,
	E par le geeste e le berzille	Et avec le levain et le moût	And with the barm and the wort
	Dunt home plus se sutille,	Dont l'homme se sert le plus,	Which are most useful to people
35	Par dreit dever de bracerye .	Pour mener à bien la brasserie.	To rightfully perform the (art of) brewery.
	Mes tut diviser ne sai jeo mie,	Mais je n'en connais pas toutes les tâches,	But I don't know all the tasks,
	Mes tut issint de art en art	Mais toutes se suivent pas à pas	As they all follow one after the other
	Attirez chescune part	Suivez chaque étape	Complete each stage
	Deskes vous eez bone serveise ,	Jusqu'à ce que vous ayez bonne cervoise,	Until you have good ale,
40	Dount home devient si ben a eise	Dont l'homme devient si bien aise	Which makes people feel so good
	Ki les uns en pernent taunt	Que les uns en prennent tant	That some take it so much
	Ke il enyverent maintenant.	Qu'ils s'enivrent sur le champ.	That they soon become drunk.
	Serveise fet miracles e merveilles:	Cervoise fait miracles et merveilles ;	Ale produces miracles and marvels,
	De une chaundaile deus chaundailes:	D'une chandelle fait deux chandelles ;	Makes two out of one candle.
45	Yveresce tent lais home a clerke;	L'ivresse fait d'un homme laïc un clerc ;	Drunkness makes a layman a clerk;

	Home mesconnu fet aver merke;	A l'homme méconnu fait avoir distinction ;	Gives to an unsung man an utmost check;
	Yveresce fet hom fort chatoner;	L'ivresse fait l'homme chanter fort ;	Drunkenness makes a man sing loudly;
	Home aroé fet haut juper;	L'homme enroué fait crier fort ;	It makes a hoarse man cry aloud.
	Yveresce fet coyfe de bricoun	L'ivresse fait coiffe de fou	Drunkenness gives a fool's face,
50	Rouge teint saunz vermeilloun,	Teint rouge sans vermillon,	A red complexion without vermillon,
	E dunt dist home ki par saint Jorge	Et dont disent les hommes par Saint Georges	And which people say by Saint George
	Trop ad il bu grece de orge.	Il a trop bu de graisse d'orge.	He has drunk too much cream of barley.
	A teles li auctour se repose,	Avec ceci, l'auteur se repose,	With this, the author rests,
	Car parler veut de autre chose.	Car il veut parler d'autre chose.	For he wants to speak of other matters.

Walter de Bibbesworth provided an Anglo-Norman French vocabulary for brewing (**Tretiz** column). He appended Middle English glosses in some editions of the text (**Old English** column). This double reading term by term puts together the technical vocabulary of these two linguistic traditions. The comparison makes it possible to know the terms of no Latin origin used by the Franks or Anglo-Saxons (OF = Old French; MF = Middle French; OE = Old English; ME = Middle English; OG = Old Germanic; OL = Old Latin).

Tretiz	Old English	Meaning (FR)	Meaning (EN)	Comments
breser	Breser	Malter, maltage	To malt or malting.	Only recorded in the Tretiz. Breuen in OE
brece		Infuser, tremper le malt	Make the mash (with malted or unmalted grain)	
bracer		Brasser dans son sens général. bracher, bracier, brascer, braser, brasser, brasir, breisser, brescer, breser, bresser	Brew ale as a whole process	Braces: a Gaulish term for malt, picked up in Latin. Brasser, brasserie, brasseur (MF)
cerveise, serveise		Cervoise	Ale	Cervoise = ale: a modern conventional translation.
cuve	fat	Cuve pour faire gerner le grain	Vat to steep the grain for malting	
enfondré	stepe	Tremper, mouiller les grains	To soak or steep the grains	
descouelé	Laden outh	(grains gemés) déchargés de l'eau	Drained off the water from the germinated grains.	
germee	spired	(grains) germés	Sprouted, germinated grain	Germer (OL), spired (OE)

breez, brez	malt	Le malt avant et après séchage	Malt before and after drying	Malt n'a pas d'origine OE
torrail	kulne	La touraille pour sécher les grains germés humides (malt)	Oast to dry the wet malt	Latin torrere = roast, grill. OE <i>kulne</i> will gives <i>kiln</i> .
molu	grounden	Concasser (le malt sec)	To grind or crush the malt	OF <i>moudre</i> OE <i>grindan</i>
enbu		(Malt concassé) <u>trempe</u> dans l'eau chaude.	(Crushed malt) soaked into hot water	OF <i>enbeverer</i> : tremper, mouiller OF <i>enbeverer</i> : to soak, steep
keverel	Mahissing fate	La cuve à maïs. Coverel , cuverel, keverel, kouverel, koverel, couwel = petite cuve	The mashing tun. Coverel , cuverel, keverel, kouverel, koverel, couwel = small vat	Fate = vat
	mahissing	<i>Mahissing</i> vient du OG <i>mashen</i> 'mélanger malt et eau'	Mashing tun	OE glose <i>mahissing</i> originates from OG <i>mashen</i> 'to mix ground malt and water' (Sayers 2009)
bresceresce		Brasseuse. Cf brescer. braceresce; brasceresce, braseresse; brasseresse; brecesce, bresceresse.	Brewster, female brewer.	ME brewstere
bersil, berzille	wort	Moût, jus sucré.	Wort, sweet juice	Infusion of malt before it is fermented into beer (bresil)
berzize	grout	Gruit, herbes aromatiques et antiseptiques. bercise, berzis, berzise, berzize	Gruit, a dry mix of aromatic and antiseptic herbs	OE grut; ME, grout. Cf infra.
geeste	berme	Levain ou levure. Racine gauloise * <i>jesta</i> levure (Sayers).	Barn or yeast. Gaulish root * <i>jesta</i> 'yeast' (Sayers).	OE <i>beorma</i> . ME <i>berme</i> .
bracerye		Brasserie	Brewery	
grece de orge		« Graisse d'orge ». Image du visage luisant du buveur de bière.	Cream (or fat) from barley.	Metaphorical picture of the beer drinker's shiny, glistening face.

[Rotwell \(2005\)](#) has published another version of the text. It adds 2 verses (in bold) specifying the technique for brewing the wort. This time, the glosses in old English translate the French text word for word, sometimes defectively.

	Old 13th French (Tretiz)	Anglo-normand glose	French translation	English translation
25	Puis serra le breys molu Et en ewe chaude tout enbu ,	After shal þe malt be grounde And in water warm al ydraweþ ,	Puis le malt sera moulu Et dans l'eau chaude bien imbibé.	Then the malt will be ground And well infused with hot water.
	Et donque voz lessez decurre tant	And þanne 3e shal let hyt renne so	Et dont vous laissez couler un peu	And then let it flow a little,
28	En un coverel mayntenant	In a koverel anoon	Dans une petite cuve maintenant	In a small vat now
	Desqur plein soit un doige beal,	Into þat ful be a droweþ fayre,	Dont soit plein un bon sceau,	which is filled with a good bucket,
30	Et puis remittés en un coverel Jesque qi la bruster en cuer tient	And after put hit a3en in a messyngwhat Into þe browestere in herte holdyþ	Et puis remis dans une cuve à trempe Jusqu'à ce que la brasseuse accorde	and after put it back again in a mashing vat Until the brewster agrees
	Q'ele eit bercil a sa talent.	þat hit be wort at hire talent.	Qu'elle a le moût de son souhait.	that she has the desired wort.

The Anglo-Norman gloss does not give the same text: line 28 **coverel** = **koverel**, but in line 30 **coverel** = **messyngwhat** (mashing vat). We are therefore dealing with two different vats. The volume of one bucket of wort is allowed to flow (or is drawn) from the mashing vat (**messyngwhat**) into a small vat (**coverel**), the content of which is then poured back (*after put hit a3en*) into the same mashing vat. Is this small tank (**coverel**) a cauldron for cooking a fraction of the wort, heated and then returned to the wooden mash tun (**messyngwhat**) which has no heating device?

This is not a minor point. The partial cooking of the mash is what differentiates a brew by infusion or decoction. These two options do not prevent the wort from being cooked afterwards, a process that is well documented.



The Anglo-Norman brewster possibly makes fractional mashing with heating of the mash. In the 13th century, she masters the crucial parameter of mashing temperature to fairly thoroughly saccharify the starch of the malt and the raw grains in her mash tun. This confirms the data from Flemish brewers in 14th-15th centuries and the alcohol content of their beers ([Alberts, 2010](#)). It is necessary to brew sufficiently sweet wort to reach beer densities of up to 8% abv.

Another contribution from the Tretiz. He differentiates between *bersil* and *berzize* in Anglo-Norman, which are respectively *wort* and *grout* in Middle English ([Sayer 2009](#)). This *grout* refers to the mixture of antiseptic-aromatic plants used by the brewers in the High Middle Ages (4.2). [Sayers 2009](#) (262) suggests that the words *grout*, *cerveise*, *brais*, *ale* and *malt* are of Nordic rather than Gaulish origin. The medieval *gruit* probably has an older origin than the Carolingian continental Latin texts suggest.

The Tretiz makes a further distinction between *geest*, *barm* and *grout*. The first two are respectively the leaven (dregs in the bottom of barrels or beer pots) and the yeast collected from the foam of the fermenting beer. There is nothing new here in these brewing technique terms. However, the *grout* coupled with the *bersil*, the wort, would therefore play some role in the fermentation process.

Lastly, Walter de Bibbesworth explains in his prologue that he ordered the agricultural work according to its natural cycle. It begins with ploughing and ends with malting and brewing. This layout is based on some technical evidence that is also a social evidence. The peasant world, almost absent from Carolingian texts, is the one that transforms grain into beer, rather than grapes into wine, which is reserved for the aristocracy. Gregory of Tours already spoke of this in the 6th century in connection with the harvesters of the Arverne country. Before being geographical and technical, the border between beer and wine is sociological.

Tretiz table of contents		
Tretiz	Old French	English
Arer	Arer	To plough. Arer .
Rebigner	Rebiner	To work a field a second time.
Waretter	Labourer une terre en jachère	To plough fallow land.
Semer	Semer	To sow.
Searcler	Sarcler	To weed.
Syer	Seier , couper avec la faucille	To reap. Cut with the sickle.
Fauger	Fauchier	To mow.
Carier	Charriier	To carry, transport.
Mouen	Empiler du grain, du foin, etc.	To stack grain, hay, etc.
Batre	Battre les grains	To thresh.
Ventre	Vanner	To winnow.
Mouwere	Moudre	To grind.
Pestre	Pestrer . Pétrir une pâte	To knead.
Brescer	Malter des grains	OE malt. Turn grain into malt.
Bracer	Bracier . Brasser la bière	To brew.