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From Pilsner to Park

Brecht Leseman

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A food systems approach to regional park design in the province of Utrecht

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MSc Thesis
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Abstract

The province of Utrecht is faced with a significant growth of inhabitants in the coming few decades. As a result, the attractive landscapes surrounding the expanding urban areas are under pressure to accommodate those inhabitants, but also their demands for recreation, energy, climate adaptation and food. The Ringpark concept positions the shared space between cities as a new regional park structure where matchmaking between new actors in the landscape is devised as the driving force for landscape development. This thesis contributes to the further development of the concept, by developing one of the examples of matchmaking sketched in previous research. This example concerned a brewery located in a landscape where the resources for beer are produced.

To increase the representation of both the food system of brewing beer and the landscape system in the design, an analysis and design study was conducted based on the Food System Approach as described by Matthew Potteiger. To identify the opportunities, narratives and networks that constitute a food system findings from a literature review, interviews, site visits and reference projects were used. Research through design aided in selecting and combining findings into eight possible food system interventions, of which three preferred alternatives were developed into propositions for the Ringpark. The three alternatives consist of a Hop harvest festival in the Kromme Rijn area, a new landscape economy around spent grain at Fort Honswijk, and a estate-like malt house integrated in the water system of the Utrechtse Heuvelrug.

All three alternatives balance the demands of both the food system, the landscape system and the new regional park system and therefore have the potential to successfully contribute to park development in the province of Utrecht. The design process furthermore helped to establish the Food Systems Approach as a valid qualitative approach to regional landscape design. Lastly, it was concluded that the food system perspective provides valuable insight into an appropriate scale for design and collaboration in the Ringpark.

Disclaimer

On January 1st 2019 the borders of the Province of Utrecht were changed to include the municipality of Vijfheerenlanden. In this thesis this change has not been incorporated, as not all data needed was available for these areas during the research.

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1 Introduction

Figure 1.0 Hop field in urban park / community garden Jardin Incroyables Comestibles in Metz, France. Image by author

1.1 Setting the stage

Food and landscape mutually constituted

There is a common proverb in the English language that says: "You are what you eat". This saying in general applies to diet, but it can be argued that there are many more things that are a refelction of what we eat, including landscape. The landscapes that we live in, both urban and rural, are a reflection of the food system that we are a part of. At the same time, landscape provides the limitations and opportunities for the food system, introducing a temporal dimension, spatial specificity and local identity into the products that come off the land. Potteiger (2013) summarises this dynamic in the following principle: Landscape and food systems have been in a way mutually constitutive.

The classical example of this principle can be found in pre-industrialised cities. Urban cores housed large concentrations of consumers and therefore functioned as large scale market places, see figure 1.1 and 1.2. Different products were produced at different distances from the city, based on their perishability and dependence on inputs from the city such as labour and waste (Bieleman, 2010). It resulted in structured landscapes in which the urban-rural relationship was not only spatial, but also temporal as the seasons dictated the food availability and –quality. Many old cities such as Utrecht reference to this food related history and identity by street names (Stroeken and Ettema, 2012).

In later times the influence of the food system on the landscape began to reach beyond places of actual production. The post-war focus on agricultural science and increasing productivity started "*...an unprecedented, complex and comprehensive process of mechanisation, intensification, specialisation, rationalisation and up-scaling*" (Bieleman, 2010, p. 241). This development not only altered the image of the Dutch landscape drastically, but it also meant that food production for many no longer was part of their daily lives. In planning and design practices of those days this process was also reflected, as formerly intertwined land use functions such as recreation and nature were de-coupled from food production. Landscape architects in the Netherlands struggled with the "old" and the "new" landscape, looking for new methodologies to balance productivity and aesthetically pleasing landscapes (van Hellemondt, 2016).

Redefining the balance between food and landscape

Debates on productivity and landscape experience continue today, and have become even more elusive. Although food production is still an

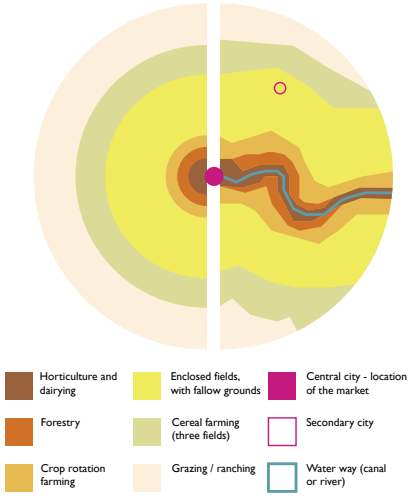


Figure 1.1 Diagram of the Von Thünen model. Dsitribution of land uses changes under the influence of a river. Adapted by author from: Rodrigue, Comtois and Slack, 2017

Figure 1.2 Diagram of the Garden City movement by Ebenezer Howard (1902). This urban planning model structures "greenbelts" around urban cores. The green belts contain houses, agriculture and industry. Image via Wikimedia Commons

Figure 1.3 Sketch of Ringpark concept by author, adapted to mimick the Garden City Movement model.

Ring 1: Green space that encapsulates the historic centre of a city
Ring 2: 19th century and modern urban parks
Ring 3: Green spaces around nodes of infrastructure. Includes small scale natural areas, residual farming and recreational areas.
Ring 4: The new coherent of the region based on the water system. a regional park system that connects urban areas all other regional profiles (Roncken, 2018)

important feature in the Dutch landscape, it has become part of a food system that is taking place on a global scale (Smith, 2012). The process of the food system shaping and being shaped by the landscape is still present, but it reaches over far greater distances and therefore the direct physical connection between producer and consumer is often lost (Wiskerke, 2009). Besides that, the environmental impacts of such a system on distance, emissions and resource use are considered unsustainable even though they are hard to grasp, especially from a planning, design and landscape perspective (Brinkley, 2013).

Likewise, due to continued specialisation and unification along the food chain many producers are no longer tied to the lands that provided a unique quality and identity to their products. Nevertheless, "eating local" is a vehicle for local identity and having authentic experiences related to food are current trends in society (Voedingscentrum, no date; Van Huijgevoort, 2017). As a result, consumers do not derive identity and a sense of belonging from the origin of a food product, but rather from newly crafted experiences and identities (Wiskerke, 2009). This can be considered as a form of place making, but instead of place being rooted in actual physical space it is constructed from something else.

1.2 Case and context

The Circlepark (Ringpark) concept as a green counterweight

It is projected that the province of Utrecht will face a population growth of about 300.000 people in 2040 and as a result will have to build about 150.000 houses (Centraal Bureau voor de Statistiek, 2018; Roncken, 2018). As a result of this growth several regions within the province will be increasingly confronted with drastic changes on mobility, new housing, energy and recreation. The political agenda is to densify existing urbanized areas and accommodate 2/3th of the growth (Provincie Utrecht, 2016). However, more large scale land uses such as nature reserves, agriculture en cultural heritage sites are left with only ample space within urbanized zones.

The provincial adviser for spatial quality Paul Roncken, developed a metropolitan landscape concept that addresses a balanced growth both inside and outside urban boundaries, as well as upscaling urban development to match the new regional scale. (Roncken, 2018). The main aim of the Circlepark-concept (in Dutch: Ringpark) is to let every future development within the region contribute to a trifold of indicators: increase of biodiversity, increase of regional economy, and increase of renewable resource management (Roncken,

personal communication, March 19, 2019).

Inspired by the development of the current green spaces in and around the city of Utrecht and examples of green belts from abroad (Vereniging Deltametropool et al., 2017; Van Otterloo, 2018a), the Ringpark was proposed: an interrelated set of four regional park systems that function as a coordinated spatial ambition for the metropolitan region of Utrecht (see figure 1.3 on previous page). This ambition is both spatial and organisational, for the Ringpark provides a green counterweight to the expanding city as well as a governance framework for the projected developments of the region. In that way, Roncken and his collaborators hope to provide an answer to the demand for a new, dynamic balance between the city and its surroundings (Roncken, 2018). In 2018 the provincial government adopted the concept as an inspiring and urgent addition to governmental responsibility.

Shared responsibility and matchmaking

Six challenges have been suggested to address a shared societal responsibility for the park system. This signifies that not only the Province of Utrecht is responsible, also other governmental bodies and companies, NGO's, citizen initiatives and inhabitants of the province. The new regional profile that the Ringpark would bring is seen as a possible common motivator, a shared ownership and framework for guidance for the parties that may traditionally not be involved with landscape development (Roncken, 2018). The challenges are framed as 'matchmaking' and presented as a platform for extending and strengthening the network of actors that can contribute to landscape development. This includes finding a new balance and collaboration between governmental, non-governmental organisations and others that have an interest in the landscape of the region (Van Otterloo, 2018b). The framework of the Ringpark is especially suited for incorporating and combining those interests, and the Province is envisioned as a matchmaker between those different interest, agendas and actors.

As a milestone for gradual and iterative development of the ongoing Ringpark research at the province of Utrecht, six promising matches were presented of local organisations that could combine their personal objective and interest to the ambition for a regional park system (Nefs, Roncken and Van de Witte, 2017). One of the subsequent recommendations of the Ringpark advice, published in June 2018, is to explore the examples of matchmaking into further detail in order to learn what is required of the province and its network partners (Roncken, 2018, p. 10). In other words, they aim to investigate what the motivations might be of the newly envisioned partners to get involved in realising the Ringpark. This kind of insights will likely be the key to the success of the spatial concept as a whole, as non-governmental network partners are deemed to have the skills, knowledge and flexibility to actually bring about the spatial innovations the Ringpark requires (Nefs, Roncken and Van de Witte, 2017; Roncken, 2018).

Following up to a promising match

This thesis project follows up on the recommendation from the advice, of Roncken and his associates by taking one of the six promising matches as a direct provocation for further research and design. In this particular concept that was visualised by Nohnik (see figure 1.4) one of the region's many microbreweries is envisioned as an initiator for collaborating food producers that can activate the landscape (NOHNIK, 2017). The brewery becomes a hub for both locally produced beer ingredients as well as new culinary landscape experiences. Implied in this concept are matches that include the brewery and farmers as entrepreneurs in the

Figure 1.4 The image of "Het Leckere Landschap", a concept for a local brewery in the landscape that was developed as part of the Ringpark Research by landscape architecture firm NOHNIK. Image source: Roncken, 2018

region, but also the water board or drink water supplier, and the organisations in charge of the fortresses in the Nieuwe Hollandse Waterlinie (Roncken, 2018, sec. Appendix page 23).

A follow-up of the brewery landscape concept that yields relevant results for both the province and the brewer, requires additional research on at least two fronts. Firstly, as the concept was developed mostly from the perspective of the province, additional research should make it possible to adopt the brewery's perspective and define more specifically the actual overlap of the brewery's objectives with the ambition of the Ringpark. Using a food systems approach for landscape design can guide this analysis and help the designer to adopt the perspective of the food system (Potteiger, 2013).

Secondly, a landscape design needs to be made to start building an understanding of what the contribution of this concept to a regional park system could be. In the advice it is for example stated that design interventions for the Ringpark ought to be grounded in the opportunities of the natural landscape system (Roncken, 2018). This is a notion that is not yet specified, as the image of the brewery landscape does not seem to refer to specific landscape features from the region of Utrecht. An analysis of the landscape system with the specifics of the brewery landscape in mind will give that insight. Additionally, developing the concept of the brewery landscape through design allows for integration with both the landscape system and the ideas behind the Ringpark.

1.3 Motive

Within the Ringpark context food and sustainable food production are recognised as factors that shape the landscape in the relation between city and countryside, especially on a regional scale. It therefore has the potential to become an addition to the ongoing movement in landscape architecture to validate food as a design tool. Another example of this is new city expansion Almere Oosterwold by MVRDV, where food production at the home plot has been made a prerequisite (Stadslandbouw – iedereen boer, 2016).

The elaboration of the brewery landscape concept from a food systems perspective furthermore contributes to the development of food-focused methodology for landscape design. The main contribution can be in exploring and adopting the food system approach by Potteiger, as the body of work that builds on this article seems to be limited. Next to that it is expected that the transition from food specific data in the analysis to the eventual landscape design will yield some interesting insights on what information designers specifically need to design local food systems.

Rene van Druenen argues in an article in Blauwe Kamer that there is a need for landscape architects that concern themselves with designing productive landscapes that balance ecology and economy. He refers specifically to making landscapes more suitable for agroforestry, as he sees this as an appropriate form of agriculture for productive land in transition zones (Van Druenen, 2018). Even though this thesis research does not concern agroforestry, Van Druenen makes a valid and more broadly applicable point about designers having to become more familiar with the specifics of producing food. A connection between the designer and the actual producers and maintainers of landscapes gives the opportunity to start building more integrated and sustainable landscapes from the bottom up. Van Druenen dubs this new breed of designers "agro-architects" and it is my understanding that this thesis might contribute to the establishment of that type of designer.

2 Research design

Figure 2.0 Organic cereals at Landerij Vantosse. Image by author.

This thesis is structured according to the Food Systems Approach by Matthew Potteiger, as described in his article *Eating Places: Food systems, Narratives, Networks and Spaces* from 2013. This approach was chosen as it is specifically targeted at landscape designers working on food system interventions in various contexts. Given the objective of the Ringpark study, this approach seemed to align well with the food system perspective required. The research objective and research questions have been formulated in line with the steps from the approach.

2.1 Food Systems Approach

The assignment and context of this research project require food to be seen in the bigger picture of the challenges faced by the landscapes of the Ringpark. These challenges are not only spatial or environmental, but also social, political, cultural and administrative in nature. Designing a local food system in this context ties food in with many other networks, systems and ideas about the area.

The Food Systems Approach (FSA) by Matthew Potteiger was designed to produce a comprehensive understanding of what food means in the context of a landscape. It incorporates insight from other disciplines beyond landscape architecture that have been studying the food systems for longer and in multiple different contexts, including rural sociology, geography and history (Potteiger, 2013, p. 263). This is especially relevant in the governance context of the Ringpark.

As the name of the FSA implies, the strategy is built upon a systems approach that has the idea of food and landscape being mutually constituted at its core. This means that the various components of a food system (i.e. the brewery, cafés and farms in the case of this thesis) are always considered to be part of a bigger, interrelated whole, which is also part of a larger system (i.e. the landscape system) (Alpak, Özkan and Düzenli, 2017). Inspired by the work on food systems of other disciplines, Potteiger provides landscape designers with three ways of representing and shaping the inherent complexity of these systems. The three "modes" he describes are food narratives, food networks and food spaces (Potteiger, 2013, p. 262). These three modes have been translated to four analysis

steps in total, as can be seen in the research design diagram in figure 2.1. The extend of the FSA is indicated by the purple box within the diagram.

Food system assessment

A food system consists of all the sectors that contribute to getting food on our plate, see figure 2.2 on the next page. It consists of physical and non-physical features, actors and spaces, networks and flows. This makes food systems elusive, complex and often hard to grasp for landscape design (Potteiger, 2013).

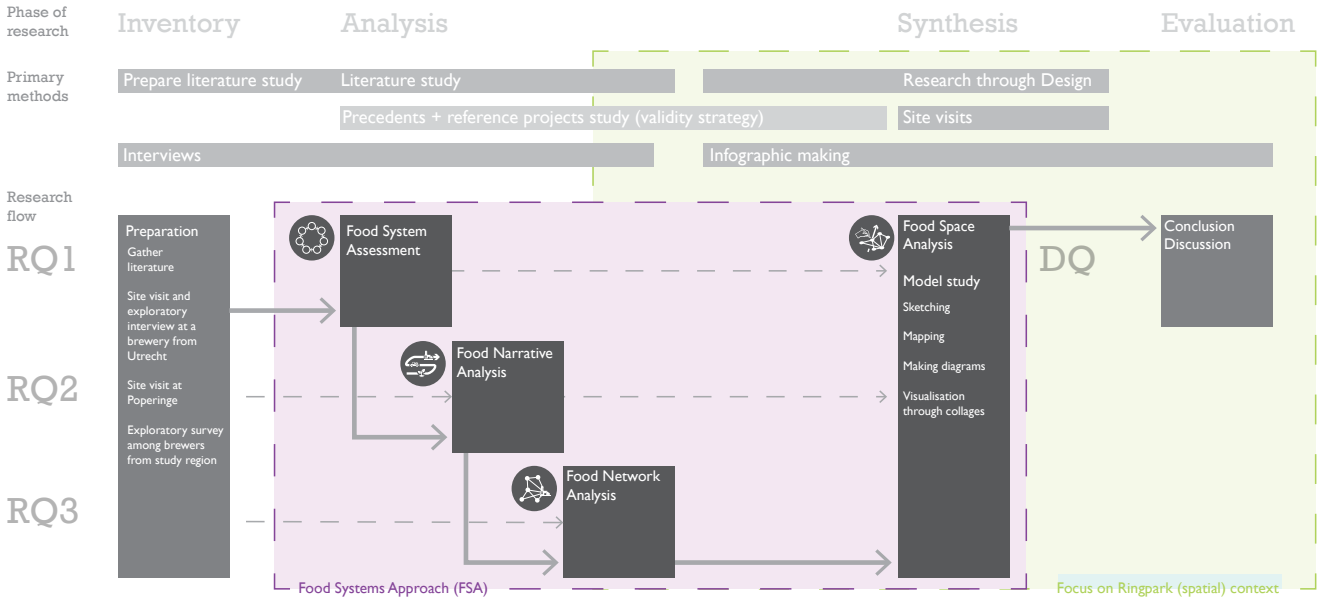
The Food System Assessment step organises food system in sectors, describes and analyses the system per sector, in order to identify gaps, linkages and interrelations between sectors.

Food narrative analysis

Food narratives are similar to landscape narratives, which is a term that has become popular in landscape design projects since the 1980's. A narrative consists of story (the content: events, characters and settings) and the telling (the expression and structure) (Potteiger and Purinton, 1998, p. 3). A narrative can be formed by the landscape, but a narrative can also influence the landscape. Just like food systems, landscapes and narratives are mutually constituted.

Not only do stories take place in a landscape, landscape is also a creator of stories itself, it structures events into sequences and a has a critical role in making place (Potteiger and Purinton, 1998, p. 6). Food narratives specifically encompass the stories of production in the landscape, but also the ways the landscape influences the look, taste, smell and experience of food. A good example of this is terroir, the French term for territory, which indicates the specific features that a certain product derives from

Figure 2.1 Research flow diagram



the environmental conditions it was produced in (Feagan, 2007, p. 26).

The Food Narrative Analysis step describes and represents temporal dynamics across sectors and spaces. The resulting narratives can be used to (re-)link sites and actions into a coherent system (Potteiger, 2013).

Food network analysis

Food networks are a combination of both social and physical networks. They consist of actors, the relations between actors and the physical spaces where these interactions take place, across sectors, sites and scales (Potteiger, 2013, p. 268). As these relationships aren't always spatial in nature (but also economic, or a sharing of knowledge), and can stretch along the globe, a valiant approach to these networks is the space of flows by Manuel Castells (Castells, 2000).

The Food Network Analysis step identifies networks across sectors, sites and scales, where narratives overlap and combine, in order to identify patterns and intensities in network.

Food spaces analysis

Food spaces are the physical manifestations of the food system, and the most straight forward way for designers to intervene in the system. In Potteiger's explanation (2013), food spaces are rooted in food system narratives and/or networks. This also relates to the space of flows concept, which described nodes or hubs as the locations where the abstract, immaterial flows link to the physical world (Castells, 2000). Potteiger describes two types of food spaces, the food shed (relating to the term water shed) and the food hub, but it is suggested in this thesis that there might be more possibilities for food spaces.

The Food Spaces Analysis step devises strategic connections between sites and direct resource flows. It identifies "hubs" where networks relate to places (Potteiger, 2013).

Figure 2.2 Diagram of the food system and its sectors. Image by author

2.2 Objective and research questions

Objective

The objective of this thesis is as follows:

To analyse the food system of brewing beer to identify food spaces and design those spaces as part of a regional park system for the province of Utrecht

Research Questions

The objective is supported by three research questions, which are rooted in the Food Systems Approach. The position of the research questions in the overall research is given in Figure 2.1 on the previous page.

RQ1: What is the current food system of brewing beer? *[food system assessment]*
RQ2: What are the narratives of brewing beer? *[food narrative analysis]*
RQ3: What is the network of brewing beer in the province of Utrecht? *[food network analysis]*

The overall design question concerns the Food Spaces Analysis and is formulated as follows:

DQ: How might the food spaces in a local food system for beer be integrated with the landscapes and experiences of the Ringpark in the Province of Utrecht? *[food spaces analysis]*

2.3 Methods

As the FSA does not specify any particular methods, except providing suggestions on how to visualise the analysis steps, additional methods had to be added. An overview of the placement of these methods in given in figure 2.1, and explained below.

Worldview

This thesis builds upon a combined pragmatic and constructivist world view on research through design. The objective of this thesis requires a new construct of what the balance between food system and landscape is and who could be involved in it. The interpretations of the landscape of those new actors are in my view essential in finding a successful strategy for developing design principles and eventually a landscape design. (Lenzholzer, Duchhart and Koh, 2013, p. 123) In my opinion, this outlook on research in landscape architecture is especially relevant in the design of foodscapes. We as designers (and planners) are "late to the table": we will have to reposition ourselves in this development and find the relevant tools.

At the same time, the implementation of an efficient localised food system requires knowledge of the landscape and its natural systems. A combination of both positivist and constructivist knowledge is needed to be able to design the beer-based food system in the context of Utrecht. (Lenzholzer, Duchhart and Koh, 2013, p. 125)

Methods

Literature review

The literature review is based on a selection of scientific peer-reviewed articles and other non-scientific resources, for example about the brewing process as provided by breweries themselves. An overview of the literature used in the review is given in the References at the end of this report. Selection of literature was organised according to the food system sectors, and articles were added until saturation was reached for each sector or a maximum of five resources per sector due to time constraints. Literature will be organised and coded based on the Food Systems Assessment as a framework for coding categories in order to distinguish current data from desired futures, and to order the information under the labels of food system sectors. This will benefit especially answering of the first research question.

Interviews

Semi-structured interviews based on interview protocols will be used to gather expert information and experiences on local beer production. Convenience sampling of interview-

ees will be used (Creswell, 2014, p. 158), to select experts from different steps in the production process. After the interviews transcripts will be made, which will be analysed through coding and compared to the insights from the literature review.

Narrative analysis
Narrative analysis is based on the approaches for landscape narrative analysis by Potteiger and Purinton (Potteiger and Purinton, 1998). For this the interviews and literature review will be coded and summarised, to identify existing or potential narratives.

Infographics
Infographics are a key component of this research, as it allows the elusive aspects of the food system to be visualised and made available for analysis (Potteiger, 2013). In order to visualise as clear as possible, visual design guidelines for cartography of Bertin and Tüfte among others will be used (Cartwright, Gartner and Lehn, 2009).

Network analysis
Network analysis will be based on distinguishing actors, interactions and spaces in the network (Potteiger, 2013), by coding from the literature review and interviews. Maps, diagrams and infographics will be used to visualise the spatial and non-spatial aspects of the network.

Site visits
Site visits are conducted to make photo's of potential locations for interventions and to gather additional information on site.

Research through design
Research through design will be used as a method to apply, adapt and discuss the findings derived from theory and practice in the initial stages of the research. (Lenzholzer, Duchhart and Koh, 2013). A more detailed description of the design methodology will be given at the start of chapter 7, the food spaces analysis.

Validity and reliability
Validity strategies are needed to guarantee the accuracy of the findings in qualitative research like this one (Creswell, 2014, p. 201). Non-peer reviewed data from the literature review will be triangulated with peer-reviewed literature where possible, but mostly by conducting interviews with actors in the food system. Where needed, precedents or reference projects will be sought in other food system design or local food initiatives to check whether certain outcomes were also found and applied there (Deming and Swaffield, 2013, p. 56 ; Creswell, 2014, p. 202).

Similarly, a small explorative survey was conducted amongst brewers from the region to gauge thier interest in locally produced ingredients. Given the small response of brewers, the results of the survey were not considered to be significant, but the outcomes do have an application as a validity and reliability strategy.

Bi-weekly peer-review sessions with the Serious Landscaping group and my supervisor will be used as an opportunity for peer-debriefing about the qualitative results in this research.

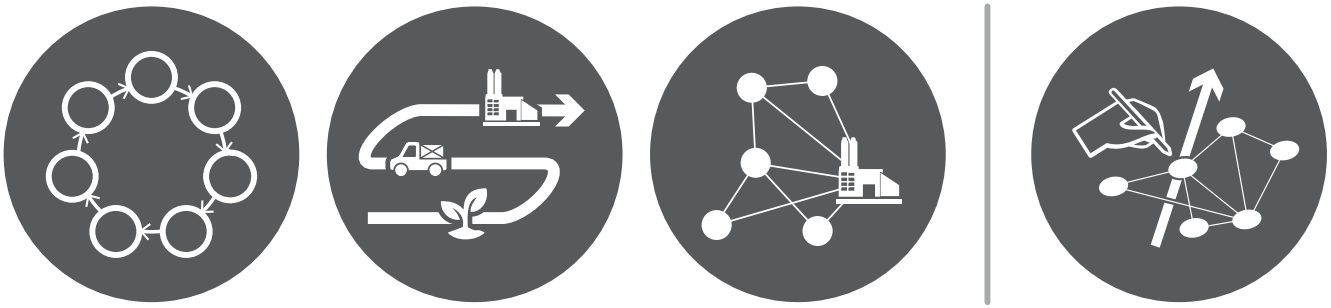
Lastly, the utmost carefulness will be practiced with regards to finding faults in interview transcripts and codes, in order to prevent mistakes and inaccurate results as a result (Creswell, 2014, p. 203).

2.4 Reading guide

This thesis consists of eight chapters into total. After Chapter1 Introduction and Chapter 2 Research Design, Chapter 3 contains a Glossary with relevant terms and explanations of processes related to the food system of brewing. For readers that do not have knowledge of the brewing process or the ingredients of beer, it is recommended to read this chapter prior to reading the rest of the research.

The inventory and analysis is spread out over four chapters, all containing preliminary conclusions and recommendations for the continued research. Chapter 4 concerns the Food System Assessment, and will contribute to answering the first research question. Chapter 5 is the Food Narrative Analysis and will answer research question 2. Chapter 6 contains the Food Network Analysis and will concern research question 3.

Chapter 7 is the Food Spaces Analysis, which contains the model study. Lastly, chapter 8 contains the conclusion and discussion. Here, the three research questions will be answered in short, as well as the overall design question. In the discussion the applicability and validity of the results are discussed and recommendations for further research are given. Below in figure 2.3, four logo's are given for the four steps of the Food Systems Approach. These icons will reappear at the start of each chapter.



Step 1: Food System Assessment | Step 2: Food Narrative Analysis | Step 3: Food Network Analysis | Step 4: Food Spaces Analysis

Figure 2.3 Logo for each steps of the FSA. These logo's will reappear at the start of each chapter

3 Brewing glossary

In order to establish an understanding of brewing and related concepts for the reader, a glossary was composed. It is purposefully positioned as an intermezzo between the research strategy section and the analysis and design chapters, to provide the reader with an appropriate background for reading the report. It contains a description of the brewing process, descriptions of ingredients and visual references for some of the key terms. For this chapter various resources were used, where possible triangulated to ensure accuracy, including interviews, site visits, handbooks, Youtube videos from home brewers and non-academic online resources.

The glossary was assembled after the main research and design steps were conducted, therefore the glossary is already tailored to the findings of the research and there is a slight bias towards the ingredients that were discussed in more detail in the thesis.

Malt

Barley

Barley (usually *Hordeum vulgare*) is a cereal that is most commonly used for brewing beer. Two different types of barley can be used. Winter barley is sown in September and harvested in July. Summer or spring barley is sown in March and harvested in September (Palmer, 2006).

Brewing barley

Brewing barley is barley that has an appropriate protein content (between 9,5 and 11,5%), is unaffected by suboptimal ripening conditions or fungi, and was conditioned after the harvest to a moisture content of maximum 14%. This ensures that more than 95% of the barley will germinate in the malting process. Barley that is not up to these standards is not suitable for malting and will be used as feed. When the product is suitable, a farmer can receive a premium on top of the price for the barley from the malt house or brewery (NIBEM, 2019).

Starches and sugars

The endosperm is the starch containing sac of the barley grain or kernel, see figure 3.2. During the malting process the starches in the endosperm are modified into sugars. The long starch chains are broken down by enzymes from the sprout (the acrospire and the aleurone layer) into shorter chains of sugars, which can be more easily dissolved into water during the brewing process (CraftBeer.com, 2019).

Cereals

Besides barley other cereals are used for brewing beer, but they usually are used for specific types of beer, or as additives to aid the brewing process. The cereals include wheat (*tarwe*), sorghum, rye (*rogge*), millet (*gierst*), oats (*haver*), rice (*rijst*), and maize (*mais*). For example, wheat malts have an application in weiss beers (*witbier*) and sorghum is common in traditional African beer (Palmer, 2006; Davies, 2016).

Storage and distribution

After the harvest the cereal of choice is conditioned to a moisture content that is appropriate for malting and that ensures long lasting storage. Sometimes, different batches from different fields are collected and stored separate from other batches (Prins, 1986).

Malting

Malting is the process of modifying the starches in a cereal of choice into sugars that can easily be dissolved in water. The resulting product is called malt. The process is based on forced germination, basically emulating the process of a grain kernel sprouting to grow into a plant under the influence of water and heat. After the first stages of germination the process is halted by quickly drying out the malt, which is called kilning. Figure 3.2 shows the malting process. After kilning, the malt is ready for packaging and distribution to brewers. Malt can also be further processed into malt syrup, which can be used for beer and other food items (CraftBeer.com, 2019).

Spent grain

Spent grain is the residue of the lautering stage in brewing beer and consist of wet grain solids. The sugars were extracted from the malt, but the residual spent grain is high in protein. Therefore the spent grain is often saved and sold for other purposes, such as cattle feed or food additives. In order to do this the spent grain can be drained, dried and sterilised to prevent contamination and brooding (Plant Chicago, 2017).

Hop

Hop plant

Hop (Humulus lupulus) is a perennial deciduous climbing vine, which means that each growth season the hop vines grows anew from an underground rhizome (root system). The growing season starts in March, when the rhizomes start to sprout. In the following months the grower trains the quick growing bines around a support structure. In modern times this is often a wire lattice, but in the past hop was more often grown around stalks. Figure 3.4 shows a typical modern day lattice field.

Hop cones

Female hop plants produce flowers, called hop cones, which are harvested for brewing beer. Figure 3.3 shows a cross section of a hop cone, including the lupulin glands on the bract leaves. When a female hop plant is fertilized, the flower produces seeds that de-

Figure 3.1 Main ingredients of beer (top left to bottom right): water, malted barley, yeast and hop Source: Freepik, no date; BuildASoil, no date; Masur, 2010; Rasbak, no date

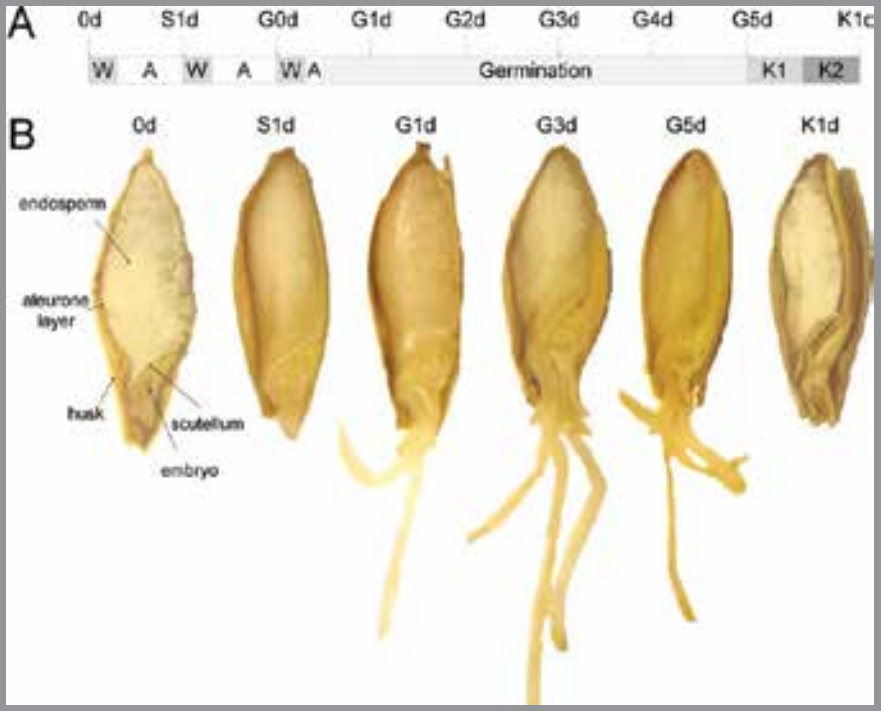


Figure 3.2 The barley germination process. S: steeping, G: germination day, K: kilned malt. W: water, A: air, rest. Section of final product is on the far right. Source: (Gorzolka et al., 2016)

Figure 3.3 Cross section of hop cone. Source: (Priest & Steward, 2006, p. 183)

Figure 3.4 Modern wire lattice field in Poperinge, Belgium. Image by author

crease the lupulin production of the hop cone. Seeded hops are generally unwanted by brewers (Roberts, 2016).

The sticky yellow lupulin glands contain hop resins, essential oils and other substances. These resins and oils are the components of the hop cone that provide aroma, bittering and preservative qualities to beer. In the resin, the level of mostly alfa-acids determines the quality of the hop and whether it will used for bittering the beer or adding aroma. The resins and essential oils are volatile components, meaning they will start to evaporate shortly after the hop cone is harvested. Therefore hops have to be used or processed shortly after picking (Roberts, 2016).

Hop has many varieties, all varying in the amounts of resins, oils and other aroma components they produce. Some varieties originate in specific regions, especially within hop producing countries such as Germany, Czech Republic, the UK and the US. Common popular varieties include Saaz, Hallertau, Cascade, Amarillo and Brewers Gold (Amerongen, no date; Roberts, 2016). Using undried hops shortly after the harvest preserves some of the volatile flavours. This type of hopping is called green hopping or fresh hopping.

Processing hop

Hop cones are usually kilned to preserve the volatile components. This means they will be dried in a kiln that is called an oast or oast house, by blowing warm air (60–758°C) through a layer of hop cones for six to eight hours. see figure 3.7. The dried hop cones will then be packed airtight or processed even further into tight hop pellets or even a fluid hop extract, see figure 3.5. The risk of hop losing its aromatic qualities is not gone after kilning, vacuum packaging and cooling helps to prevent further degradation of the product (Roberts, 2016).

Yeast

Yeast is a unicellar fungus that is used by brewers in general to ferment sugars into alcohol, carbon dioxide and other flavour components. Yeast is also used in preparing bread, sparkling wine, coffee and chocolate. There are many different types of yeast, the brewer's yeast varieties are distinguished from other varieties by the ability to convert the specific sugars from malted cereals (Russell, 2016).

Brewer's yeast varieties are roughly divided in two types: top-fermenting yeasts and bottom fermenting yeasts. Top fermentation takes place at higher temperatures (15 to 25°C) and produces the beer type ale, bottom fermentation takes place at lower temperatures (4 to 10°C) and produces lager types (Anderson, 2006). The brewer usually adds laboratory isolated yeast strains to his brew, as a single uncontaminated yeast variety gives a reliable result.

Yeast also occurs in the air and specific beer types such as Belgian lambic rely on spontaneous fermentation by these atmospheric yeasts (Papazian, 2006). Other brewers extract atmospheric or wild yeasts from flowers or fruits, or purposefully mix less reliable or varied types of yeast to create new flavours or beer styles (Gibson et al., 2017).

Water

Water is the primary ingredient for beer. Water in the brewery distinguishes in four categories: Brewing water, Process water, General-purpose water and Service water. Brewing water is sometimes indicated as liquor and is usually treated within the brewery to reach a desired composition of minerals and other substances. The composition of the water varies per beer type. The other water categories are used for sanitation off the equipment, materials and the machines. The amount of water a brewer uses per hectolitre of beer varies, depending among other factors on the efficiency of the brewing installation (Eumann and Schaeberle, 2016).

Gruyt

Gruyt is a herb mixture that was commonly used as an aroma and bittering additive in beer before hop became the more popular and common additive. The main ingredient in gruyt is sweet gale or bog myrtle, which has a sweet taste. Unlike hop, sweet gagel does not have preservative qualities, therefore gruyt beers were only consumed in the region where the plant was found (Behre, 1999). Gruyt could also contain herbs like Laserwort, Wild rosemary and Laurel (Nicolas, 1966; Behre, 1999) see figures 3.8 to 3.11.

Figure 3.5 Two common processed forms of hops: dried and pressed (top) and pellets (bottom) Source: (Best Pellet Plant, no date)

Figure 3.6 Historic oast house in Poperinge, Belgium, with a characteristic chimney and wind vane. Image by author

Figure 3.7 Image of a modern day kiln Source: (Best Pellet Plant, no date)

Laserwort (en)
Laserkuid (nl)
Laserpitium siler

Wild rosemary (en)
Moerasrozemarijn (nl)
Ledum palustre

Laurel (en)
Bekeler (laurier)(nl)
Laurus nobilis

Figure 3.8 - 3.11 Four herbs associated with gruyt (Behre, 1999; Nicolas, 1960).
Left: Sweet gale / Gagel / Myrica gale. Image from Flora Batava (1836), via Wikimedia Commons
Top left: Image from Afbeeldingen der artseny-gewassen met derzelver Nederduitsche en Latynsche beschryvingen (1796), via Wikimedia Commons
Top middle: Image original source unknown, image via http://ilovehomoeopathy.com/
Top right: Image from Flora von Deutschland, Österreich und der Schweiz (1885), via Wikimedia Commons

Brewing process

Based on the description of the brewing process by Eaton (2006)

Brewing phase

Milling

Malted barley is stored as whole kernels at the brewery. Shortly before brewing the kernels are milled to grist to expose the inside of the kernel, which increases the contact of the sugars in the malt with water in the next stage.

Mashing

Water and grist is added to a mashing vessel. The mixture is heated and kept at a set temperature to dissolve the starches into the water, which is then called wort.

Lautering

The wort together with the solids are transferred to the lautering vessel. Here as much fluid as possible is drained from the solids and the wort and solid are separated. The spent grain exits the process in this step. The wort is then transferred to the boiling kettle.

Boiling

The wort is boiled in to clear the wort of impurities, form colour and flavour and concentrate the sugars in the wort. The timing of the addition of hop to the boiling liquid determines to a large extend whether the hops will add bittering or aroma to the wort. At the end of the boiling a trub consisting of unwanted proteins and hop residues is filtered from the wort, to create a fluid that is suitable for fermentation.

Cooling

The hot wort or green beer is cooled down to a temperature that allows for fermentation. In this process, heat is exchanged between the cooling liquid and the word. The heat is reused somewhere else in the brewery. The cooling will also allow the brewer to extract the last impurities.

Cellaring phase

Fermentation

When the wort is cooled to the desired temperature, the yeast is pitched in. The yeast cells use the sugar and protein in the wort to produce alcohol, CO2 and flavour compounds, and regenerate new yeast cells. When the sugar runs after fermentation out and yeast starts to settle out, the spent yeast is removed from the brew. The beer is transported to lagering vessels to mature.

Lagering

During the lagering time, the flavour of the beer develops further and a second fermentation can take place, should not all yeast and debris be remove from the beer in earlier stages. The lagering stage can also be used to build up reserves in the brewery, and therefore the brewing capacity of a brewery is highly dependent on the lagering capacity.

Filtering and carbonation

To create a beverage that is stable and clear and ready for bottling, the beer is filtered for a last time (or left cloudy when it concerns beer types like weissbeer) and carbon dioxide can be added to reach the preferred fizziness of the final product. The less contamination of the brewing process is left, the smaller the chance of the beer spoiling.

Packaging and distribution phase

Cleaning

Another factor to ensure high quality beer that keeps for a longer time is proper sanitation. This applies to the brewing equipment, but also to a large extend to the vessels the beer will be put in. Breweries usually take care of this step themselves, to prevent contamination between cleaning and bottling.

Bottling and kegging

Depending on the preferences of the brewery, beer is bottled in the brewery's standard bottle or kegs. The bottle is chosen and designed to allow for long term cold storage, for example by using glass that lets trough less daylight. Kegs are used in the brewer's taproom or sold to restaurants and cafes to sell as draft beer. In this stage the brewer can add extra wort or sugar for bottle conditioning, where the flavour develops further after bottling.

Distribution

The brewer takes care of storage and distribution for whole sale (selling to consumers via a reseller such as a liquor store or supermarket) or direct sales (to consumers or restaurants).

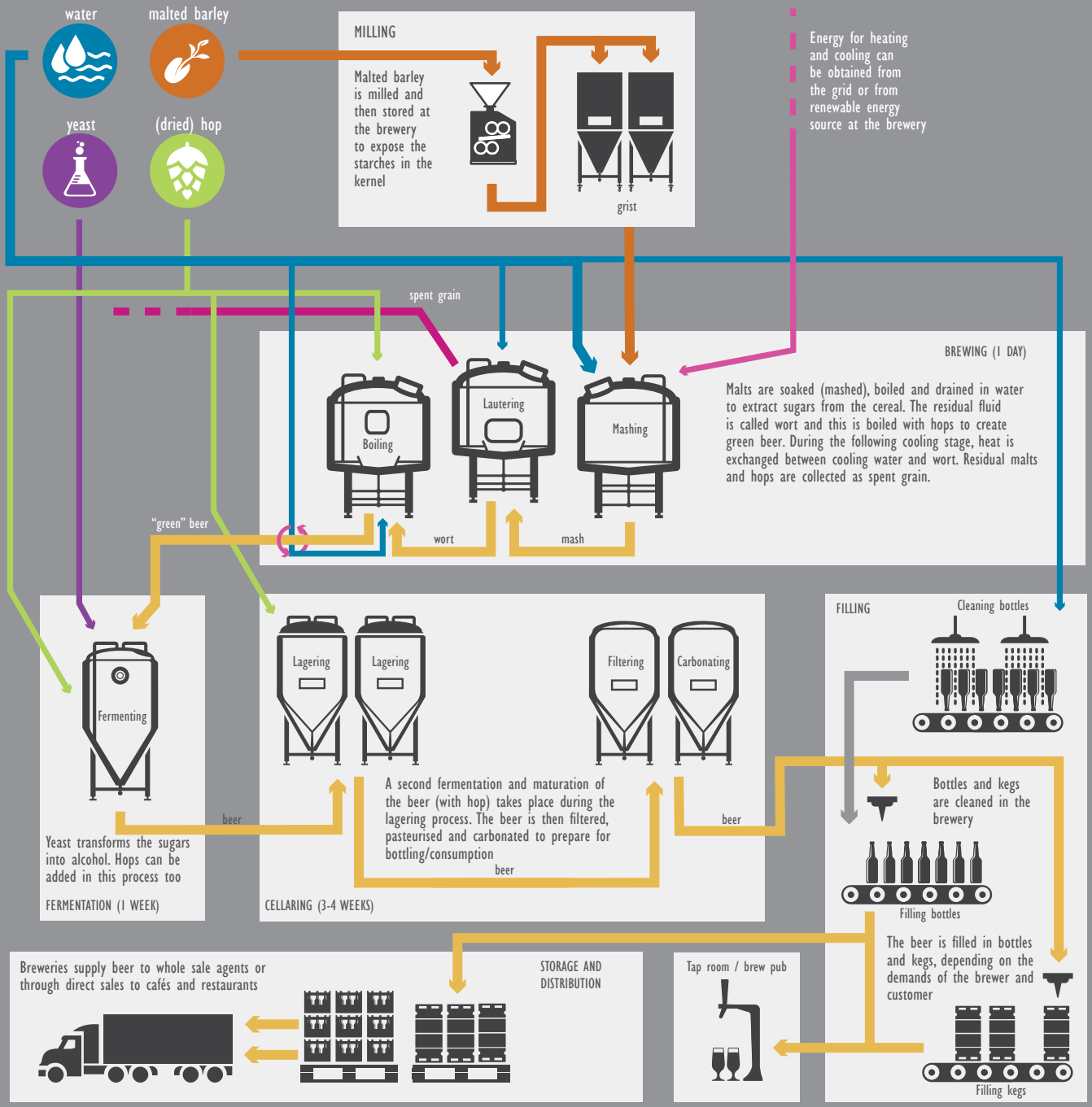


Image 3.11 Diagram of modern day brewing process. Image by author, based on site visit at Brewery de Leckere, additional source include Brouwerij Jopen, no date; Eaton, 2006.29

4 Food system assessment

Figure 4.0 Historical, pyramid shaped trellises above a hop pit (In Dutch: *hopkuil*) at Haarzuilens, near Utrecht. Photo by author

The goal of this chapter is to outline the study object of this research project in general terms, as we will try to answer the first research question: "What is the food system of brewing beer?". The answer to this first research question is needed to guide further exploration in the consecutive analysis chapters. As the food system of brewing beer has undergone some drastic changes during the last few decades, the historic development of the food system is deemed to contain valuable information on how the contemporary food system of brewing was formed. Therefore the main analysis in this chapter gives a historic, chronological perspective based on a literature review, inspired by development periods as defined by van Dijk, Kroezen and Slob (2018). A description and illustration of the food system by sectors, modelled after the food system a Dutch microbrewery from Utrecht, is given at the end of the chapter.

4.1 Prehistoric brewing

The development of brewing is closely linked to the development of agriculture. The earliest evidence of people brewing can be traced back to the Mesopotamians, about 6000 to 7000 years ago. This civilisation inhabited the fertile soils in the delta of the Tigris and Euphrates rivers, and are known for growing cereals (Priest and Stewart, 2006). The abundance of cereals and bread eventually lead to the discovery of beer as a beverage, and the spreading of the practice throughout regions with suitable climates for growing grains. Brewing was also a common practice in Egypt, and there are archaeological artefacts found that depict the brewing process, see figure 4.1.

Brewing before the brewery

Instead of having dedicated breweries, brewing usually was a craft that was practiced at home. Archaeological artefacts from the twelfth century found in the Netherlands suggest that brewing was first and foremost a domestic practice (van Dijk, Kroezen and Slob, 2018), often carried out by women (Nicolas, 1966, p. 7). The beer was used only for personal use within the household, and therefore brewed on demand. Monasteries were the only places where brewing was organised at a larger scale (Van Vlisteren, 1994; van Dijk, Kroezen and Slob, 2018). Village breweries also did exist. In these cases the brewers were often also innkeepers or farmers, and the frequency of brewing varied a lot (Volkers and Kik, 2016).

The availability of cereals at the farm initially lead to brewing being a rural practice (van Dijk, Kroezen and Slob, 2018). This means that the ingredients for the beer ere likely grown by the farmer himself, using

Figure 4.1 Ancient Egyptian funerary model of a brewery. Photo taken at the National Archeological Museum in Athens. Source: Stavrakis / AP, 2008, via https://www.spiegel.de/fotostrecke/photo-gallery-the-ancient-art-of-brewing-fotostrecke-50107.html

the locally available varieties of resources. Brewers in the middle ages are known to have used many other types of grain besides barley, including oats and wheat (Nicolas, 1966). Other ingredients, such as hop and the herb mixture gruyt, were likely grown in small quantities or foraged nearby. Differences in calcium and alkalinity levels in (ground)water can lead to differences in the end result of brewing as well (Eumann and Schaeberle, 2016). In that way local climates and availability of ingredients lead to the development of different recipes and beer types.

Environmental influences on beer variety

Besides the variation in ingredients, the taste and quality of the beer varied under the influence of unreliable factors, unknown to brewers at that time. Yeast as the driving force behind fermentation and eventually a good beer was only discovered as such in the 19th century (Gibson et al., 2017). Fermentation thus happened spontaneously through atmospheric yeasts, or was started by means of adding bread or scum from previous brews to the mixture (Nicolas, 1966; Van Vlisteren, 1994).

Next to that beer would often spoil after brewing in the summertime. Temperature was the main contributor to this problem. In winter, the colder air lead to a bottom fermentation, which leads to a more stable beer, like a lager type beer. Top fermentation is a wilder fermentation process that leads to ales and less stable brews (Anderson, 2006).

4.2 The emergence of the urban brewery

As urbanization in the Netherlands continued in the twelfth and thirteenth century, brewing moved out of the increasingly smaller kitchens into organised professional breweries. It can be imagined that when demands for beer ingredients began to rise, the production sector would expand and develop as well. For example, the rights of producing and trading gruyt were obtained by land lords, such as the bishop of Utrecht. They organised specialised marketplaces called gruythuizen, that allow the land lord to collect taxes from anyone that wished to use these herbs (Nicolas, 1966; Kistemaker, Van Vlisteren and Hendrikman, 1994).

Water as a location factor for the brewery

A clean source of water remained a major location factor for breweries. Beer became popular as a beverage as an alternative to water, as the brewing process cleared some of impurities from the surface water that people would usually drink. Breweries nevertheless also relied on that same water. There are recorded instances of the brewers guild getting involved with keeping the canals clean (Nicolas, 1966). Brewing was one of the most profitable crafts in Dutch cities during the Middle ages, and the brewers guild also had an influence on governance in cities (Yntema, 1994). Dutch cities such as Haarlem, Delft and Amersfoort are examples of places where the brewing craft flourished.

Nearby waterways such as a canal would also provide a way of transportation. Beer would leave the brewer by boat and would be delivered at the client by the brewery. For an example, see figure 4.2. Not only were the Dutch beers popular locally, they were also exported to other regions. Simultaneously beer from other regions was imported to the Netherlands, which influenced the brewing sector greatly (Nicolas, 1966; Kistemaker, Van Vlisteren and Hendrikman, 1994). In the fourteenth century Dutch people started to favour hopped beer styles from Germany and hop rapidly replaced gruyt as the main bittering agent in beer (Van Vlisteren, 1994).

Lack of Dutch quality ingredients

Even though the demand for hop increased, specialised hop farming stayed a small sector in the Netherlands. In only a few regions farmers specialised in growing and selling hop to others, for example around the villages of Peize and Schijndel. As the quality of Dutch hop lagged behind the quality of Flemish and English hops, brewers tended to prefer foreign hops for brewing, leaving local

Figure 4.2 Painting by Hendrik Meijer of an urban brewery in Leiden at the waterfront around 1772, located in Museum Lakenhal in Leiden. Image obtained via www.lakenhal.nl

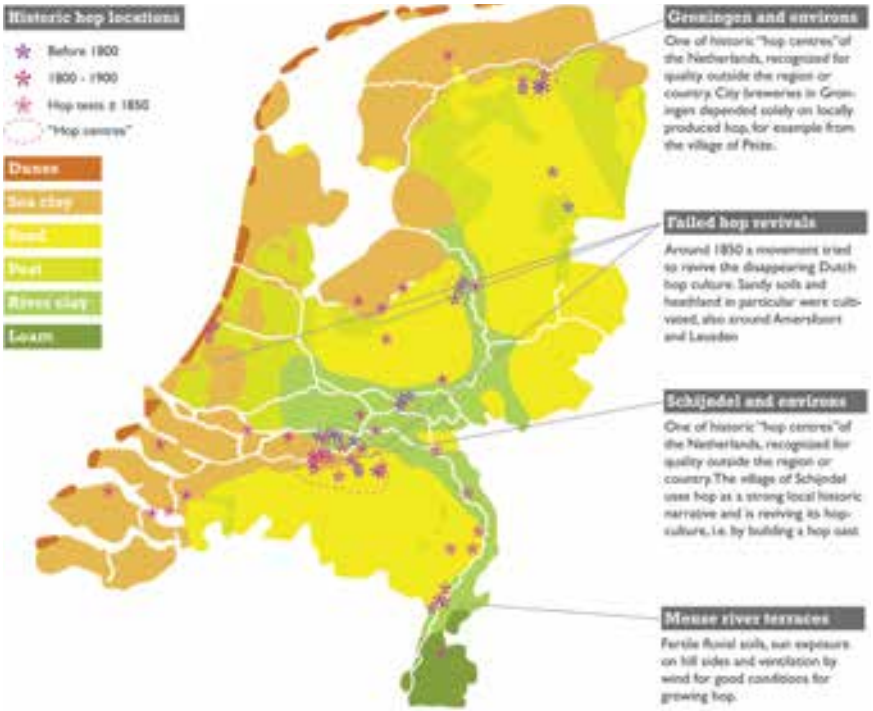


Figure 4.3 Historic hop locations. Image by author, adapted from HopNederland, 2018, Platform Nederlandse Hoptelers, 2018 and Volkers & Kik, 2016

hop only to be used by small local breweries (Volkers and Kik, 2016). The small scale food system around a rural brewery would remain to exist as such up till the nineteenth century, as every village and town still had its own brewery, often brewing local specialties.

Similarly to hop, the use of local cereals disappeared and barley was imported from elsewhere. The reason being that Dutch native varieties of barley were less suitable for brewing, and it took till the 1960's for plant breeding to catch up with the demands of modernised brewing (Nicolas, 1966). Interviewee Erik van der Marel from Brewery de Leckere estimates that Dutch barley still only accounts for just a fifth of the total malt production in the Netherlands (Van der Marel, personal communication, May 15th 2018).

4.3 The development of industrial brewing

Advancements in science and technology during the nineteenth century however signalled a new phase in the Dutch beer landscape. Bavarian brewers figured out a way to control the fermentation process by cooling the wort (van Dijk, Kroezen and Slob, 2018). The resulting bottom fermented beers became immensely popular and the new practice was quickly adopted by industrial brewers in the Netherlands by the end of the 19th century (Nicolas, 1966).

The popularity of pilsner

Smaller breweries dissolved into large, industrial breweries that followed the new brewing techniques from Germany. As a result traditional local recipes were discarded, and down with it went the last remnants of the Dutch hop culture by the end of the twentieth century (Volkers and Kik, 2016). In only a couple of decades the number of breweries in the Netherlands was reduced to 16 in 1980 (Stichting Erfgoed Nederlandse Biercultuur, 2018). Some of the new industrial breweries and pilsner focussed brands from this time have survived up till now, for example Heineken and Amstel (Volkers, 2017a).

Upscaling and professionalisation

The new-found control over the brewing process aided the development of brewing as an industry. A modern brewer now had access to a particular yeast strain, kept safe from contamination by either the brewer himself or a laboratory. A reliable yeast culture is important in commercial brewing to eventually end up with a consistent quality of beer every time a particular recipe is brewed (Russell, 2016). Contamination by other yeast can lead to unwanted flavours in the beer, or the fermentation process to be disrupted and the batch being spoiled (Priest, 2006).

Industrialisation also affected the malting industry. Similarly to brewing, malting was an artisanal craft. The introduction of industrial heating and mechanics allowed for production on a larger scale. As the supply of Dutch barley remained limited, Dutch malt houses had to rely on barley from abroad. This focus on foreign cereals is still reflected in the locations of modern day malt houses, as some of them are still located near harbours (brouw-bier.nl, no date).

4.4 A return to brewing as a craft

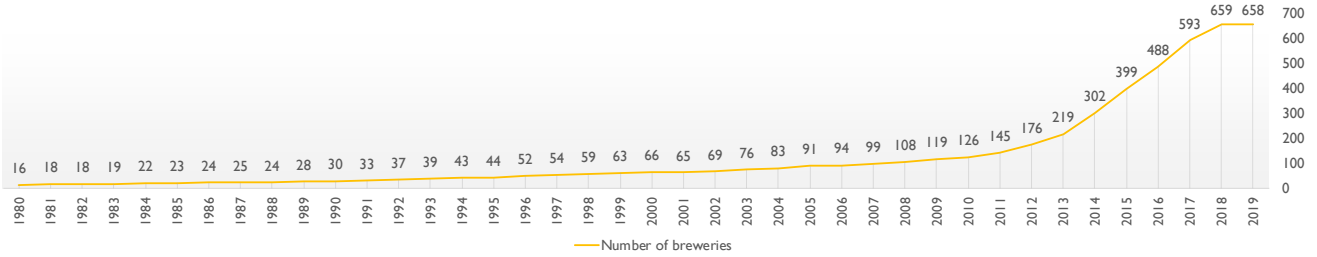
Craft brewery movement

The end of the twentieth century brought about a counter-movement to the industrialised and monotonous brewing sector in the Netherlands. Inspired by the remaining traditional beer sector of Belgium, a small group of craft beer enthusiasts and specialised cafés in the 1980's kindled the attention and interest for traditional beers in Dutch society (van Dijk, Kroezen and Slob, 2018). The revival of the small and artisanal brewery mirrored developments in America and Great Britain, where so called microbreweries paved the way for more traditional and flavourful brews, served to their local communities (History of Craft Brewing, 2017). Breweries such as Brouwerij 't IJ, Hertog Jan and De Friese Bierbrouwerij stem from this era (Volkers, 2017a), and have almost become mainstream brands in the Dutch beer sector.

A second wave of new breweries caused an exponential growth in the number of Dutch breweries from the start of the 21st century on (Volkers, 2017b). Most of these breweries have

Figure 4.4 Poster of a festival in Utrecht in 2015, promoting the use of historic Dutch beer recipes. Organised by the Campaign for Dutch Beer Styles, which has contributed to the craft beer movement in the Netherlands. Source: Campagne Nederlandse Bierstijlen, 2015

Figure 4.5 (below) Number of breweries in the Netherlands. From about the 2000's on, an exponential growth can be observed. Image made by author, adapted from Stichting Erfgoed Nederlandse Biercultuur, 2019



a small brewing capacity and can therefore afford to experiment with bold flavours and adventurous techniques, such as fermentation with wild yeast cultures (Matthias Terpstra, personal communication, June 11th 2018). This generation consists of home based brewers and contract brewers, that rely on cheaper tools or the facilities of others (van Dijk, Kroezen and Slob, 2018). The website of the Foundation for Dutch Beer Culture Heritage registers 656 active breweries in the Netherlands (Stichting Erfgoed Nederlandse Biercultuur, 2019), see figure 4.5. However, it is reported in January 2019 by the same foundation that the rapid growth of breweries decreased in 2018, and that the market for new local breweries might have reached its limits (Meesterburrie, 2019).

Variation in distribution

The craft beer movement has appealed to new audiences, and therefore the sector of retailing and consumption has diversified over the years. Brewers continue to sell to wholesale suppliers, who then distribute to bars, restaurants and other beer serving places. When a brewer tailors to a particular sector of the beer market, for example local or ecological beer, then the beer is sometimes supplied to a specialised wholesale supplier such as Nectar in Utrecht (Nectar Drankengroothandel, no date; Van der Marel, personal communication, May 15th 2018).

Especially for smaller breweries, self-delivery to bars and restaurants is common. Their scale of operations allows them to supply directly to their buyer, and allows them to get feedback from their drinkers (Horijon, 2015). Next to that direct sales through brewery-run taprooms or brewpubs are reminiscent of historic village breweries. This direct sale or retailing by the brewer can also be seen at numerous beer festivals or craft focussed festivals where brewers are often featured as crafters of local products (van Dijk, Kroezen and Slob, 2018).

A crowded market for ingredients

Even though the brewery sector itself went through drastic changes over the last few decades, the sectors that supply the breweries are still mostly tailored to the needs of an industrial brewery. Depending on the size of the brewery, brewers nowadays will buy their hops directly from the farmer or from an intermediary. Such intermediaries play a role in the now globalised food system of hops. The increase of small, craft beer oriented breweries has crowded the market for specialty aroma hops. Buying from multiple different intermediaries, or reaching out in advance to hop farmers could ensure a brewer a share in the harvest (Van der Marel, personal communication, May 15th 2018).

Similarly to hop, malt is bought through the malt house or through an intermediary. However, due to the large scale of malting, traceability of the origin of malt is limited, even though storage before malting is aimed at separating out batches by quality and origin (Prins, 1986). A few small initiatives for artisanal malt houses have recently started or are being developed (Graanrepubliek, 2019; Vloermouterij Masterveld, 2019). The scale of operations of this kind of initiatives allows for small batches of specialty malts that fit the demands of smaller craft brewers (Olsson, Rahbek Christensen and Frausing, 2009).

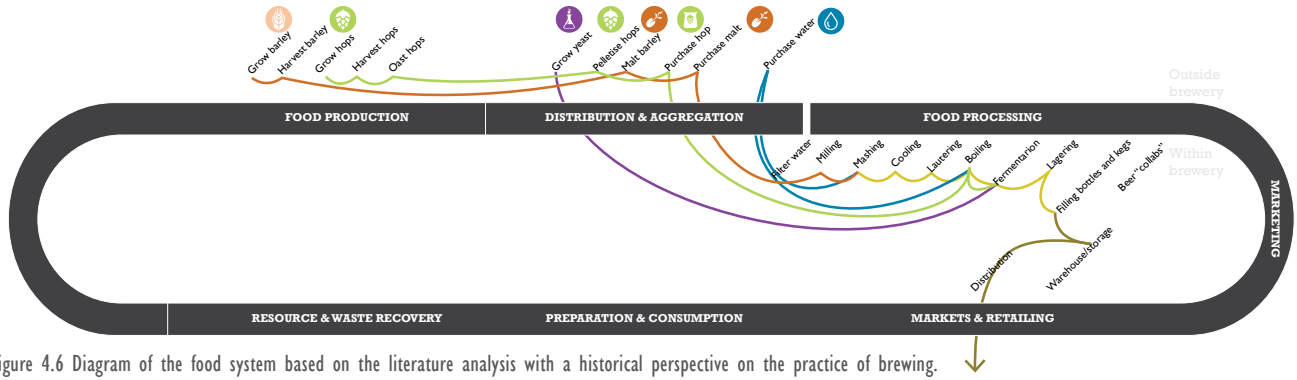


Figure 4.6 Diagram of the food system based on the literature analysis with a historical perspective on the practice of brewing. Image by author

4.5 Towards a local food system for beer

Figure 4.6 shows a diagram of the food system as it has emerged from the literature study on the development of the practice of brewing beer and the food system. To bridge the gap between the glossary and the analysis, the steps of the brewing process are also incorporated in the diagram. The diagram distinguishes between the inside and the outside of the brewery, as there is nowadays a clear divide between what activities, resource flows and actors are located within the realm of the brewery and outside the realm of the brewery. It also shows a clear connection between the sectors of food production, distribution and aggregation, and processing. Next to that, not all food system sectors were equally represented from the historical perspective and are therefore not yet included in the diagram.

Filling in the gaps in the food system outline

The literature study on the historic development has left some gaps in the outline of the food system that require consideration before the next steps in the analysis can be taken. For example, the food system sector of resource and waste recovery remained relatively unexplored, just as the sectors of marketing, retailing and consumption. As these latter few sectors focus more on the experience and stories of the product, it is recommended that they will be examined in more detail in the Food Narrative Analysis (Chapter 5). An overview of some of the elements in the resource and waste recovery sector are mentioned below and shown in figure 4.7.

Legend food system diagrams (applies to figures 4.6 to 4.8)

- Uncommon resource flow
- Hop
- Barley / malt
- Water
- Yeast
- Brewery
- Bottle collector
- Water/sewage company
- Farmer / Composter
- Wholesaler/ supermarket
- Directsaler i.e. cafe
- Unbottled beer
- Bottled beer
- Waste flow (spent grain and yeast)
- Energy flow (heat and electric energy)
- Opportunity
- Hop seller
- Yeast laboratory
- Malt house / collector
- Cereal farmer
- Hop farmer
- Caterer / Directsaler

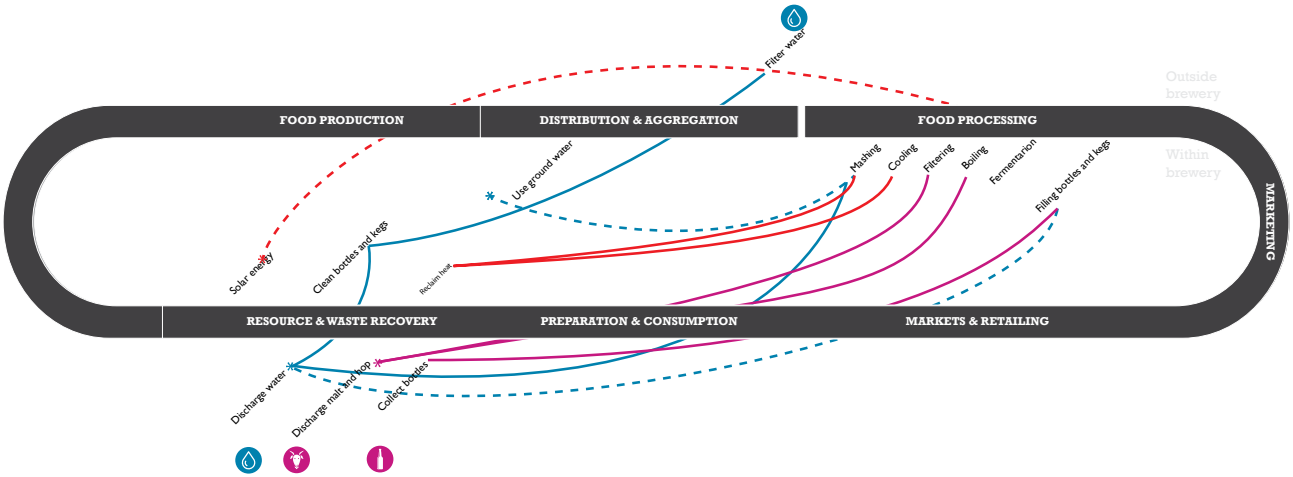


Figure 4.7 Diagram of the food system based on additional literature analysis concerning the underexposed food system sectors.

Energy and emissions

The main residues of the brewing process consist of emissions and various by-products, such as spent grain, yeast, effluent and filtration residues. The emissions are mostly linked to the brewing process itself, as it is an energy intensive process requiring heat and cooling in different stages of the brewing process (Hoalst-Pullen et al., 2014). The energy required can increasingly be obtained from sustainable local resources, such as solar panels (Van der Marel, personal communication, May 15th 2018), but most breweries will still emit CO2. Gulpener initiated the planting of a new forest nearby their brewery to compensate for their emission (Wilschut and Koedoot, 2014).

Spent grain and yeast

By-products spent grain and yeast have long-known secondary purposes within the food industry. Beside catlle feed, it can also be used as a base for bread and granola (Zwaan, 2012), and as a substrate for growing fungi for multiple applications (Mediamatic, 2016). Yeast cultures that are spent have an application in vitamin supplements and medicine (Huige, 2006), however discharging of yeast is less common.

Water

Efficiency in the use or reuse of water varies per brewery and is usually based on the quality of the brewing system. A smaller brewery might use 9 litres of water per litre of beer produced (Van der Marel, personal communication, May 15th 2018), whereas Grolsch aims at using 3,05 hectolitres of water per hectolitre of beer (Koninklijke Grolsch, 2017). This is evident that a lot of water is needed for other processes in brewing, like cooling, rinsing and cleaning.

These uses of water require different qualities, therefore water can be reused either within or outside the brewery (Eumann and Schaeberle, 2016). In that case, breweries should have cleaning facilities in place to clean the water. These could be chemical, but Heineken is collaborating on biological filters and constructed wetlands with their neighbours of the plant in Zoeterwoude (Heineken Nederland, Provincie Zuid-Holland and Alterra Wageningen UR, 2015).

4.6 Conclusion

The findings of this chapter have been gathered to answer the question what the food system of brewing looks like. Through the diagrams and the historic approach to the food system an outline of this study object could be made, a representation of this outline can be seen in figure 4.8. The conclusions and recommendations from this chapter have been subdivided and numbered below. The numbers will be used later on in the design phase of this research to structure and compare the recommendations from the different chapters. For the recommendations from this chapter are targeted towards the Ringpark context and the design phase of this project, these recommendations are visualised in small diagrams, to already start to bridge the gap between these phases. The iconic oval shape of the food systems diagram in figure 4.8; often lovingly referred to as the *"race track model"*; is used as a jumping off point for all the consecutive diagrams. In each chapter it will be explained how the shape morphs and is adapted to the relative recommendation.

C1.1 Urbanisation and professionalisation contributed to brewing as an urban practice

The food system of brewing beer has developed from a non-professional domestic practice, mainly carried out in rural areas. Under the influence of urbanisation and professionalization, the processing sector moved to the city and as a result the sectors of distribution, marketing and retailing developed as part of the urban system.

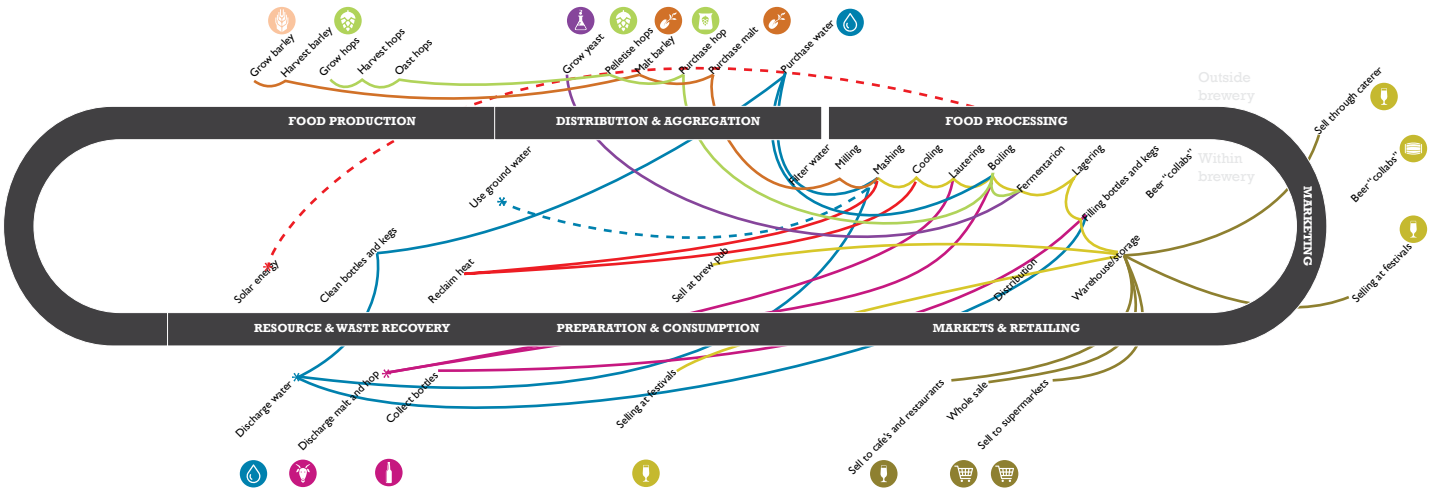
C1.2 Industrialisation and scientific advancement led to the further separation of food system sectors, through space and scale.

Through scientific advancement of the brewing practice and industrialisation the sectors of the food system became more strictly defined and separated through space and scales.

C1.3 There are nuances between industrial brewing and craft brewing

As a countermovement to the eventual highly industrialised and globalised food system of brewing beer, the craft beer movement re-focussed on local brewing practices and ingredients. The resulting variation of different types of breweries, recipes, flavours and focusses has crowded

Figure 4.8 Diagram of the complete food system, incorporation the findings from figure 4.6 and 4.7



the Dutch beer landscape, specifically the market for locally produced beer. Therefore the next step might be to find new ways to cope with competition for resources and different brewing demands.

C1.4 The food system is biased towards production and processing, other sectors deserve equal attention

Nowadays there is a focus on the production and processing sectors in the food system and the sectors of marketing, consumption and resource and waste recovery are less exposed, both in literature as well as reference projects.

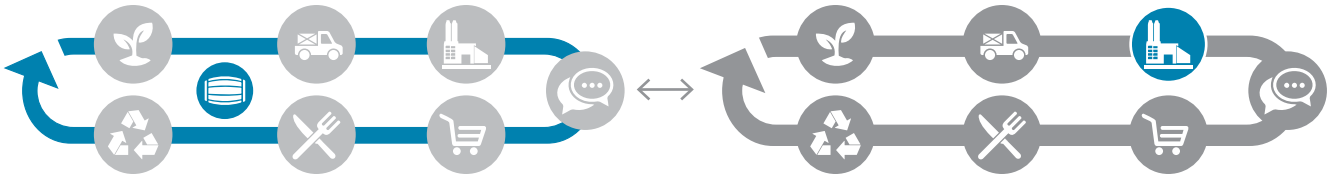
This research builds upon the idea that the food system of brewing beer could be localised for the specific context of the Utrecht region and the Ringparken concept. In order to do this, all food system sectors ought to be considered in further research and eventually represented in the design considerations for the region.

With regards to the findings of this research, some recommendations are formulated that will aid the following analysis steps, and specifically the design phase.

R1.1 Explore the shifting realm of the brewery from a historical perspective

The historic perspective on the food system of beer provided us with insight mainly related to the "realm of the brewery" within the food system. For example, in the first paragraph about the early beginnings of brewing it was described that the domestic rural brewery was an important part of the household and overall food system of the farm. Furthermore, the influence of climate on beer stability and the dependence on ingredients that were foraged instead of farmed, positions the brewery as part of an active exchange between people and the landscape. In other words, this early conception of a food system puts the brewery in the centre of a

Figure 4.9 Diagram of the shifting realm of the brewery within the food system. The blue color of the oval depicts where the realm of the brewer is or was in the historic iterations of the food system (top) and the current iteration of the food system (bottom)



system that we would nowadays classify as circular and local.

How this realm of the brewery has shifted from a holistic agricultural system to an isolated specialised space provides inspiration for the design phase. Design exploration can take leads from both the historical precedents from this chapter, as well as the underlying principles that have a new application in a modern food system.

R1.2 Identify opportunities based on the analysis

Besides the conclusions regarding the underexposed food system sectors, some additional information was found on food system opportunities during the literature review. These were not incorporated in the diagram, as they are considered too uncommon for a generalised outline or too specific to a case or location. This is a result of the interviews and incorporating sources into the literature study that include case studies or reference projects. Examples include production of local ingredients and especially hop, the potential for small scale malting or embracing alternative fermentation styles and recipes.

Through studying the reference projects, some of the thresholds and barriers for these initiatives have been identified that currently limit the scale, adoption or success of the initiatives. These findings could serve as inspiration for the design phase of the research, under the condition that they are explored into more detail in the following chapters. Design can then aid the adaptation of these innovative projects to the context of Utrecht, and can help to develop unique concepts that contribute to the attraction of the Ringparken.

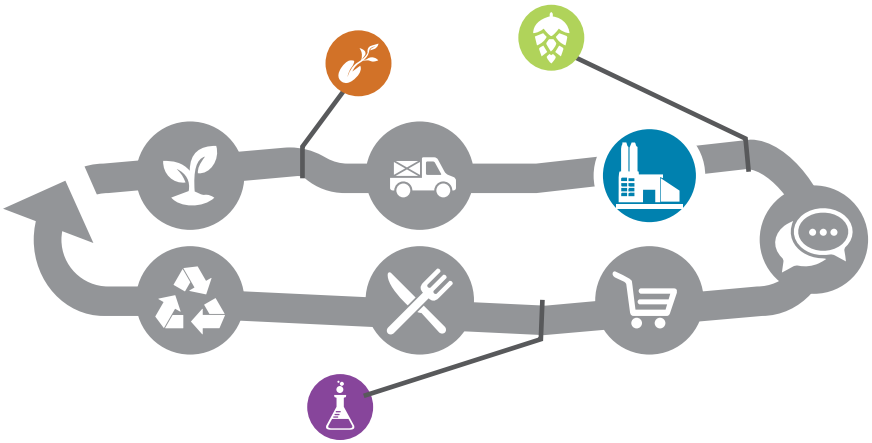


Figure 4.10 Diagram of identifying upportunities based on the food system assessment. The icons that "tow" on the food system diagram represent the possibilities that there might be to broaden both the realm of the brewers, as well as the definition of what a food system could be

5 Food narrative analysis

Figure 5.0 A marker for a hop route through the city of Poperinge. Photo by author

The following chapter will explore food narratives and trace them throughout the food system to answer the second research question "What are the narratives of brewing beer?". The location of narratives within the food system as it was described in the previous chapter is considered, including to whom the narrative is directed. The chapter is structured by food system sectors, focussing on the sectors recommended in the previous chapter.

5.1 Food production and aggregation

With regards to the food system sector of production, we can roughly distinguish two types of narratives. The first narrative is a narrative of production that concerns the sequence of actions that shape the ingredients of beer. The second narrative concerns narratives of origin, concerning the characteristics of the specific environment that the product came from.

Narratives of production

The production of the ingredients of beer create local narratives, explicitly bound to the landscapes that they grow in. The narratives are therefore related to amongst other factors the passing of the seasons, growth, weather conditions and the activities of the farmer. Given that the sequence of growing hop or barley will usually repeat itself every year, this is a continuous process-oriented landscape narrative that can be experienced by the farmer and others in the regions where those crops are currently grown. Figure 5.1 gives an overview of the sequence of actions related to hop and barley.

Hop

The presence of those particular narratives in the landscape opens up the possibility for narrative experiences where the product can be encountered up close (Potteiger and Purinton, 1998). The most prominent examples of such narrative experiences can be found around hop, in regions where the growing of hop is a long-lasting or historic practice. During an excursion in the spring of 2018 to the town of Poperinge, located in one of the remaining hop-producing areas in Belgium, these narratives are

Figure 5.1 Harvest calendar of hop and barley (summer and winter), including images of the different harvest activities. Diagram made by author.
Image sources (top left to bottom right): https://www.detafelvantine.be/hopscheuten; http://onthebaymagazine.com/hop/; https://www.alamy.com/stock-photo-young-hop-plants-growing-in-field-12892718.html; https://www.pinterest.com/pin/456482112208488379/; https://www.youtube.com/watch?v=0JCGHegE7Ck; https://www.youtube.com/watch?v=2lvGkT7g10I; http://www.kleintiengemeten.nl/gerst-zaaien/; https://www.akkerwijzer.nl/artikel/110093-nederlandse-brouwgerst-voor-schotse-whisky/; http://www.trekkertrekker.nl/gerst-dorsen-met-loonbedrijf-voshart/; http://farmerjakef.blogspot.com/2010/11/ploughing-for-spring-barley.html

prominently represented in the city and surrounding landscapes. An example of this is shown on the cover page of this chapter. These narratives are not only bound to the hop cones, but also to the hop shoots, which are considered a local delicacy available in early spring (see figure 5.1, top left image).

The narrative experiences are especially represented with regards to the harvest of hop. Before the mechanisation of the hop harvest, picking the hop cones from the bines was a time-consuming task that had to be done by hand shortly after harvest. Historic hop regions such as Kent and Poperinge used to attract seasonal workers to aid the harvest from urban areas nearby. When the time of the harvest came around, a workforce of thousands would make camp for three weeks at the different farmsteads (Lawrence, 1990). After the harvest a feast would be organised, a tradition that continues to this day in Poperinge (Toerisme Poperinge, Poperinge Stad and Hopmuseum Poperinge, 2018).

Even though the narrative experience of the Hoppefeesten in Poperinge is historic and cultural in nature, the narrative keeps its appeal for new generations of growers. The rekindled popularity of hop production has also caused new iterations of

the hop harvest festival to come in to being. Examples include the hop harvest festival organised by Gulpener at their own hop field in Reijmerstok, and the hop harvest at Brewery Hommeles in Odijk (Local2Local, no date; Wilschut and Koedoot, 2014). Here, patrons and friends of the breweries are invited to participate in (part of) the harvest. For a small hop grower who does not have the means to buy harvesting equipment this is a feasible way to get the hop harvested.

Malt

Even though growing barley appears to be a more widely spread and less specialised practice, the product does not entice consumers in quite the similar way as hop does. The exact reason for this was not found, but it is suspected by the author that the role of barley as a taken for granted bulk ingredient in beer and the scale of production itself plays a part in this. Instead, the production narrative of barley seems to gravitate towards the malt house.

Although barley is collected and stored by their origin (Prins, 1986), narratives of origin and traceability that might be linked to the product get lost. The large scale industrial processing in the conventional malt house does not allow for such a continuous narrative as different batches with similar properties end up mixed in the final product. The processing of the cereal that happens in the malt house to a large extend determines the eventual impact of the malt on the taste and image of the beer. Therefore the narratives reproduced by brewers to consumers linked to malt do more often concern the malter's craft: reliability, constant quality and technological innovation.

Narratives of origin

As mentioned before, narratives of production especially have an impact in the region where they are produced. In such regions the link between producer and consumer is often short or even direct, which for example means that a representation of the production narrative of hop on a beer label would make sense to a consumer of that beer (see figure 5.6). When a consumer is not familiar with that particular landscape, he might not understand it.

While researching the sector of production a second type of narrative emerged that slightly overlaps the narrative of production, but with a different audience: narratives of origin. A narrative of origin explores the particular factors that made a certain ingredient as it is and unlike any other product. The narrative of terroir that is often applied to wine, cheese and other natural products is an example of this. The French

Figure 5.2 Hop harvest at Gulpeners hop field in Reijmerstok Source: Wilschut and Koedoot, 2014

Figure 5.3 Hop harvest at Brouwerij Hommeles in Odijk Source: (Local2Local, no date)

Figure 5.4 Excerpt from the hopgids (hop guide) of ingredient and brewing supply sellers Brewfirm and Brouwland. Source: Brewferm and Brouwland, no date

Figure 5.5 Facebook item of Vloermouterij Masterveld, announcing a finished batch of local barley malter for a local distillery. Source: Vloermouterij Masterveld, 2019a

term terroir is used to represent all the (micro)environmental factors in a certain place that contribute to the specific qualities of a product (Eriksen, 2013). These factors include the soil and climate, but also the production practices that contribute to the product (Feagan, 2007, p. 26).

Terroir

Hop, and to a lesser extent cereals, are crops that are believed to have terroir (Van Holle et al., 2017). In the case of beer their terroir seems to be conveyed in a mostly technical way, tailored to the vocabulary and interest of brewers. An example of this can be seen in image 5.4, which shows the chemical properties of a hop variety in an excerpt out of a brewing supplies catalogue. Another option for encapsulating terroir for consumers with marketing and promotional purposes, is to represent the terroir into a label of origin that guarantees the buyer of its provenance (Feagan, 2007, p. 26). An example of this specifically for the context of Belgium can be found on the beer label of Brouwerij de Plukker in figure 5.6 on the next page.

In 2018 a small scale artisanal malt house was opened in Winterswijk, that focusses on processing small batches of cereals from the region (Vloermouterij Masterveld, 2019b). Such initiatives for artisanal malt houses have the potential to support continuous narratives of production with local crops and therefore build an understanding of terroir specifically for the Achterhoek region. Close cooperation between the producer of the cereal, and the processer of the malt (a brewery or distillery) which is suggested in the image in figure 5.5, allows the terroir to reflect upon the whole production chain.

Another example comes from Vitens, a drink water supplier that is also active in the region of Utrecht. This company designed a campaign explaining the quality and different sources of their water and promoting the use of tap water. In a pop-up store visitors could taste, compare and buy tap water from different sources in the region (Vitens, 2018).

Figure 5.6 Beer label of Brouwerij de Plukker
This label is an example of close proximity between brewer and ingredients from a Belgian hop farmer that brews his own beer: Brouwerij de Plukker. A look at the label for their "All Inclusive" beer of 2018 gives us an insight in the workings of the hop farm. The label is an interpretation of the landscape that the beer comes from, as the images on the bottle label reference the practices that contribute to all aspects of the hop. The brewer apparently is able to do this convincingly as this landscape is a lived experience for him. The premise of the beer is the inclusion of all hop types grown in that year on the farm in the final brew (Brouwerij de Plukker, 2018). The label then lists eight hop varieties. The label features a sincere image of the brewer/farmer who keeps a watchful eye over his crop, drawings of hop bines with leaves and hop cones and a pattern in the background that could depict a wire lattice field, commonly used in the region of Poperinge. The text on the bottle mentions where exactly the beer was made and bottled, and the occasion (the hop harvest) the beer was made for. These images and text all reference different practices of the hop farm. The bottle label includes several logo's, representing the ecological farming practice and the origin of the hop.

The latter label was introduced in 2011 to promote the use of Belgian hops to both brewers as well as beer enthusiasts (Hop Overkoepelende Producentenvereniging vzw, 2018).

OPROER
BROUWERIJ

Figure 5.7 Logo of Oproer Brouwerij
Oproer Brouwerij was founded in 2015, part of the second wave of craft breweries in the Netherlands. Oproer translates to uproar, symbolised by the clenched fist in the logo. The brewery focusses on flavourful beers, experimentation, a brewpub and organic, plant based restaurant. The narrative of alternatives and resistance to convention (Mulville, 2019) is carried through to the beer labels as well, which depict pirate ships, Molotov cocktail throwing dolls and a phoenixes (Oproer Brouwerij, no date).

Figure 5.8 Logo of The Sisters Brewery
The Sisters brewery from Breukelen was founded by two sisters together with their father (The Sisters Brewery, 2018). The bee head depicted in the logo refers to the surname of the sisters, and therefore the whole brand of the brewery can be related back to the brewers as the heroes of the brand (Hede and Watne, 2013, p. 213).

Figure 5.9 Logo of Brouwerij 't Mirakel
This brewer takes a local history from Amersfoort as the inspiration for both their brand and their beer. The brewery name refers to a local miracle of a statue of the Virgin Mary that was retrieved from a moat that performed miracles in the Middle Ages (Brouwerij 't Mirakel, 2017a). The reference to a stained glass window pays homage to this legend and pilgrimages to Amersfoort. It also references the moat the statue was thrown into.

5.2 Food processing

Throughout the long history of brewing beer, multiple different narratives have become attached to the brewing practice itself, the brewery and the brewer himself. Some of these narratives have been adopted and expressed in or outside the brewery, other remain to be explored.

Seasonal narratives

As brewing historically depended on the availability of ingredients and certain brewing conditions, seasonality is one of the oldest narratives in brewing that emerges. For example, the brewing of certain beer types was limited by temperature and climate (Kistemaker, Van Vlisteren and Hendrikman, 1994). Occasion brews, such as green hopped beer (beer made with fresh hops) or pumpkin beer, convey the seasonal narrative as they celebrate the availability of certain special ingredients (Volkers, personal communication, May 19th 2018). Cases of engineered seasonality also exist, for example the introduction of a dark and sweet ale called bokbier to promote drinking beer in the winter season (Nicolas, 1966).

In the development of the beer sector till the end of the twentieth century, a lot of those seasonal narratives that brought about diversity and local specialties were eliminated in the upscaling of the brewing process. It is therefore not surprising that when the craft brewery movement gained foothold in the beer sector, new brewers introduced narratives that embraced diversity and formed a stark contrast with the industrial brewers that had created a "pilsner desert" (Schnell and Reese, 2003; van Dijk, Kroezen and Slob, 2018, p. 259).

Sense of place

As a narrative has the potential to engage customers and form the base for interaction between customers and your brand (Hede and Watne, 2013), new brewers were probably very aware of what narratives they presented to their consumers. This statement still seems to be applicable today, for example when looking at the names of craft beers an breweries. A proven strategy to engage consumers with a brand are humanisation and a sense of place. Hede and Watne describe how craft breweries have adopted narratives of folklore, myth, legend and local heroes as a way of humanising the brand of the brewery (Hede and Watne, 2013). Some examples of brewery names specific from the region of Utrecht can be found in figures 5.7 to 5.9.

The revival of brew pubs and tap rooms that is associated with the craft brewery movement (van Dijk, Kroezen and Slob, 2018), has given brewers the opportunity to build narrative experiences around the practice of brewing and the brewery itself. The location of the brewery and/or the brew pub is another factor that contributes to the narrative of brewing. Brewers have a preference for historic locations or buildings that express a certain aesthetic or atmosphere that is relatable to their audience (Horijon, 2015, p. 54). You could go as far as to call such pubs new storytelling landscapes (Potteiger and Purinton, 1998, p. 11) in which the brewer controls many aspects of the experience of consumers. A similar statement can be made about the numerous craft beer or local food festivals that are nowadays organised. Such festivals are regarded by brewers as effective opportunities and places where they can present themselves, their brand and their stories to their audience (Horijon, 2015, p. 51).

5.3 Marketing, retailing and branding

A small survey by Stephan Dahl of TV advertisements in the UK, Germany and the Netherlands indicated that dominant themes in Dutch beer commercials are friendship and affiliation, sports, and relaxation (Dahl, 2000). With the craft beer movement growing exponentially since this survey was taken, it is suspected that this range might already have expanded. Examples of this include the interest of industrial brewers in the appeal of craft brewers, including acquisitions of small independent brands such as Brouwerij de Molen which was bought by Swinkels Family Brewers (Bavaria) in March 2019 (Pijpker and Tuenter, 2019).

In the article by Pijpker and Tuenter in Dutch newspaper NRC, Michel Ordeman as chair of the association of Dutch craft brewers argues that industrial brewers ("big beer") are actively acquiring a diverse portfolio of beer brands, to be able to present a wide range of products to their (potential) consumers (Pijpker and Tuenter, 2019, p. 12). In that sense industrial brewers seem to have adopted part of the narratives that initially sparked the rise of the craft breweries: alternativeness and diversity. Such takeovers and the development of new beer styles, most recently low- or non-alcoholic beers that are sometimes mixed with lemonades (De Jongh and Tramper, 2018), are ways industrial brewers can stay connected to the developing tastes of their customers.

Spatial branding

As this mechanism of developing diversity in beer is more or less inherent to the practice of craft brewing, craft brewers turn to other narratives in marketing and branding. The sense of place related narratives in brewing that were mentioned before in this chapter are an example of this. However, Gatrell, Reid and Steiger (2018) argue that a successful brand strategy goes beyond the adoption of a local name for a beer or the brewery. They suggest that an understanding of place and region in combination with sustainability (both environmental and social) is the basis for a strategy they call spatial branding and in the end a viable business.

Spatial branding includes that the socially constructed authenticity that such a locally inspired brand name has, has to be recognisable for consumers and represented in the structure of an organisation (Gatrell, Reid and Steiger, 2018, p. 362). Other aspects of this strategy are the use of local recipes that can be related to the brand, sourcing of locally produced ingredients and

Figure 5.10 A brew for the "Pannenbier" celebration at Tivoli Vredenburg in 2011, made by Brouwerij de Leckere. Source: Van der Vliet, 2011; *Delirious NL*, 2011

materials, involvement in community projects and contributions to local employment opportunities. As such, breweries have the potential to contribute to revitalisation of neighbourhoods, which the American cases described by Gatrell, Reid and Steiger have done (Gatrell, Reid and Steiger, 2018).

This social consciousness of the activities that a brewery undertakes broadens the understanding of what the contribution of beer to a community and place could be. Eric van der Marel of Brewery De Leckere gave an example of this for his brewery, explaining an occasion where they brewed a batch of beer to celebrate the construction of new music hall Tivoli in Utrecht reaching its highest point (see figure 5.10, Van der Marel, personal communication, May 15th 2018). Another example in Utrecht could be the brewpub of Brewery Maximus, located in the urban expansion of Leidsche Rijn. Maximus employs and trains people (re)starting on the job market and they pay homage to local initiatives (including their own pupils and volunteers) in the names of their beers (Brouwerij Maximus, no date).

5.4 Resource and waste recovery

The food system sector of resource and waste recovery seems to be the most elusive and underexposed sectors of the food system. Some of the waste flows have little to no application outside the brewery and are disposed of as soon as reusable components of the substance, such as heat and water, have been recovered (Huige, 2006). The related narratives as a result in general do not translate to audiences outside the brewery. A supporting argument for this statement is that sustainability as such is generally not used in marketing, as local and craft appear to be the more appealing narratives for consumers (van Dijk, Kroezen and Slob, 2018). An exception to this might be the organically produced beers, which cater to a niche market.

The abundant spent grain has a common use as cattle feed and some less explored uses such as bread additives (Lynch, Steffen and Arendt, 2016) or a substrate for fungi (Mediamatic, 2016; Le Champignon de Bruxelles, 2017). A continuous narrative for the use of spent grain depends on a quick distribution to the next user or sterilisation of the grain. It can quickly become infected with bacteria and start to brood which makes the spent grain unsuitable for further use (Plant Chicago, 2017).

The intangible waste flows of a brewery are generally part of a technocratic sustainability narrative, which is a narrative that for most brewers stays within the brewery. The efficiency of the brewing equipment and use of renewable energy sources have an important impact on the energy efficiency and greenhouse gas emissions of a brewery. Surveys among American breweries show that these kind of sustainability measures resonate with brewers as solutions that will also lead to economic benefits for the brewery (Hoalst-Pullen et al., 2014).

New conceptualisations of especially emissions can be the source of less technocratic narratives and eventually sustainability interventions. This resonates with the spatial branding strategy explained above. Concepts such as the carbon footprint or landscape services (Opdam and Steingröver, 2018) spatialise the impact of CO2 and have the potential to inspire new landscape narratives. An example of such an interpretative landscape (Potteiger and Purinton, 1998, p. 11) is the compensation of emissions by planting trees by Gulpener in collaboration with nature conservation and forest service Staatsbosbeheer (Wilschut and Koedoot, 2014).

5.5 Conclusion

The food narratives within the food system of brewing beer cover a wide range of topics. In the following few paragraphs the collected narratives from the analysis will be discussed, including how those narratives might affect or be incorporated in the rest of this research. The impact of the found narratives on the food system of brewing is gain summarised in diagrams, and the conclusions and recommendations are numbered to allow for comparison in later chapters. The coloured blocks in the diagrams indicated the realm of the discussed narrative within a particular sector, and in or outside the realm of the brewery.

C2.1 Narratives of origin and production are associated with beer ingredients

The first two narratives that have been identified are the narratives of production and origin. Although these two narratives slightly overlap, they can be distinguished by their time line. The narratives of production are associated with the practice of growing the ingredients, which emphasises the yearly sequence of events in the growing season. The narratives of origin explain the qualities of a particular product and as a result the long term or even historic practices that are associated with it. Both narratives have a strong connection to the actual places where the ingredients are grown, and therefore where mostly observed in places, breweries and beers where a hop culture exists.

R2.1 Extend narratives of production and origin

The narratives of production and origin have a limited representation within the realm of the brewery in the region of Utrecht. Localising the production of beer ingredients however gives the opportunity to explore the terroir of the landscapes of Utrecht. Next to that, presenting ingredients with a notion of terroir involves customers with both the product and the place, which can lead to a sense of care for the heritage and the rural landscape the product was produced in (Feagan, 2007). The potential for narrative experiences around seasonality, crop growth, harvest and food culture applies to the objective of this research specifically, as the references used in the research show the potential of those experiences for the benefit of brewers in a Ringpark setting. This effect is visualised in figure 5.11 by the vertically stacked representations of the production narratives "pushing down" on the food system, but not directly penetrating the realm of the brewer.

The small exploratory survey among brewers conducted by the au-

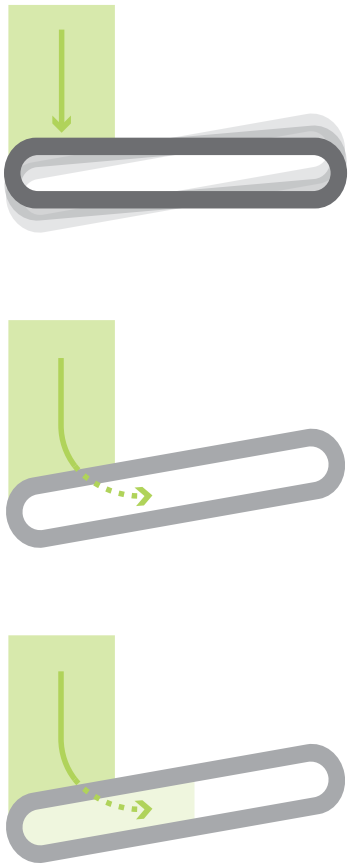


Figure 5.11 Diagram for C2.1 and R2.1: extending narratives of production and origin beyond the sector of food production

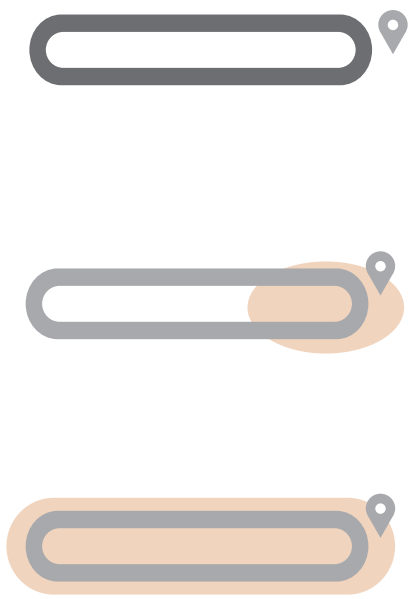


Figure 5.12 Diagram of C2.2 and R2.2: Exploring "local" beyond marketing

thor indicated that one of the reasons for brewers to be interested in local ingredients was "the story" of locally produced ingredients that contributes to their brand experience (see Appendix 1). Working towards the design phase of this research project, it is therefore promising to further explore the potential of local production of ingredients from the perspective of the brewer and the consumer. In other words, how could the narratives of production and origin be extended further into the food system towards both brewer and consumer? And how could that reflect in the spatial brand of breweries in Utrecht.

C2.2 Narratives of craft are associated with the brewing and with the brewer himself

As a result of the craft brewery movement narratives of resistance, authenticity and especially craft began to associate with the practice of brewing and with the brewer himself. These narratives can be considered a counter-reaction to the large scale industrial production of big beer brands in the 1980's. The narratives of craft therefore associate with local heroes, folklore, historic locations, diversity in flavours and ingredients and an all-over sense of being different and unique. Craft breweries capitalise on their sense of place mostly in branding, or example in beer names.

R2.2 Explore "local" beyond marketing

The sense of place that is commonly adopted by craft brewers has provided us a wide range of place-related products, mostly consisting of beers baring historic names or geographical references. This practice of naming for marketing purposes stays on the surface, whereas the location of breweries is a landscape narrative that can still be explored. For example, in the previous chapter it was established that throughout history water has been an important location factor for breweries, which could be a factor that is included in a contemporary process narrative of producing beer. Another example concerns the rural brewery as a narrative setting or even topos (Potteiger and Purinton, 1998, p. 11) for artisanal brewing practices that include historic recipes and local ingredients.

Expanding the understanding of local in the context of brewing should open up possibilities for design interventions rooted in the landscape of the Utrecht region. This is especially relevant for the Ringpark context, as it is stressed in the Ringpark advice that new interventions have to be integrated in the natural landscape system (Roncken, 2018). Next to that, the implicit narrative of local patronage that is part of spatial branding seems to be motivated by locations in

the craft beer sector. In the following analysis chapter and the subsequent design phase, locations that have an inspiring narrative for brewers ought to be an important factor to consider.

C2.3 Narratives of sustainability are mostly contained to the realm of the brewer

It can be concluded that narratives around waste recovery and sustainability have little attraction for consumers on their own. The analysis showed that there are only few precedents where sustainability is a integrated part of the brewer's narrative outside the brewery itself. The main Dutch precedents that were explored are Gulpener and Heineken. Sustainability however seems to be mostly understood as a technocratic narrative. Spatial branding as a concept was explored as a new way for brewers to adopt sustainability in their brand.

R2.3 Incorporate sustainability narratives as part of spatial branding

Sustainability narratives have potential to be incorporated in a brewer's spatial brand. Small separate initiatives can be made part of a larger, encompassing sustainability narrative that is reflected throughout the food system. In this way, sustainability efforts move from the realm of technocratic solutions towards a more integrated definition of sustainable within the food system.

Future integrated sustainability narratives for brewers are expected to have a direct impact on the landscape of Utrecht, and will therefore require design. The spatial branding strategy positions the brewer as an proactive actor in the entire food system, and towards the landscape. Landscape design can furthermore help to explore what narratives that fit the sustainability demands of brewers resonate in the Utrecht region, for example decreasing CO2 emissions from transport, using sustainable resources from the region and building a sustainable community around the brewery's brand.

R2.4 Be aware of merging realms of consumption, retailing and marketing

Brewers in both the craft and industrial brewing sectors have explored ways to stay connected to their drinking audience. It has resulted in narratives that span across sectors, especially the sectors of Preparation and Consumption, Markets and Retailing, and Marketing. The (re)introduction of the brew pub and numerous craft beer festivals embody the narrative that drinking beer has become an experience beyond the taste of the product itself. As such the

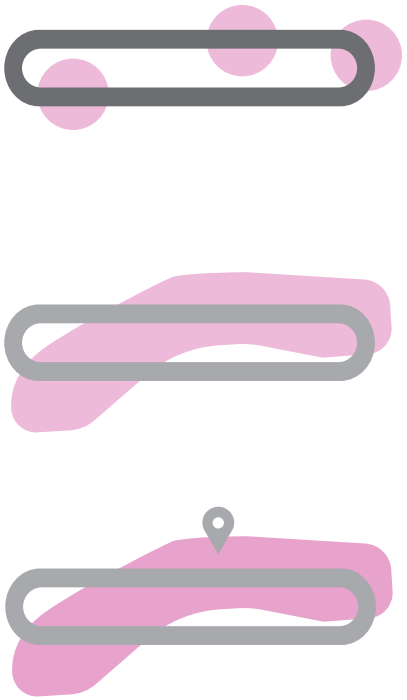


Figure 5.13 Diagram of C2.3 and R2.3. Incorporate sustainability narratives as part of spatial branding connects separate sustainability narrative into a greater more encompassing narrative

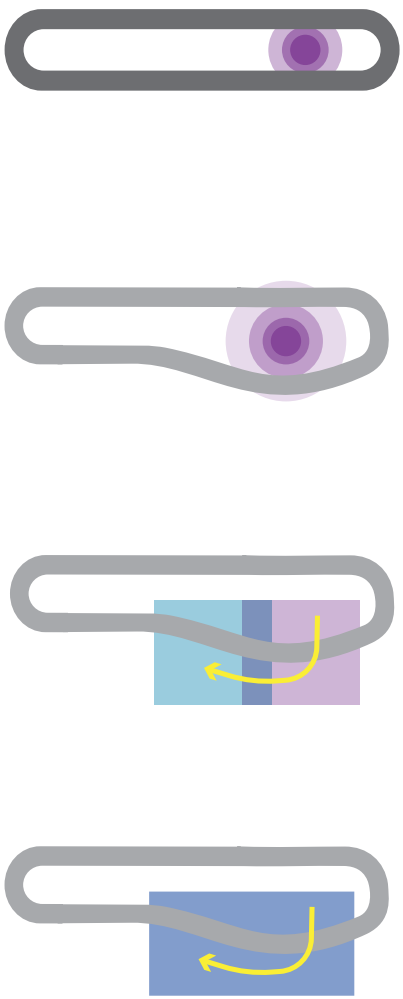


Figure 5.14 Diagram of R2.4. The growing influence of the brewer merges and expands the realms of consumption, retailing and marketing.

activities of brewers are or are becoming involved with extend beyond the practice of brewing, visualised in figure 5.14 by a widening of the diagram around the brewer on the side of those sectors.

In the design phase of this research, this conclusion has as a consequence to incorporate narratives that go beyond the traditional narrative of a brewery and to explore how narratives that originate in the aforementioned sectors of the food system align with other narratives. For example: what other activities could a brewery participate in that are in line with a narrative of authenticity? In the context of the Ringparken region this would apply to for example programming, new food initiatives or historical places that have a link to food production or consumption.

C2.4 Not all narratives are equally exposed or accessible for certain audiences

It has become clear that not all narratives are equally exposed and explored, and that the narratives appear to be tailored to a specific audience. In figure 5.15 on the next page, the narratives that have been found in the analysis have been mapped around the food system diagram. In the diagram is shows that there are several actors within the food system that function as gatekeepers for certain narratives. These gatekeepers include the cereal collector, malt house and hop dealer as gatekeepers for narratives of production that include seasonal dynamics. Breweries are gatekeepers for the narratives of origin towards consumers, and often the narratives that are associated with the brand of the brewery are substituted for the narratives associated with the ingredients. The same can be argued for narratives of sustainability that might not appeal to audiences as a brand.

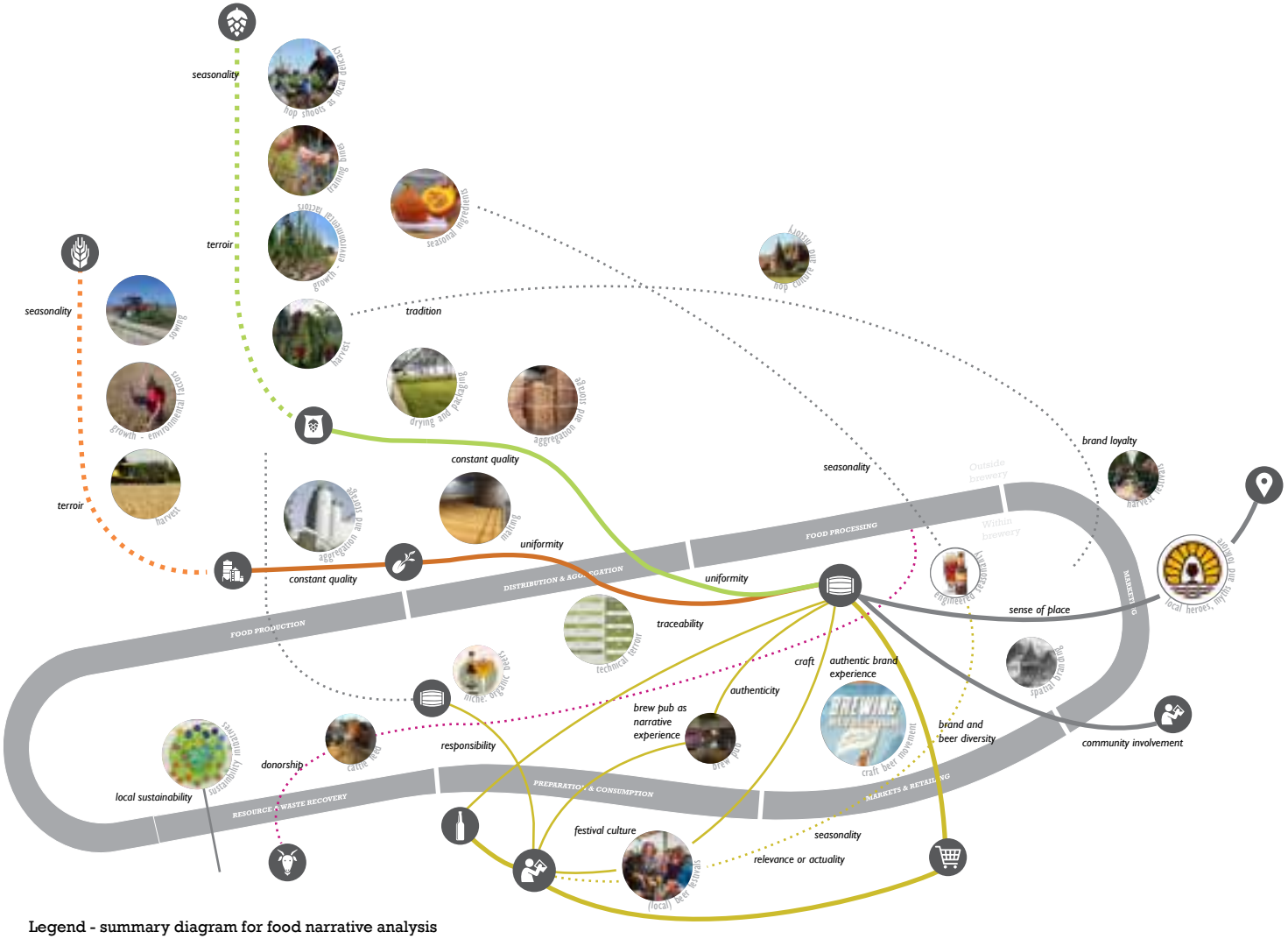


Figure 5.15 Summary of food narrative findings with legend. Findings are organised by Content, Expression and Actor/audience. Actors where the appearance of the expression changes are considered "gatekeepers" for certain narratives

6 Food Network Analysis

Figure 6.1 Hop field at Landerij Vantosse, near Oss.
Photo by author

Under the influence of the third research question "What is the network of brewing beer in the province of Utrecht?", the focus shifts from the food system in general to the specific food system of brewers in Utrecht. Applied to the analysis of the brewer's food system this means that the object of study are the locations of interactions that take place within the network of the brewer. Where exactly do these interactions take place? Where do certain resources move from sector to sector? Is this the direct doing of the brewer, or is there a middle man involved?

6.1 Food networks and landscape networks

Networks in landscape architecture are most commonly understood as a collection of interwoven spaces or elements, as a result of human efforts to connect or separate the landscape. Examples include urban networks of parks, or the national ecological network of the Netherlands (EHS) (Vroom, 2005, p. 250).

In the context of food systems the understanding of networks is associated more with the (intangible) flows of i.e. goods, labour and value across the planet that are a part of our modern global food system. The flows of resources materialise in "hubs", where an exchange can take place between the real world and the "space of flows" (Castells, 2000).

6.2 Food production and aggregation

Hop

Hop requires deep, well drained and fertile soils (for example loam, light or sabulous clay), an adequate supply of water, good ventilation, and a climate with warm summers and cold winters to grow. It is an labour intensive crop, that requires constant care of the grower. Due to the fragility of the hop cones during the growing season and the harvest, an absence of pests and diseases and an abundance of cheap labour or well developed technology is required (Priest and Stewart, 2006). Growing hop thus requires an intensive network of labour, knowledge and materials, located close to the hop field itself.

Most of the hop that is used by Dutch brewers is imported from abroad, mainly from Germany, Belgium/Luxembourg and the USA

Image 6.2 Global sum of hop production per country in 2017. Ethiopia is an anomaly in these data, as other crops than hop (Humulus lupulus) are registered as hop. Source: Food and Agriculture Organisation of the United Nations, 2018

(OEC, 2017). Figure 6.2 shows a map with hop-producing countries and an indication of how much hop they grew in 2017. In the Netherlands however, hop fields are sparse, despite the suitable growing climate. The platform for Dutch hop growers currently lists about 20 initiatives for a hop field, most of them not exceeding the size of a few hectares (Platform Nederlandse Hoptelers, 2017, see figure 6.3 on next page). Growing on these fields is usually not an economic activity, but rather a secondary activity for craft brewers (Volkers and Kik, 2016).

The same can be observed in the region of Utrecht. The few instances where hop growing currently takes place, the hop field was initiated by a brewery. This is the case for Brouwerij Hommeles who grow their hops in Odijk, and Brouwerij Maximus, who use hops grown near the brewpub in the city of Utrecht (Regio Leidsche Rijn, 2018; Brouwerij Hommeles, 2019). The main reason these activities are small and not commercial is a lack of the infrastructure that is needed to properly process the hop cones after harvest, Kees Volkers form Brouwerij Hommeles explained. As a consequence, the hops have to remain "wet" and are used in adapted "green hop" recipes (Volkers, personal communication, May 19th 2018).

Besides the two examples from Utrecht, a survey by the author conducted amongst brewers from the

region shows that there might be potential for larger networks in Utrecht. The brewers indicated that hop is one of the products that brewers are most interested in to purchase locally (see Appendix 1). This was also indicated by Erik van der Marel from Brouwerij de Leckere, who explained that local hop is something they see as an ingredient to grow locally and interesting marketing opportunity (Van der Marel, personal communication, May 15th 2019).

Barley and malt

As seen in the food system assessment chapter, the network of malt at least consists of two important parties: the farmer and the malt house. A separate collecting company can serve as an intermediate between farmer and malt house, similarly there are resellers that can be an intermediate between the malt house and the brewer (Hobbybrouwen.nl, no date). The malt house appears to be the most important hub in this network. Even though barley is a more common crop than hop, the network of brewing barley is harder to trace than the network of hop.

In 2009, malting barley accounted for only 13% of the global barley production. The rest of the produced barley is mainly used for livestock fodder and a small percentage is reserved for human consumption (FAO, 2009, p. 8). The location and scale of malting does however give some clues of the scale on which the network for producing malt takes place. Figure 6.4 shows an overview of malt houses in Western Europe, including the malt houses within the Netherlands. Most of these malt houses are part of a larger corporations, indicating that industrial scale malting has developed into an internationally operating network. Access to a harbour or a strategic location within a barley producing region are the main aspects that motivate the location of these malt houses (Cargill, no date).

Dutch malting

There are four industrial malt houses in the Netherlands, all located outside the region of Utrecht, see figure 6.4. The plants in Eemshaven (from Holland Malt BV) and Swalmen (from Cargill BV) are oriented towards the global market and various uses of malt, whereas the plants in Kloosterzande (from The Swaen) and Lieshout (from Holland Malt BV) focus on craft and specialty malting for the small to mid-size brewing and distilling industry (Cargill, no date; Holland Malt, no date; The Swaen, no date). There furthermore are at least small scale, artisanal malt houses in the Netherlands. These malt houses in Winterswijk, Bad-Nieuweschans and Bolsward operate in a local or regional network,

Image 6.3 Current hop fields in the Netherlands. Source: Geodienst Rijksuniversiteit Groningen, 2018, HopNederland, 2018, Platform Nederlandse Hoptelers, 2018, Volkers & Kik, 2016

Image 6.4 Malt houses in th Netherlands and abroad. Pink asterisks and dotted lines represent international matl houses in their corporations. Filled blue asterisks represent Dutch malt houses, unfilled blue asterisks are artisanal malt houses. Image based on brouw-bier.nl (no date)

acquiring local cereals and profiling themselves as focussing on craft, small batches and individual wishes of the client (Graanrepubliek, 2019; Moutery Noard-West Fryslân, 2019; Vloermouterij Masterveld, 2019).

The institute of Dutch brewing barley (NIBEM) has been promoting growing high quality brewing barley among Dutch farmers, framing it as an competitive crop to wheat. This campaign includes a "brewing premium" for farmers when their harvest is up to the standards of the malt house (NIBEM, 2019). Barley, however, has remained a relatively uncommon crop in the study region. In the Province of Utrecht 111 hectares of barley (summer and winter varieties combined) were grown in 2017 (CBS, 2017). Taking into account livestock farming as the most common type of agricultural business in the region of Utrecht (CBS, 2018), it is suspected that most of that harvest was used for feeding livestock.

The only clue for a local network for malt found in the Utrecht region is the example of Brouwerij Heuvel. This brewery from Langbroek cooperates with a local farmer from Elst that is the only producer of malting barley in the region (Van Merkenstein, 2017). After malting, the beer is brewed nearby at contract brewer De Loonbrouwerij in Cothen (Brouwerij Heuvel, 2019). In an interview, Erik van Marel from Brouwerij de Leckere points out that there is no possibility for malting the cereal locally within the region, therefore the local barley is send to malter The Swaen. He then doubts whether it is actually the same barley De Heuvel gets back from the malt house (Van der Marel, personal communication, May 15th 2019).

6.3 Food processing

The increase of breweries since the 1980's as part of the craft brewery movement has also affected the sector of brewing in Utrecht. The number of breweries since has rose from 3 in 1990 to 58 in 2019 (Stichting Erfgoed Nederlandse Biercultuur, 2019). Figure 6.6 shows the breweries on a map of the region.

Brewing capacity

The breweries on the map are categorised by their brewing capacity, based on the well-defined American understanding of the microbrewery. The microbrewery category has been split up into pico-, nano- and microbreweries based on the found brewing capacities, to provide further insight into the scale of brewing in Utrecht. A survey of the websites of the breweries showed that all of these breweries, including the one brewery that falls outside the microbrewery category, focus on brewing craft or specialty beers. Figure 6.5 shows an estimation of the amount of beer that is brewed each year within the region, based on the categories.

Contract brewing

The location of the breweries in the region does have significance in the context of this research for multiple reasons. The first reason is the distinction of independent brewers and contract brewing. This latter concept is one of the main reason brewery numbers were able to grow at such a fast rate the last few decades. Contract brewers do not own their own brewing equipment and rely on the brewing capacity and skills of other breweries to make a beer. These sort of agreements where at first frowned upon in the craft beer sector, but it is believed that it has led to the advancement of the sector through allowing new brewers to overcome technological and financial constraints to start brewing (Garavaglia and Swinnen, 2018). The resulting collaborative culture amongst brewers is reflected in "beer collabs": beers that are sold as an combined effort of multiple brewers (Thorsøe, Kjeldsen and Noe, 2017).

Within the region several of these contract brewing networks exist (see figure 6.6), most notably around A Brewery in Zeist and De Loonbrouwerij in Cothen that only brew based on contracts (Stichting Erfgoed Nederlandse Biercultuur, 2016; De Loonbrouwerij, 2017). On the other side, some contract breweries have contracted brewers from outside the region. This indicates that geographic proximity between contract brewery and contractor is not always a determining factor. There are also larger independent brewers that rent out their excess capacity to contract brewers, such as De Leckere and Oproer from Utrecht (Van der Marel, personal communication, May 15th 2018). Within the network of breweries, these particular breweries that rent out their space and time at the brewery function as important hubs for knowledge, materials, acquiring ingredients and skills.

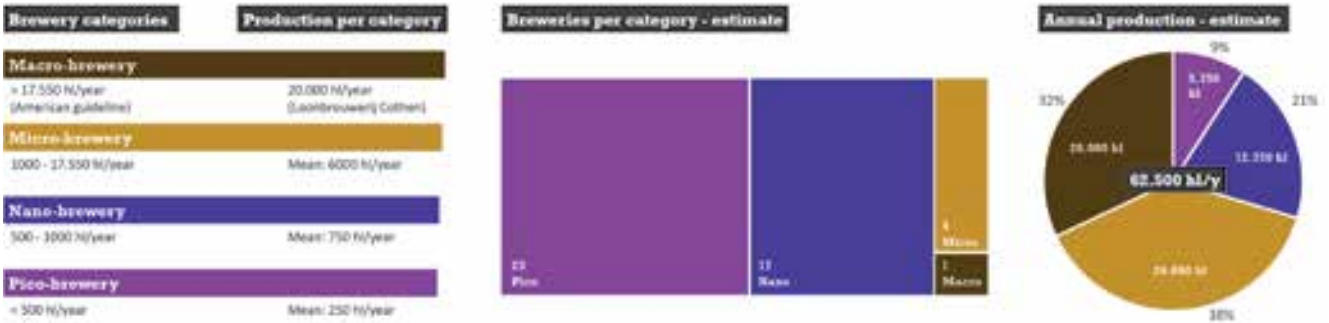


Figure 6.5 Brewery categories, numbers and estimation of annual production. Number of breweries is corrected for contract brewers that have a contractor within the region

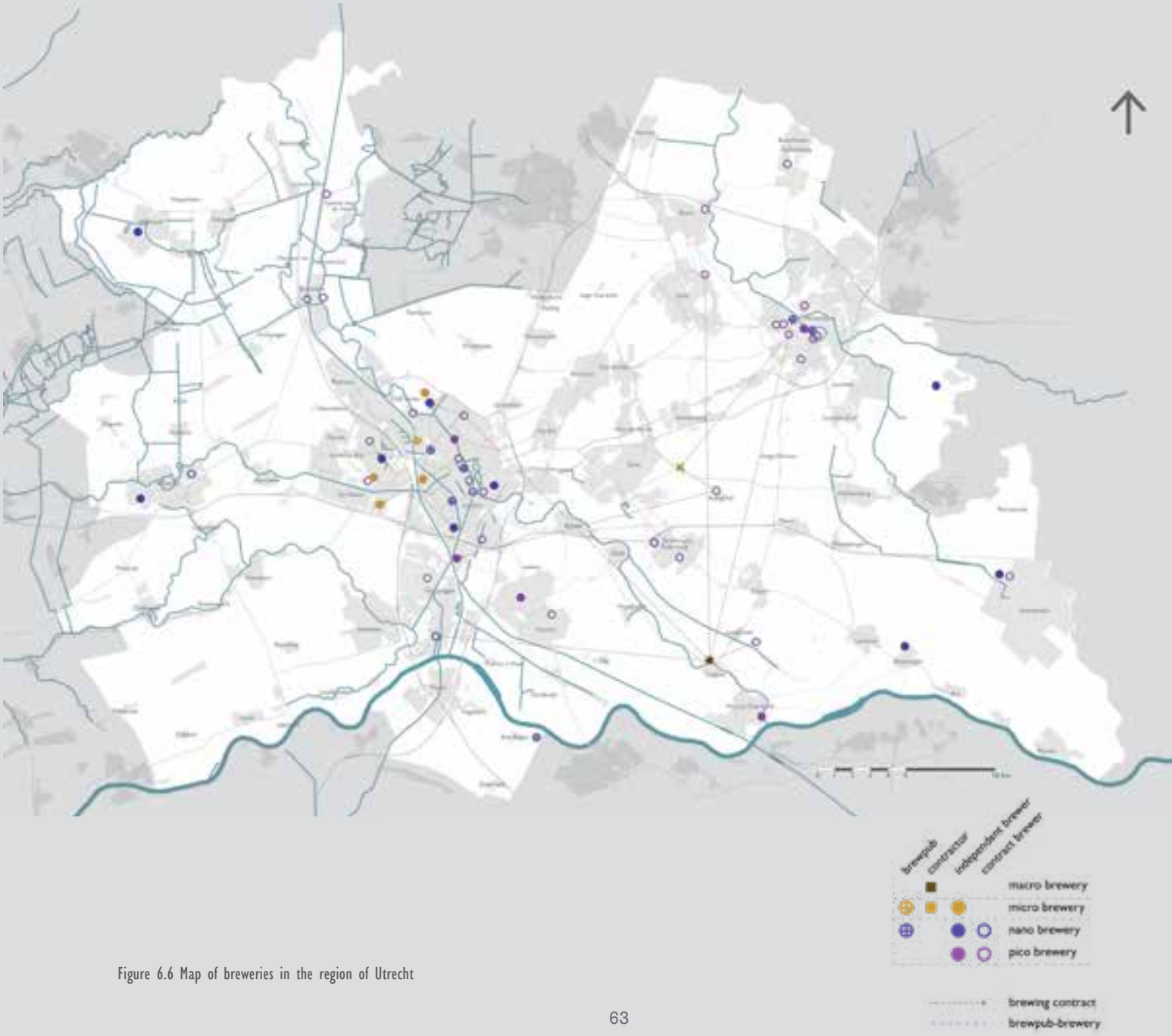


Figure 6.6 Map of breweries in the region of Utrecht

Brewery location

A second reason for the brewery location having significance in the Utrecht region is related to conclusions from the previous chapter on food narratives. It was noted there that there are multiple ways location can influence a brewery, as well as the other way round. Examples included brewery atmosphere, the use of local history or folklore and community involvement through spatial branding. When looking at the physical manifestations of those narratives in the network, several brewpubs in historic or post-industrial locations can be observed, as well as multiple breweries adopting and reviving historic recipes or using local ingredients for occasion brews, and breweries collaborating with other brewers and societal actors around certain causes. Figure 6.7 and 6.8 show some examples from the region.

Next to the breweries themselves, festivals and events are considered to be new hubs where brewers interact with each other, their consumers and the landscape. Within the region of Utrecht there are multiple beer(related) festivals and events to be found. Examples include the Streekbierfestival (regional beer festival) and Utrecht's Finest in April, beer history tours and monthly tasting events organised by beer consumer advocate PINT (Biernet, 2019; PINT, 2019). Due to the local or craft focus of breweries, festivals that celebrate local craftsmanship or food often also welcome brewers. Cook notes that beer tourism has become a reality already in America, where people plan their holidays around certain festivals or brewery locations (Cook, 2018). Whether this is already applies to the Utrecht region is unknown.

6.4 Marketing, retailing and branding

The attachment of a brewer to a certain place, community or network can be reflected in its marketing. In the middle ages brewers' guilds would sponsor stained glass windows in churches, as a sign of community involvement and surreptitious advertising (Nicolas, 1966). Another option is crowdfunding for a brewery start-up for example, which is perceived by some brewers as a firm tie to the community that sponsored them (Horijon, 2015). The hop harvest festival of brewer Gulpener is another example of marketing, this time targeted at patrons and employers of the brewery (Gulpener Bierbrouwerij, 2018). All of this can also be considered spatial branding (Gatrell, Reid and Steiger, 2018), as it was explored in the previous chapter.

Figure 6.7 Herb "scharlei" as grown by Brouwerij de Vecht for their reinterpretation of historic beer from Loenen (Brouwerij de Vecht, no date)

Figure 6.8 Local choir from Vreeswijk gets sponsored by the Kolkbier foundation that promotes local cultural and social activities from Vreeswijk (Bok, 2018)

From beer geeks to a broad audience

In the last couple of decades, beer marketing has become an international affair, mainly due to the internet. Online platforms such as Untappd allow beer enthusiasts to keep track of the beverages they tasted, share their experiences and build a guide for other drinkers what to consume in certain places. The service is also available for breweries, so they can update followers on i.e. new beer releases or an updated menu at the brew pub (Untappd, 2019). The internet has also made it easier to order beers from international breweries, or for brewers to reach out to customers abroad. An example of this is Brouwerij de Molen from Bodegraven that has targeted and found an international audience, especially for their beers with an acquired taste (Pijpker and Tuenter, 2019).

However, most craft brewers no longer focus on just a small community of "beer geeks" and have broadened their product range to accommodate more common beer types like pilsner (Thorsøe, Kjeldsen and Noe, 2017). Drinking craft beer has become more popular over the years (De Jongh and Tramper, 2018), meaning the audience and network for craft beer has become bigger and broader. This is reflected in retailing, as the number of restaurants, bars but also supermarkets that carry a varied selection of (local) craft beers has increased (RTL Nieuws, 2017; De Jongh and Tramper, 2018). On the other hand, the crowded market allows or even forces brewers to profile their brand towards a specific kind of customer, as Erik van der Marel explained in an interview (Van der Marel, personal communication, May 15th 2018).

Urban and rural networks

Besides a larger concentration of brewers in the cities, other marketing outlets such as cafés, restaurants, brew pubs, supermarkets, retailers and festivals are also mostly found within urban areas. This could mean that the audience of craft beer enthusiasts has a higher concentration in the cities. Kees Volkers from Brouwerij Hommeles experienced less enthusiasm for craft beer in their hometown of Houten, near Utrecht. He describes a certain cultural chauvinism from non-urban residents he encountered, that do not want to be associated with the perceived urban craft beer culture (Volkers, personal communication, May 18th 2018). The hubs for marketing and retailing within the region therefore seem to gravitate to the urban areas within the region of Utrecht.

However, rural networks can also be found around (mostly contract) brewers that target a local audience. Examples include Stadsbrouwerij de Dikke from Wijk bij Duurstede and Kolkbier from Vreeswijk (see figure 6.8), that market their beers and brewery to their local community through local retailers only (Stiching Kolkbier, 2018; Stadsbrouwerij de Dikke, 2019). Another example comes from Brouwerij de Vecht, that use local ingredients from historic recipes for beers that are sold in the villages and cities along river de Vecht that runs through the region , see figure 6.7 (Brouwerij de Vecht, no date).

Figure 6.9 Image of a beer schip of Heineken, carrying kegs. Source: Nicolas, 1966

6.5 Resource and waste recovery

How to deal with waste flows and resource recovery in a network is an issue that is particularly relevant for large scale industrial breweries. It can be imagined that their demands for energy, water and transport put extra pressure on multiple networks. Industrial brewer Heineken's sustainability programme *Groene Cirkels* (Green Circles) incorporates circularity in local networks to organise a positive impact on their surroundings. This includes collaboration with farmers nearby their brewing plant, contributing to biodiversity networks and generating renewable energy (Heineken Nederland, Provincie Zuid-Holland and Alterra Wageningen UR, 2015).

Regional networks

The craft-focussed brewers from the region of Utrecht tie in with regional networks of waste processing, such as the sewer system and garbage collection for the disposal of waste flow such as brewing water and brewing supplies. Glass bottles and crates with deposits are collected through supermarkets, and redistributed by bottle type back to the breweries. Brouwerij de Leckere collaborates with Jupiler on this, as they use the same slender 25 centilitre bottles as Jupiler does (Van der Marel, personal communication, May 15th 2018).

In the city centre of Utrecht a "beer boat" supplies cafés and restaurants near the city's canals with crates of beer and other beverages and collects empty crates (Gemeente Utrecht, no date). This initiative by the municipality revives a long Dutch tradition of distribution bottles, crates and kegs for beer by boat, see figure 6.9 (Nicolas, 1966). In such instances, the location of the brewery and retailer at a waterfront dictates whether a brewer can participate in a certain network.

Scale as limiting factor

Even though yeast and spent grain have applications outside the beer sector, only a few instances were found within the region where these resources where actually revalorised as a raw materials for other products. At Brouwerij de Leckere, the spent grain is occasionally donated to a local goat farm (Van der Marel, personal communication, May 15th 2018) and as using spent grain as feed is such a common practice it is suspected that other breweries in the region of Utrecht might have similar local networks. It can be reasoned though that, especially for smaller brewers that brew on an irregular basis or contract brewers, having such an agreement with a secondary user can be difficult to uphold.

6.6 Conclusion

This chapter had the objective to find out what the food network for brewing beer in the Utrecht region is. In comparison to the previous chapters, this meant that a spatial context had to be introduced, as well a sense of scale. Main reason being that not all food system sectors operate on the same scale or in the same spatial context. In figure 6.10 the process of this chapter is illustrated, and the reworking the initial food system model from the food system assessment chapter is explained. This reworking will be further referenced in the following few paragraphs where the conclusions and recommendations from this chapter are collected and numbered.

Figure 6.10 Reworking process of food system diagram explained:
1. Separation into sectors, 2. Introduce spatial context, 3. Distinguish between Ringpark context and other scale levels, 4. Align food system sectors with appropriate scale levels 5. Connect the sectors in continuous diagram that shows long connections between sectors (steep slopes) and shorter connections (lazy slopes)

C3.1 The networks for bulk ingredients of beer are optimised at a global and supra-regional scale

It has been found that especially the production of hop and malt is firmly grounded in optimised networks. Hop for Dutch brewers comes from all over the world, but mainly from Germany, Belgium/Luxembourg and the USA. Barley is shipped to malt houses and distributed on a supra-regional scale to brewers. These networks produce high quality products for competitive prices that appeal to industrial and craft brewers alike.

With regards to the research, the scale and extend of the networks within the Food Production sector made it harder to identify the exact actors or connections between brewers and producers. This part of the overall food network is therefore the most elusive and the most outside of the realm of brewers in the region. Similarly, the scale and extend of the network will make it more difficult to propose food system interventions in this sector, when the goal is to produce local ingredients for competitive prices.

C3.2 Regional and local networks for processing, marketing, consumption and waste recovery are coming into their own under the influence of brewersv

The network in the food system sectors of Food Processing, Marketing, Retailing, Consumption and waste recovery within the study area function on a regional or even local scale. Especially within the first four sectors, the breweries from the region are a driving force behind building local connections between actors. The main examples from this chapter are networks of contract brewers where knowledge, skill and materials are shared; brewpubs or taprooms where brewers connect with their consumers; and involvement of brewers with local causes through sponsoring or occasion brews. Most of these brewer-centred networks have an appeal beyond the local, and apps such as Untappd are gatekeepers to this appeal for non-local audiences.

Within the sector of Resource and Waste Recovery, networks for waste collection or sewage are heavily intertwined with the networks of other (food) systems. In this chapter few examples have been mentioned

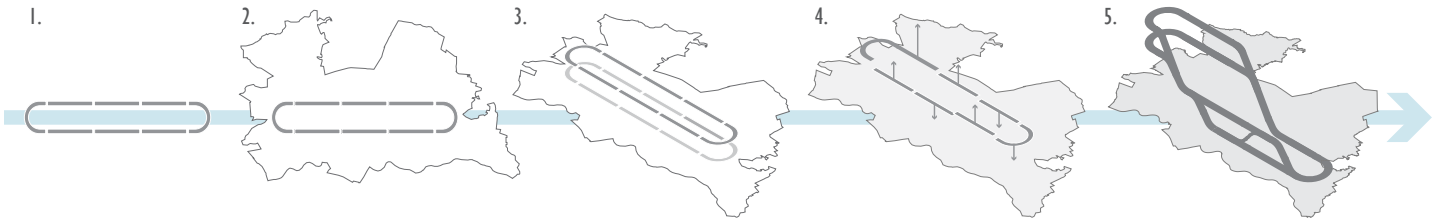


Figure 6.11 Diagram of C3.1 - C3.3

Figure 6.12 Diagram for R3.1: Hubs are considered as places where the food system can be spatialised in the context of the Ringpark.

Figure 6.13 Diagram for R3.2: Develop the production of beer ingredients and other food system interventions as part of networked territories

of brewers navigating the complexity of these networks (such as the beer boat), but in general these networks are considered too complicated to adequately describe or alter without influencing other network partners. More research is required to find ways to incorporate this sector further within the realm of the brewers and their food system.

C3.3 / R3.1 Hubs are considered as places where the food system can be spatialised in the context of the Ringpark

The places where multiple connections, resource flows or narratives meet or combine have greater presence in the food system. These hubs in the food system can be identified due to their position in and impact on the food system as a whole. Some of these hubs could even be identified in the most elusive parts of the food network: malt houses and (international) intermediates that sell brewing supplies. In the study region the following hubs could be identified: breweries (especially brewpubs), craft(beer) festivals and urban areas in general as a concentration of hubs for urban consumers (cafe's and restaurants) and craft beer culture in general.

From this conclusion simultaneously comes the recommendation to capitalise on the potential these hubs have to be further explored in the context of the Ringpark. In Potteigers article, multiple food hub designs are described as place where an interaction between the food system and landsape system can be explored. As the research now moves towards integrating the food system of beer in the landscapes of Utrecht, hubs are perceived to be a good starting point for design exploration.

From the food system perspective developed in the past few chapters, the hubs that have much potential are the malt house as a hub for local cereal farming, the hop farm as hub for terroir and narrative experiences, the brewery and beer events as places for interaction between brewers and consumers. In the coming chapter in which a landscape analysis is integrated, hubs in the landscape system might be discovered, into which the food system of beer can be (co)accommodated. This might reaffirm the potential of narratives, networks and hubs that have appeared to be secondary up till this point in the research.

R3.2 Develop the production of beer ingredients and other food system interventions as part of networked territories

In the article by Potteiger a networked territory is described as delineated area in which sites from all

food system sectors are linked to the particulars of place and culture. The networked territory is considered the basis for exploring design interventions in the food- and landscape system (Potteiger, 2013, p. 272). As the production of ingredients has been found to be firmly rooted in global networks, it is suspected that such an integration of production with a particular landscape is required to be able to be an attractive alternative for brewers.

Within the current food system multiple interactions between the food network and landscape networks have been identified in this network. Besides the possibility for growing beer ingredients hop and barley in the region of Utrecht these interactions are: (a reinterpretation of) location factors for breweries such as a water connection, the use of ingredients and historic recipes from the region; possible beer tourism to breweries and festivals; and using the subtle differences between networks in urban and rural landscapes. With regards to the delineated area, the Ringpark can serve as a networked territory hypothesis around beer in the coming chapters.

R3.3 Explore patterns and intensities within networks

As the current food network is spread out across space and scales, the nature of the relations between actors in the system haven proven to be sometimes hard to grasp. The article by Potteiger however tells us to rather focus on the pattern and intensity of connections within the food network (Potteiger, 2013, p. 269). Instead of further incorporating this into the analysis, this remark is taken into the design phase as a reminder to explore patterns and intensities in the model study.

This is first and foremost relevant for the design itself, but it also matters for the Ringpark context. Patterns and intensities can also be understood as the different ways the actors that are active within the Ringpark concept interact with each other. The framework of food system design could provide a new perspective on those interactions, explore the possibilities within them and propose new forms of patterns and intensities that are part of the Ringpark governance concept. The adoption of other narratives or motives for cooperation are believed to be able to shift the balance in these networks. Examples of this include the multiple networks/cooperatives around sustainable production such as Triligran and Stichting Veldleeuwerik that not only work towards a high quality product, but also a more sustainable business operation for both farmer and malter (NIBEM, 2019).

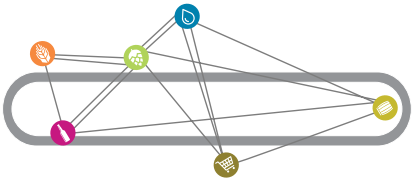


Figure 6.14 Diagram for R3.3: Explore patterns and intensities within networks

7 Food Space Analysis Model study

Figure 7.0 Projection of the three food system models on the landscape of Utrecht.

The findings from the previous chapters have established a beer-specific food systems thinking towards design. Such a food systems perspective, as Potteiger argues, can generate new conceptions of landscape spaces and systems (Potteiger, 2013, p. 271).
The food space analysis in this chapter brings together the analysis findings into a first exploration of the food system of brewing in the Ringparken context, moving towards the Ringparken as a spatial concept and a governance concept respectively.
This chapter is used to answer the overall design question: "How might the food spaces in a local food system for beer be integrated with the landscapes and experiences in the Province of Utrecht?"

7.1 A perspective shift from pilsner to park

During the previous three chapters the knowledge on the food system itself, food narrative and networks has been analysed and gathered as fragments of potential food system interventions in Utrecht. An overview of the conclusions and recommendations is given in figure 7.1. This next step in the research requires a further perspective shift from just the food system of brewing to the food system in the context of the Ringpark. The objective of this research is to analyse the food system to identify food spaces, and design those spaces as part of a regional park system for the province of Utrecht. In this design chapter, the objective is split up into two parts.

The first part of the objective is divergent in nature and is directed towards identifying what a food space for beer in the context of the Ringpark could be. This steps takes the findings from the analysis, and compiles and projects them on the landscape system of the region. Design in the form of a model study is required in this phase to explore space and scale and to a limited extend test the applicability of the models.

The second part of the objective aims at converging a selection of the models with not only the specific landscape system, but also the governance context of the Ringpark. A selection of three preferred alternatives will be developed into more detail. During this phase design is necessary to as a tool to test and define the extends of the alternatives. As a result, the design products part of each preferred alternative vary depending on its specific focus.

CONCLUSIONS

Chapter 4: Food System Assessment

RQ1: What is the current food system of brewing beer?

C1.1 Urbanisation and professionalisation contributed to brewing as an urban practice
C1.2 Industrialisation and scientific advancement led to the further separation of food system sectors, through space and scale.
C1.3 There are nuances between industrial brewing and craft brewing
C1.4 The food system is biased towards production and processing, other sectors deserve equal attention

Chapter 5: Food Narrative analysis

RQ2: What are the narratives of brewing beer?

C2.1 Narratives of origin and production are associated with beer ingredients
C2.2 Narratives of craft are associated with the brewing and with the brewer himself
C2.3 Narratives of sustainability are mostly contained to the realm of the brewer
C2.4 Not all narratives are equally exposed or accessible for certain audiences

Chapter 6: Food Network Analysis

RQ3: What is the network of brewing beer in the Province of Utrecht?

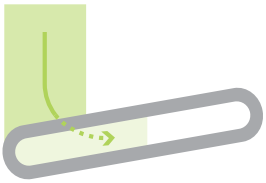
C3.1 The networks for bulk ingredients of beer are optimised at a global and supra-regional scale
C3.2 Regional and local networks for processing, marketing, consumption and waste recovery are coming into their own under the influence of brewers
C3.3 Hubs are considered as places where the food system can be spatialised in the context of the Ringpark

RECOMMENDATIONS

R1.1 Explore the shifting realm of the brewery from a historical perspective

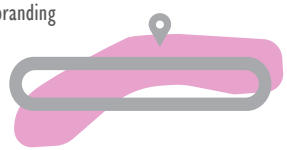
R1.2 Identify opportunities in the food system based on the analysis

R2.1 Extending narratives of production and origin



R2.2 Exploring "local" beyond marketing

R2.3 Incorporate sustainability narratives as part of spatial branding



R2.4 Merging realms of consumption, retailing and marketing

R3.1 Hubs are considered as places where the food system can be spatialised in the context of the Ringpark

R3.2 Develop the production of beer ingredients and other food system interventions as part of networked territories

R3.3 Explore patterns and intensities within networks

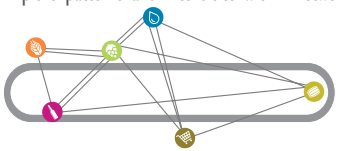


Figure 7.1 Summary of conclusions and recommendations from the analysis chapters

7.2 Designing food spaces

Context and objectives

In its basic format, the model study can be understood as an balancing act between the food system of brewing beer, the landscapes of the region and the context of the Ringpark. Of these three the landscape system of the Ringpark context has been least explored up till now in this research. It is therefore important to keep in mind the initial idea behind the six match making examples: to find a spatial expression that could combine an initiator's personal objective and interest with the ambition for a regional park system (Nefs, Roncken, & Van de Witte, 2017, see chapter 1).

To find a range of these possible spatial expressions, the models need to focus on the specific elements of the landscapes, culture and history in the region that will lend a sense of identity to the food spaces. Putting this objective first, the spatial expression could speak to the brewer, as well as to the Province, local governments and other non-governmental parties. This refers to the Ringparken advice: a regional profile as a common motivator (Roncken, 2018).

Method

In order to be able to carry out the model study, some additional analysis steps were required. Some of these analyse steps are rooted in the recommendation in each chapter, others are related to the goal of this chapter as described above. The steps include a landscape analysis and a scale study among others steps.

A map study and sketching on the scale of the region was used in the first phase of the design with the intention to identify food spaces, while the conclusions and recommendations with regards to the food system were used as leads for exploring the map. When a potential food space was found, sketching on a smaller scale helped to develop the conceptual models and to incorporate the particularities of the landscape system and the place. This phase of the design process was ended when the most important conclusions and recommendation were incorporated in one or multiple food space concepts.

In the next phase, the generated conceptual models were extended through sketching, researching the spatial and social-political context of those places and looking up reference projects. When saturation of the concept was reached, the second design phase was ended by visualising each developed model in a collage. These collages were made to represent the potential spatial expression of the models, not yet focussing on the governance context of the Ringpark.

Landscape units analysis

The landscape system of this region based on its geomorphology consists of five major landscape units, as shown in figure 7.2: the push moraine landscape, the Eem valley landscape, the upper river landscape, the lower river landscape and the peat meadow landscape.

The push moraine landscape is a remnant from the second to last ice age. The sandy ridge serves as a groundwater infiltration area that supplies high quality groundwater seepage to lower lying areas. It is also the water divide between the watershed of the Eem river and the Kromme Rijn watershed (Jongmans, 2013). The top of the moraine is predominantly forested an currently protected as a national park, whereas the sides of the ridge are historic settlement areas where there is a mixture of natural and agricultural land uses (Blijdenstijn, 2005).

The Eem valley landscape is located on the north-eastern side of the push moraine, in the basin that was left behind when the land ice retreated. The landscape south of Amersfoort is characterised by sand ridges from the last ice age, whereas the areas north of Amersfoort have long been under the influence of the sea and the incoming river Eem so clay and peat can be found here. After the ice ages a warmer climate

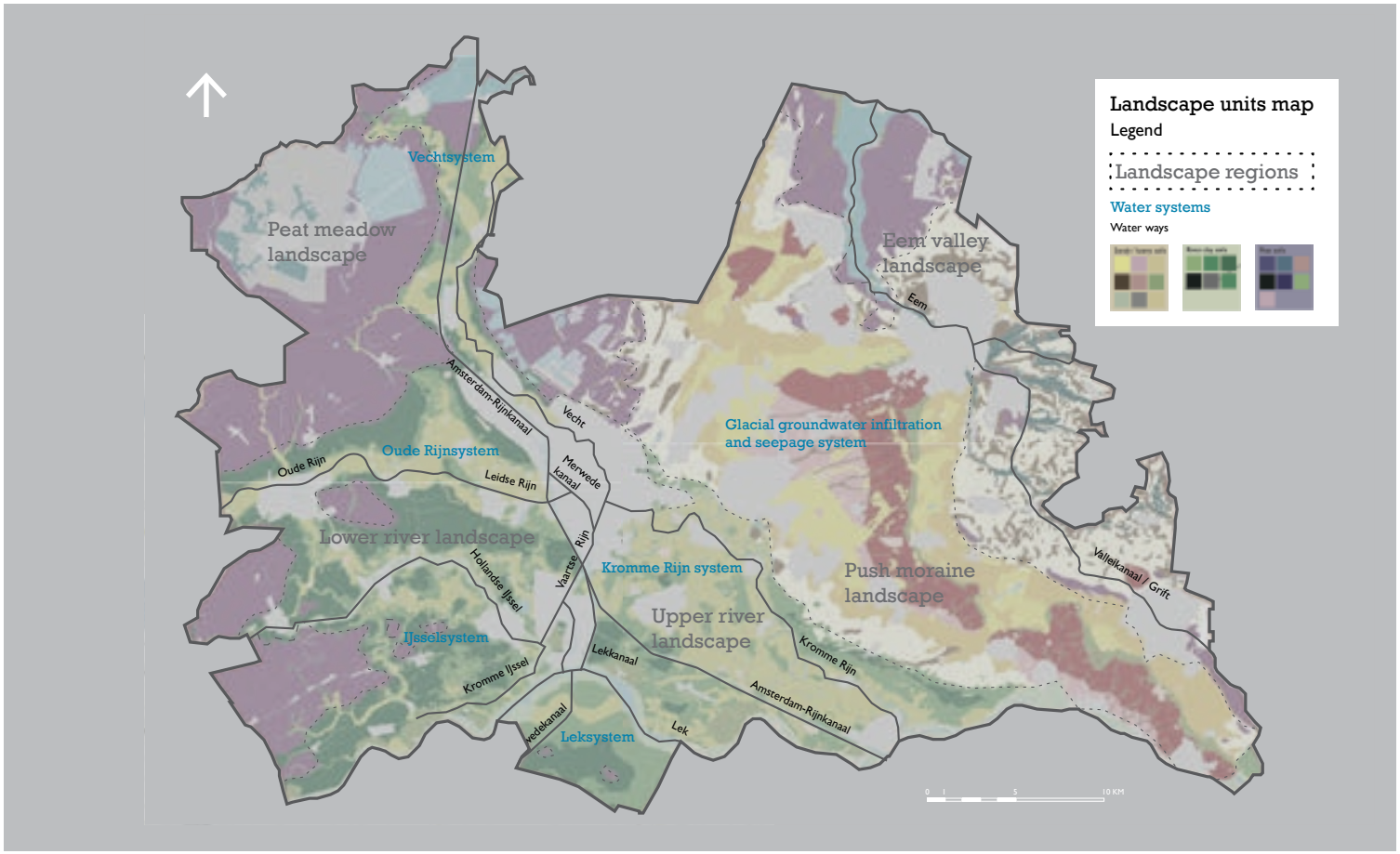


Figure 7.2 Landscape units map of the study region

lead to the development of peat soils and a lot of smaller rivers that merge into the Eem river at Amersfoort. On the sand ridges and river dunes the oldest settlements can be found (Blijdenstijn, 2005).

A distinction is made between the upper and lower river landscape based on the soil types found in the areas. In the upper river landscape, the many courses of rivers Kromme Rijn and Lek left behind a broad system of fertile levees and clay flood basins. The settlements in this area are very old, including many castles or estates, and there are clusters of horticulture on the most fertile grounds. Downstream, the river Rijn flowed into a peaty landscape, leaving behind far narrower levees and wet flood basins with clay and peat. Here the levees of the rivers Hollandse IJssel and Oude Rijn formed the spine for systematic land reclamations that drained the basins and made them suitable for agriculture (Blijdenstijn, 2005).

The peat meadow landscape in the north-western part of the province is essentially a man-made landscape. Prehistoric banks of rivers and creeks since the Middle Ages served as occupation opportunities from

which the large peat domes where excavated as fuel. The fine grained pattern of ditches and plots still characterises parts of this landscape today. Large scale drainage and land consolidations around the villages of Mijdrecht, Wilnis and Vinkeveen have erased parts of this pattern in favour of low lying, large polder plots (Blijdenstijn, 2005).

Suitability for ingredients

From the previous chapters it was concluded that the local production of beer ingredients in the region is promising (CX.X). Given the focus on the landscape system from both the food systems perspective (C3.X) as well as the Ringpark perspective (RX.X), a further specification of where those ingredients could grow is required.

Hop is a crop that requires deep and fertile soils, warm summer sun and cold winters with adequately changing day length and adequate supplies of water (Priest & Stewart, 2006). Furthermore, slight slopes aid ventilation of the roots and sun exposure (Wilschut & Koedoot, 2014). Protection from wind is lastly crucial to protect the fragile hop cones from bruising (Lawrence, 1990). Given these requirements, the upper river landscape in general will be a suitable area for growing hop. Besides that, some areas of the lower river landscape (with low enough ground water levels), the Eem valley (the non-peaty soils with sufficient drainage) and the push moraine landscape (the flanks where there are fertile and water retaining soils are located) have suspected suitability. When hop is grown in conventional agriculture, it is often treated with chemicals to reduce pests and diseases (Lawrence, 1990). This makes non-ecological hop an unsuitable crop to grow nearby other land uses that are sensitive to pesticides. Most new hop farmers are however more interested in growing organic hop (Platform Nederlandse Hoptelers, 2017)

Malt can be made from any cereal, but barley is the most common for brewing beer. The survey amongst brewers indicated that more than barley, brewers are interested in brewing with non-barley malts (See appendix 1). Therefore the analysis looks at a wider suitability for cereals. Barley specifically grows best on clay soils, both sea clay and river clay (Nicolas, 1966). Cereals are most commonly grown in the north-eastern and south-eastern agricultural areas of the Netherlands (CBS, 2017). This means that the soils there (combination of sand and clay areas) are also suitable. For the study area we could therefore consider the same landscapes as for hop to be suitable. Conventionally grown barley specifically requires less pesticides than

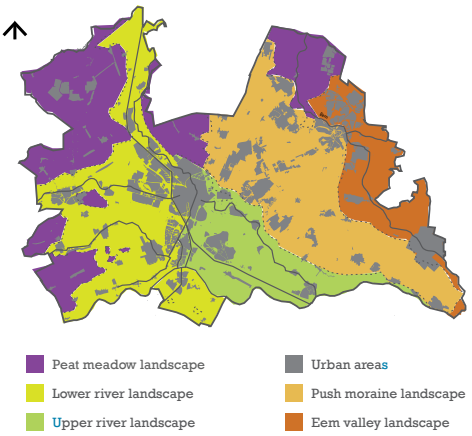


Figure 7.3 Landscape units, summary of figure 7.2


Figure 7.4 Areas not suitable for production of hop and cereals


Figure 7.5 Areas suitable for growing hop and cereals, based on landscape units. In the hatched areas suitability for production cannot be determined on a regional scale.

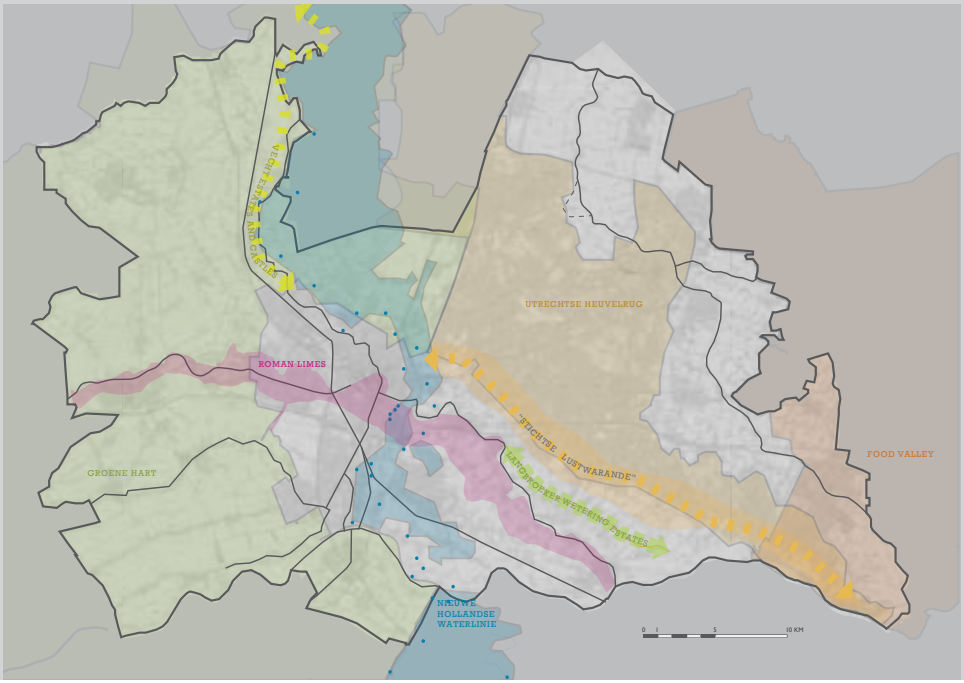


Figure 7.6 Map of regional profiles and landscape identities. Based on Blijdenstijn (2005) and Roncken (2018)

other cereals and contributes to soil recovery as it improves soil structure (NIBEM, 2019).

The landscapes in the region that are in general not suitable are the areas that have high groundwater- and surface water levels (results in rotting rhizomes for hop) or where there is too little sustenance in the soil for crops to grow. On this basis the peat meadow landscape is excluded, as well as the peat soils in the Eem valley and the dry and poor sandy soils on top of the push moraine. A summary of this analysis is given in figure 7.4 and 7.5.

Occupation patterns and regional profiles

In the food network analysis it was recommended to be aware of the urban areas as hubs for breweries, beer and ingredients (C3.3). The food narrative analysis and the food system assessment emphasises the long history of domestic, non-professionalised brewing and the potential for the rural brewery as a narrative topos (C1.1 + R2.2). It is therefore interesting to explore settlement and occupation patterns (both urban and rural) as inspiration for locations of food spaces.

The province of Utrecht furthermore has established regional profiles that could lend a sense of place to both products as well as breweries and food spaces (Roncken, 2018). These profiles include the Nieuwe Hollandse Waterlinie, an inundation based line of defence with fortresses, and the Limes, the former north border and trade route of the Roman empire. Historic structures were added to this map, including the linear settlement patterns of the Stichtse Lustwarande and the Langbroekerwetering area. A sequence of estate areas and castles lends local identities to these areas (Blijdenstijn, 2005; Wijngaarden, 2017).

Scale study

In the food network chapter it was estimated how much beer is brewed each year in the province. Producing the ingredients for this amount of beer is an potion that ought to investigated before designing. To give a sense of scale to the production of ingredients in the study area, a calculation was made of the surface needed for the production of the required ingredients. Some conversions factors by the Food and Agriculture Organisation of the United Nations (FAO) were used, in combination with average yield data from the Dutch Statistics Bureau (CBS) and other sources to establish an acreage for hop and barley (CBS, 2017; FAO, 2009).

It should be noted that the FAO conversion factors are based on an industrial brewing process rather than a craft brewery that is in general less resource efficient and requires more aroma ingredients. Therefore the conversion factors are likely higher for this region, as small scale craft brewers are very common in this region (C1.3) The result of this scale study is shown in figure 7.7.

Figure 7.7 Scale study of the food print of food system of brewing in the region of Utrecht

7.3 Model representations

Eventually eight food spaces have been identified through the model study. Figure 7.8 below shows the location of the results of the model study in the food systems diagram. The variation in the models can be attributed to a couple factors. The first factor is whether the model is located within the realm of the brewer or not (represented by the model originating inside or outside the oval diagram). This is significant aspect of the model, as it tells us something about the matchmaking that needs to happen in the light of the Ringpark concept. The second factor is the food system sector. Some of the models originate in multiple food sectors, as they incorporate some of the findings about the blurring between several food systems sectors.

As was explained in the method paragraph of this chapter, the opportunities in the food system in combination with the maps study served as the jumping-off point for the model study. In figure 7.9 on the next page a table shows which findings, conclusions and recommendations are incorporated in each food space model.

In the pages that follow, each potential food space is visualised by a collage that shows the potential spatial expression, and a diagram of the corresponding landscape units the model would be applicable to. In these diagrams the asterisks mark locations where sketching took place to develop the food space model.

Figure 7.8 Food system diagram with indicated where in the food system, the different models are located

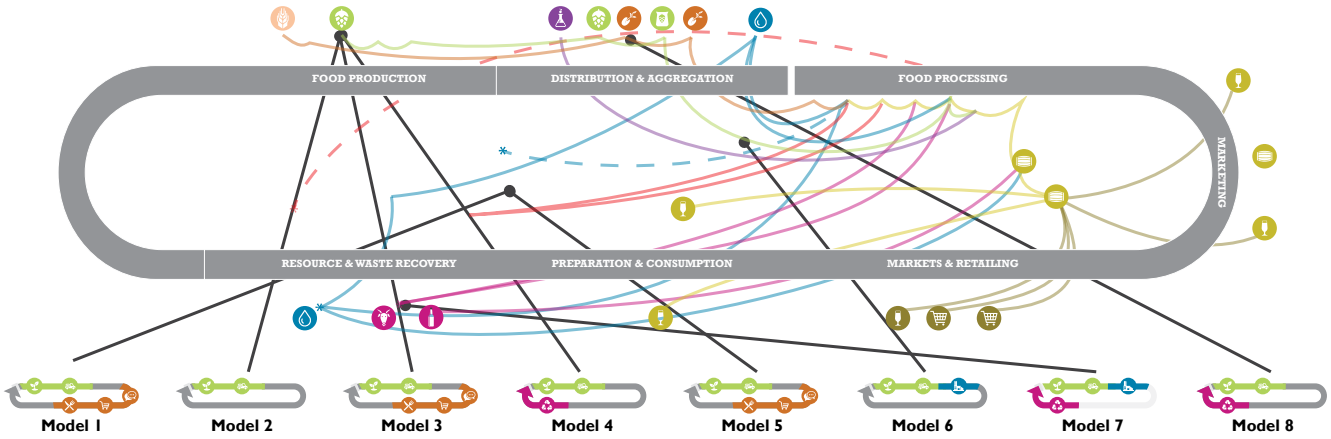


Figure 7.9 Table for comparison of models in model study. The blue vertical columns represent the preferred alternatives

Conclusions and recommendations Chapter 1-3	Food System opportunities from analysis	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
	Harvest narrative	●		○	●	●			
	Hop festival / hop culture	●		●		●	●		
	Continuous narrative for malt								●
	Terroir for Utrecht (hop, malt, water)	●		○					●
	Seasonal ingredients	○							
	Label of origin	○							●
	Local heroes, folklore, myths	○				○			○
	Spatial branding			●	●	○	○	●	●
	Local historic recipes		○						
	Sustainability niches (organic)		●						○
	Continuous narrative of spent grain							●	
	Technocratic narratives		●						
	Landscape services		●					○	●
	Engineered seasonality								
	Festivals and brew pubs	●		●		○	○		
	Hop processing and quality check	●							
	Malt house and cereal collector								●
	Consumption places (cafes / festivals)						○		
	Brewery as hub						●		
	Farms as hub		●		●			○	●
	Hop networks with brewers and farmers	●	●		○				
	Brewing premium								○
	Contract brewers								
	Tourism and audience participation	○		●		●	●		
	Collaboration for sustainability		●		●			●	●
	Hop territories	●				○			
	Cereal territories								●
	Urban brewery territory						○	●	
	Rural brewery territory				●				
	Water based territory		○					●	

Figure 7.10 and 7.11 Collage and spatial distribution of the hop harvest festival model.

Model 1: Hop harvest festival

Through a yearly hop harvest festival, a new narrative of production is introduced **(R2.1)** on the fertile fluvial soils of the Kromme Rijn water shed **(R3.2)**. The craft brewers of the region invite their network partners and patrons **(C3.2)** to help harvest the hop that will be used for green hopped beers **(R2.2).** Similarly to Kent and Poperinge, the brewers (in collaboration with other partners) provide the "seasonal workers" with transport, temporary accommodation close to the fields, sustenance and a festival to celebrate a successful harvest **(R1.1+2.4).** Walking from farm, to field, to other field, to festival is encouraged, as walking infrastructure is improved.

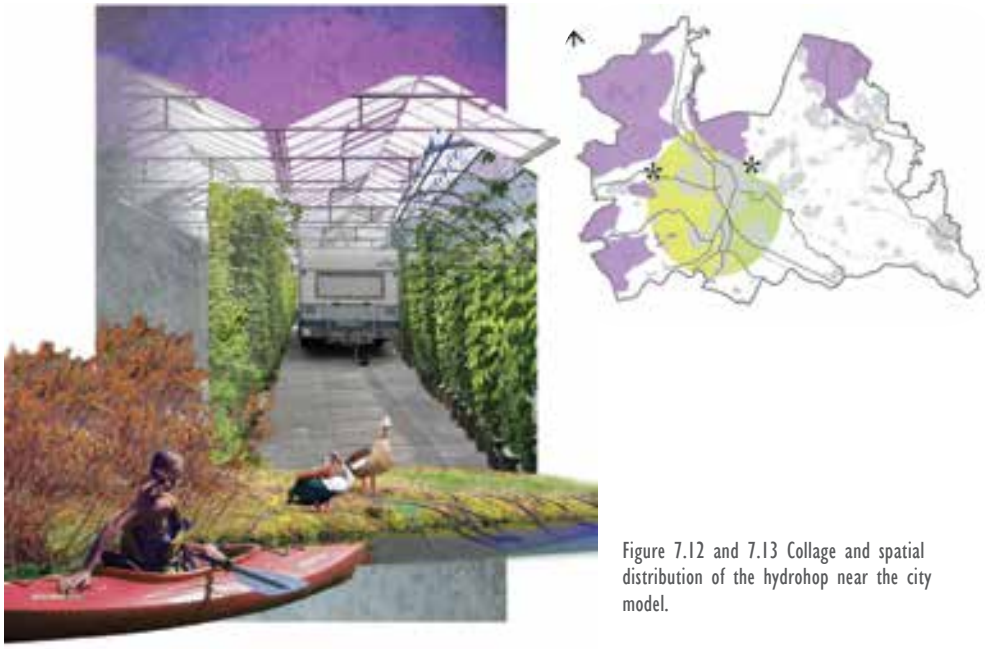


Figure 7.12 and 7.13 Collage and spatial distribution of the hydrohop near the city model.

Model 2: Hydrohop near the city

Following the example of their American colleagues, brewers introduce hop grown in greenhouses to the region **(R1.2)**. They reclaim abandoned green houses in the urban fringe for the production of high value crops close to the city **(C3.1+3.3)**, restoring the original function of these current storage facilities for caravans and campers. As less production capacity is needed, materials are recycled **(R2.3)** and the small scale greenhouses are also introduced in the peat meadow areas, where they perform as a water treatment facility. With this positive feedback loop to the water system, the rare Sweet gale shrub can be reintroduced as a historic counterpart to hop

Model 3: Hopart

The trellises of hop are an iconic feature of the landscape in historic hopping areas **(C2.1)**. For the Utrecht region, the trellis was and is continuously reinvented by designers and artists to create land art installations that have the ability to travel through the region. Both brewers as well as farmers or estate owners adopt the structures to amplify the landscape or event that they are placed at **(R2.2)**. The pyramid structures as displayed in the collage could for example blend with the military defence structures of the Nieuwe Hollandse Waterlinie or a formal garden at an old estate. A combination with Model 1 could be made.

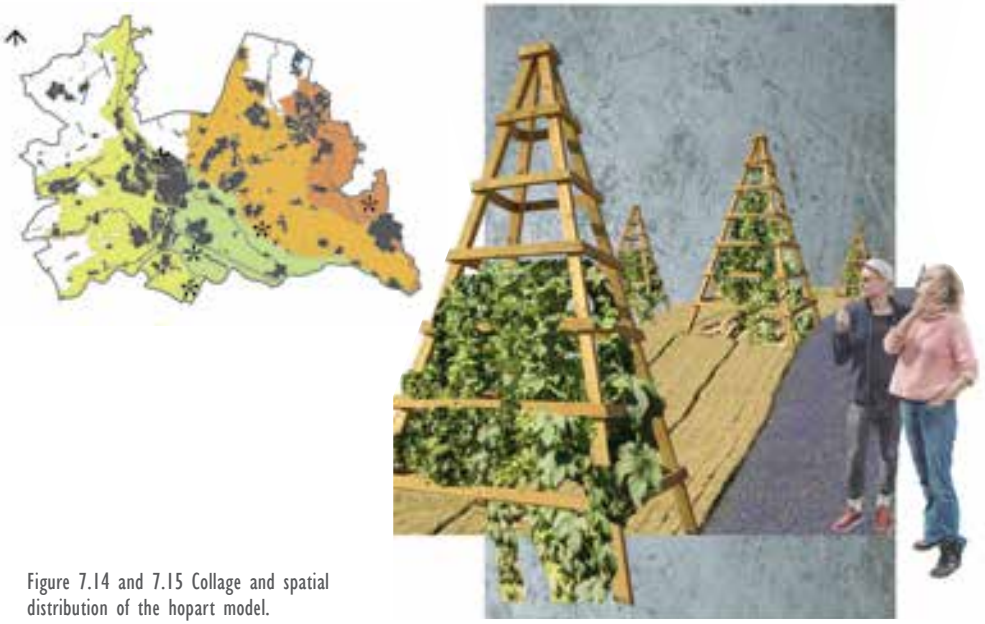


Figure 7.14 and 7.15 Collage and spatial distribution of the hopart model.

Model 4: Hopping farms

The province of Utrecht is faced with vacancy of agricultural property, which has the potential to degrade the quality of rural areas. Temporary production of cereals and hop has the potential to keep farm yards active and away from degradation, while a new purpose is sought for the building. Brewers can become involved and adopt a farm yard **(R2.2)**, maybe even using the yard for brewing and marketing purposes **(R2.4)**. This revives the historic connection between rural areas and breweries **(R1.1)** as well.

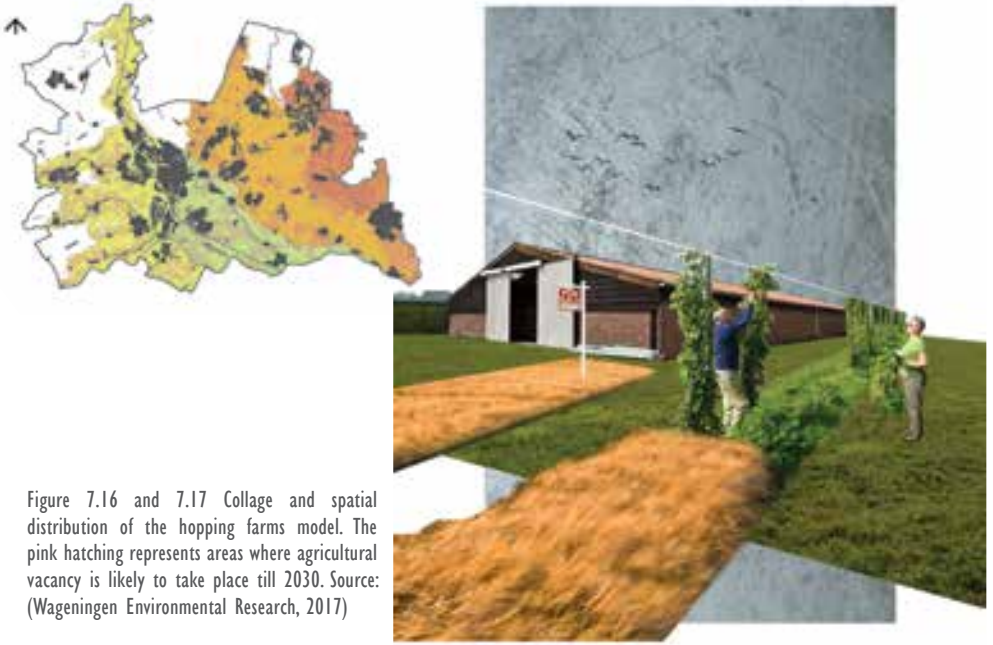


Figure 7.16 and 7.17 Collage and spatial distribution of the hopping farms model. The pink hatching represents areas where agricultural vacancy is likely to take place till 2030. Source: (Wageningen Environmental Research, 2017)

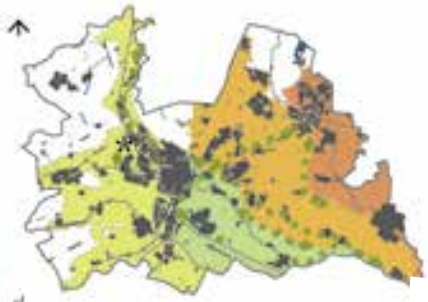


Figure 7.18 and 7.19 Collage and spatial distribution of the arcadian ingredients model. The green arrows represent the linear estate areas around the Utrechtse Heuvelrug and the river Vecht

Model 5: Arcadian ingredients

Estate owners usually were reliant on their lands, meaning that the food and income required by the inhabitants of the estate was either grown on the premises or by lessees. This principle becomes part of the estates again when growing hop and cereals becomes part of the Arcadian experience that these areas nowadays offer to visitors **(R1.1)**. The Arcadian experience is a sense of place that resonates with brewers **(C2.2)** and consumers alike **(R2.1)**, and is enhanced by reintroducing historic growing practices like hop pits, corn sheafs and manual harvesting. Brewers and estate owners participate in joint marketing through beer sales and events **(R2.2).**

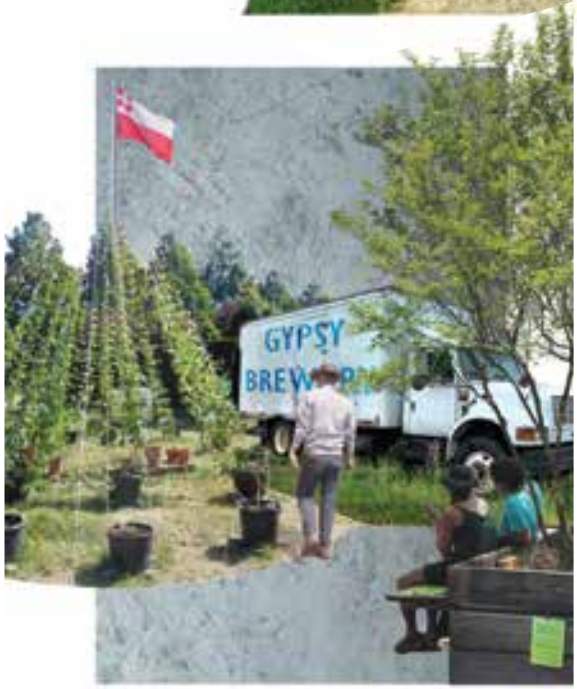


Figure 7.20 and 7.21 Collage and spatial distribution of the gypsy urban brewery model

Model 6: Gypsy urban breweries

Craft brewing has become associated with notions of authenticity and alternativeness **(C2.2)**. A mobile brewery gives gypsy breweries a chance to build a brand around a sense of place **(C1.3)**, without having to invest in equipment. The location of the gypsy brewery, tap room or hop yard triggers place making and utilises the potential of a brewery to contribute to programming, activation of places by attracting visitors or developing certain derelict places in the city **(C3.2+3.3)**.

Model 7: Spent grain as trigger for new products and experiences

Spent grain has an application as substrate for growing mushrooms and mycelium based packaging and insulation materials **(R1.2+2.3)**. The undeveloped fortresses of the Nieuwe Hollandse Waterlinie feature suitable growing conditions and opportunities for new visitor experiences **(C2.3)** that complement the diverse palette of activities already taking place at the fortresses. Together with brewers, neighbouring (goat)farmers, biomass producers and culinary innovators a new circular economy around a fortress can be developed **(C3.3+R2.3)**.

Figure 7.22 and 7.23 Collage and spatial distribution of the Spent grain as trigger for new products and experiences model. The blue hatching and dots represents the Nieuwe Hollandse Waterlinie and its fortresses

Model 8: Malting for soil and water quality

Barley has a positive effect on soil quality, especially when combined with green fertilizers or other crops that contribute to the structure and robustness of soil **(R1.2)**. Involving farmers and nature organisations with a programme to promote growing organic cereals for malting brings diversity and spatial quality to a monocultural landscape and has the potential to contribute to biodiversity. Involving the water board to develop a small scale malt house that is integrated with the landscape and water system positions the malt house as hub for both the food and landscape system **(R2.3+3.1+3.2)**.

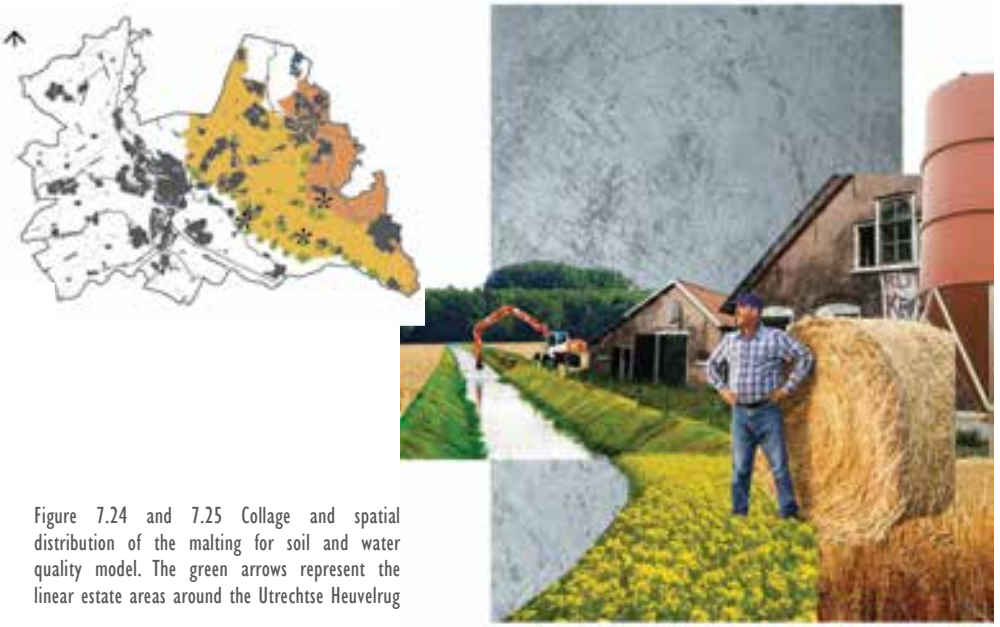


Figure 7.24 and 7.25 Collage and spatial distribution of the malting for soil and water quality model. The green arrows represent the linear estate areas around the Utrechtse Heuvelrug

Discussion

It can be noticed from the model study that the balance between the interests of the food system, the regional park experience and the contribution to landscape quality shifts. For example, the hop harvest festival has the potential to provide a range of landscape experiences, whereas the hydroponic hop model does not interact much with its surroundings nor the regional park due to its closed indoor production system. This model is more tailored towards the critical demand of brewers for a high quality local product. It that sense, the model study has succeeded to explore the range of food space possibilities.

The food production sector, and especially hop production, has understandably gotten the most attention in the models. It is the sector with the largest footprint, it offers the most narrative experiences and the possibility to interact with the landscape system. Even though the representation of the whole food system therefore becomes skewed towards food production, this is not considered a problem for the next step. It is rather considered an opportunity, as further design can maximise the interaction with the landscape and the park system.

A selection of the models was made based on their applicability to the demands of the sector, the Ringpark and potential visitors. For example, models 7 and 8 represent true innovations for the sector. Of all the hop based models, model 1 has the most integration with a particular landscape unit, similarly models 7 and 8 have strong integration with the landscape system.

Three models have been selected to be further developed into food space alternatives: the hop harvest festival, spent grain as a trigger for new products and experience, and malting for soil and water quality. Selecting only three of the models was necessary to be able to develop alternatives within the time and scope restraints of this research, without compromising on the diversity and range of the designed models. The possibility to design the three models as an integrated plan was kept open, and this notion was further explored in to following section and design phase.

Figure 7.26, 7.27 and 7.28 Collages of the three selected food space models

Model 1
Preferred alternative 1

Model 7
Preferred alternative 2

Model 8
Preferred alternative 3

Figure 7.28 Projection of the three food system models on the landscape of Utrecht.

7.4 Developing the preferred food space alternatives

Context and objectives

The second part of the design objective concerns the design of the food spaces as part of a regional park system for Utrecht. The three chosen models will be developed into further detail to integrate the designs with the scope and objective of the Ringpark.

With regards to the current results, the context of the Ringpark concept is as follows: The Ringpark is supposed to develop as a clear spatial profile, with well-designed connections and hubs between the park elements in the region. Supporting this new profile is a broad network of both governmental and non-governmental actors that develop, maintain and finance the park structure out of a shared interest in a qualitative living environment. This networks included parties from both city and countryside, ensuring that benefits and burdens are equally distributed in the Ringpark (Roncken, 2018).

The model study has provided us with limited leads towards how the spatial and organisational collaboration of the model could develop. Lacking from the food space models are the questions of who, how and why. Who beside the brewer will get involved, how will they contribute to the food space and Ringpark at large and why are they motivated to contribute? Design is once more needed as a negotiation tool to explore, define and answer these questions and achieve the objective. The key elements to arrive at three well developed alternatives for the food spaces are therefore an analysis of landownership and a further exploration of the specific spatial and governance context of these areas.

Methods

The method used for elaborating the three preferred alternatives in the second phase of the design process refers to the FSA. Firstly the location of each model needed to be specified, by looking at the specific demands of the model (assessment). Secondly, both narratives from the model itself as well as the landscape were considered and combined (narrative analysis). Thirdly, the network of the model was considered (network analysis). This final step looked at both which actors ought to be included, as well as the contribution of the alternative to the landscape network through "landscape services" (Opdam & Steingröver, 2018).

For the final step of the design process mapping landownership at the location of the food space models is required to identify network partners. These findings will then guide an exploration through policy documents, news articles, websites and other resources to identify the governance context of the food space models. Depending on the scope of the model, the results of this analysis will be summarised in a map, diagram or text.

Additional sketches, maps, artists impressions or other design expressions will be made to cover all aspects of the food space design. As the balance between aspects of the food system, landscape system and park experience varies among the models, these design expressions will differ from model to model. However, to convey the expression and influence of the food space model in the food system a beer label is designed for all three models.

Beer labels have proven to be a rich source of information during this research. They express the identity and sense of place of a brewery, through the images, expressions and beer names used. To refer back to this important aspect of the craft brewing sector, the beer label is the design product that ties the knot between analysis and design phase.

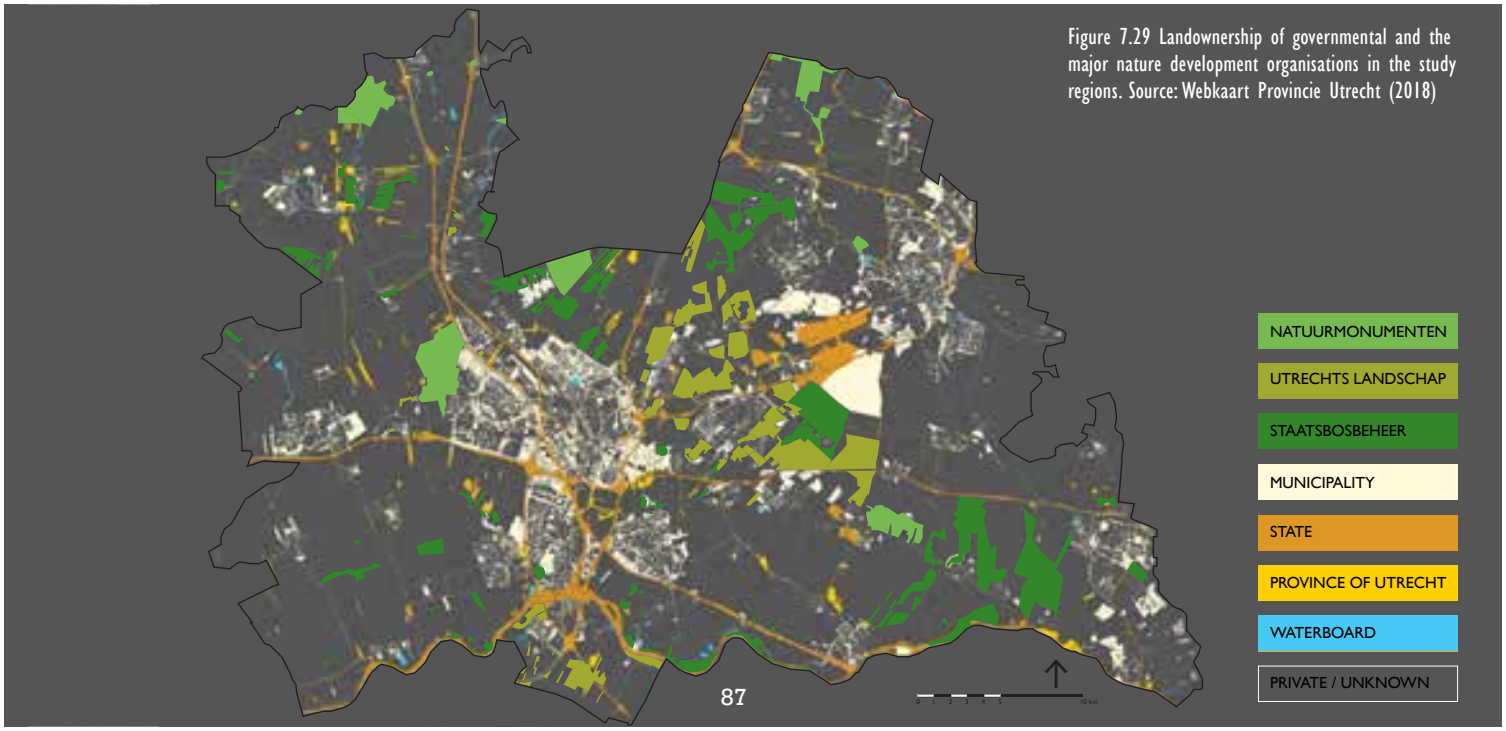


Figure 7.29 Landownership of governmental and the major nature development organisations in the study regions. Source: Webkaart Provincie Utrecht (2018)

Preferred alternative 1: Historic hopping inspires terroir in Kromme Rijn

The first design proposal is situated in the Kromme Rijn area. To recap from the landscape analysis, the river's many different courses over the years left behind a broad area of fertile fluvial sediments. On the levees you can nowadays find fruit farms, mainly apple and pear orchards. The levees are also the places where you can find historic settlements, including (remnants of) estates and castles. The seasonal narrative of the blossoming and harvest of fruit is one of the most important landscape experiences in the area, inspiring a wide range of activities that include farm shops and harvest events for families (VVV Kromme Rijnstreek, 2019).

Matching the narrative and experience of the hop harvest with the existing seasonal narrative in the Kromme Rijn requires strategic alliances and collaboration. From a seasonal perspective and from a practice perspective we could therefore turn to cherry farmers. As you can see in figure 7.31, the harvest period of hop clashes with the harvest of apples and pears. A collaboration is therefore sought with cherry farmers, who harvest their produce earlier in the season. Next to that, the use of screens, cables and poles to protect the delicate fruit that is common with cherry farmers could inspire interesting synergies between growing hop and cherries, see figure 7.32 on the next page.

Figure 7.30 Collage of the hop harvest festival model.

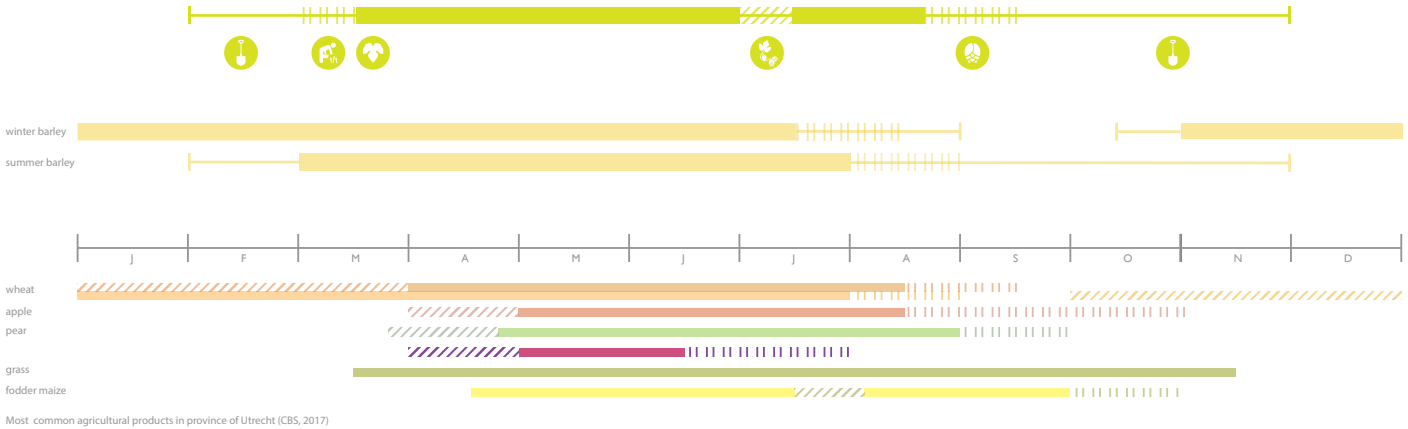


Figure 7.31 Calendar of the most common agricultural products in the province of Utrecht Source for agricultural data: CBS, 2017. The harvestperiod of hop (aug-sep) clashes with the harvest of apples and pears, but is complementary to the harvest of sweet cherries.

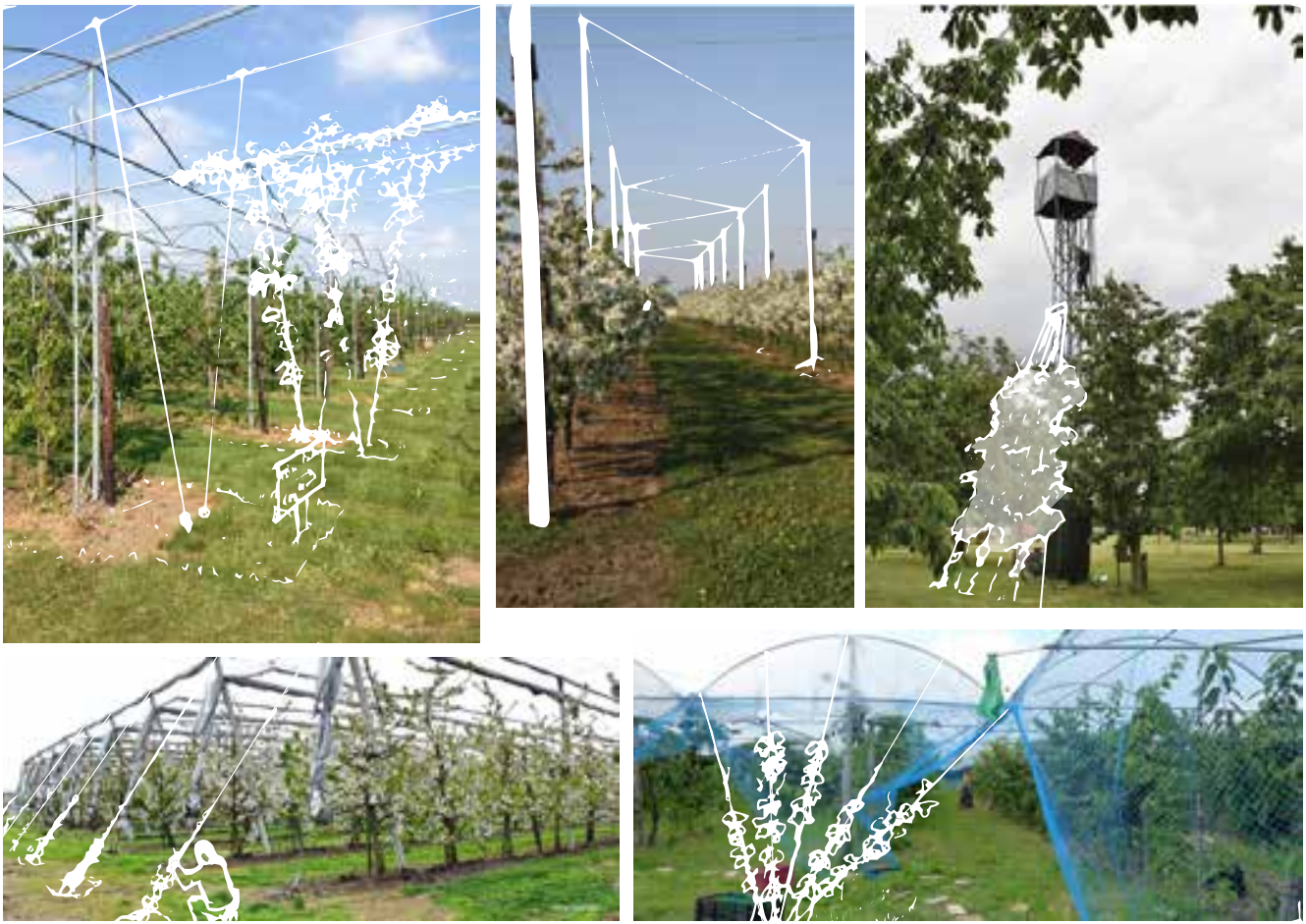


Figure 7.32 Sketches on possible “synergies” between the growing facilities of cherries and hop. Sketch bases via Google Images.

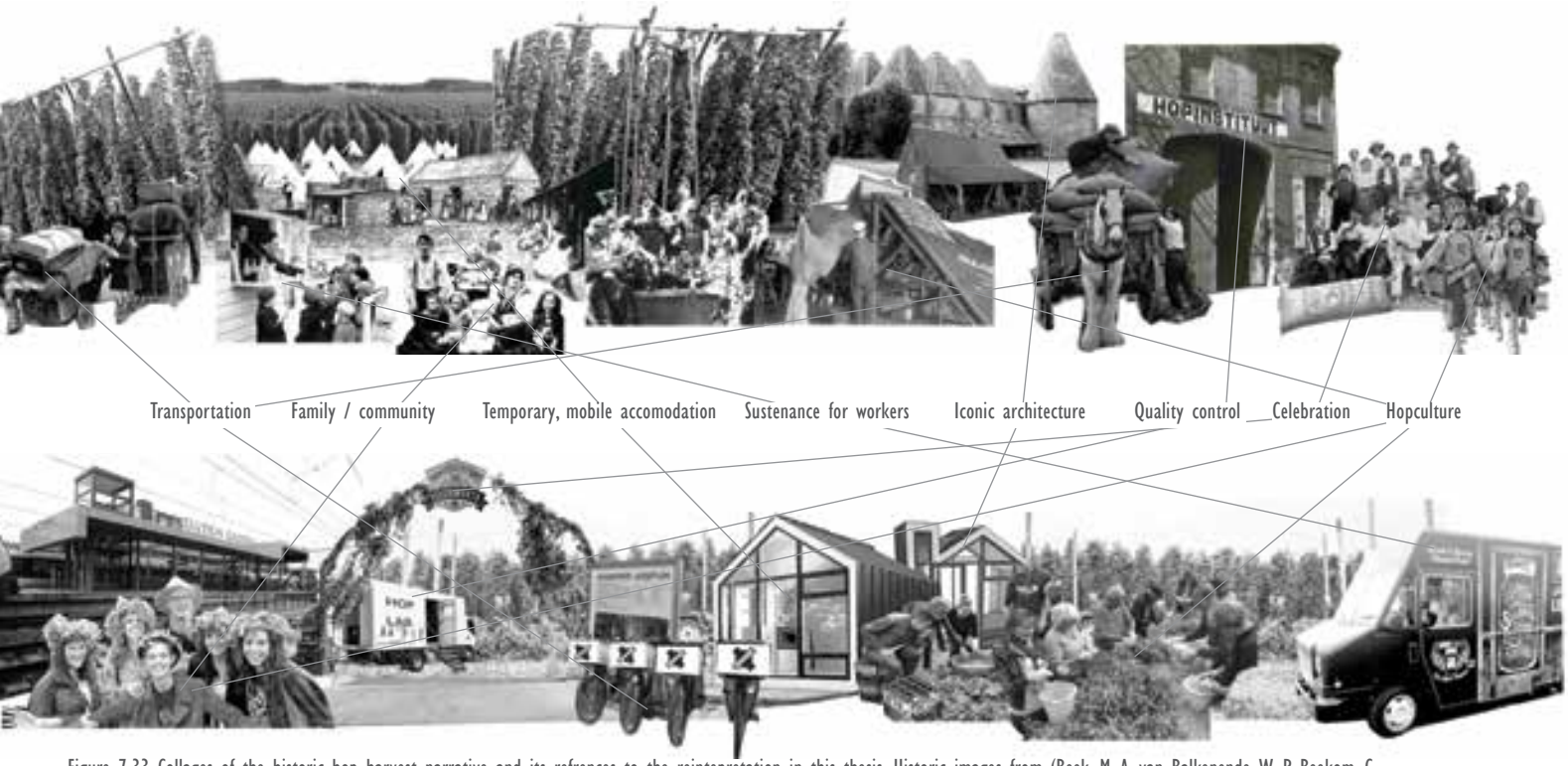


Figure 7.33 Collages of the historic hop harvest narrative and its refrences to the reintepretation in this thesis. Historic images from (Beek, M. A. van Balkenende, W. P. Beekom, C. W. C. van Bom, Luyendijk and Rijkslandbouwvoorlichtingsdienst voor de Zeeuwse Eilanden, 1959; Lawrence, 1990; Arbuckle, 2017)

To diversify the range of activities available in the region and therefore the Ringpark, inspiration is taken from historic precedents. The historic production narrative from traditional hopping areas such as Kent and Poperinge is used as form generation (Potteiger and Purinton, 1998). This means that this historic narrative is not literally copied or reproduced, but that it serves as an inspiration for how to handle the problems and opportunities faced in this particular area. Figure 7.33 represents elements of the historic harvest narrative, and how those could be reinterpreted for the modern time. The resulting activities include harvest activities spread over multiple sites and seasonal small scale opportunities for an overnight stay, which can be used both during and before the harvest period.

Walking and taking a train from the city as the dominant mode of transport in the historic precedents inspires to make access to the area by foot or public transport easy. The function of this region as amenity area for the surrounding cities and villages furthermore recommends designing routes for multiple purposes: short circuits for a stroll and longer circuits to facilitate running. The clusters of orchards that can be observed in figure 7.34 can be made part of the largest circuit, which is considered the main festival route during the harvest. The result can be a fine-grained network of walking routes based on historic roads that can enhance the experience of both the landscape and the seasonal hop narrative, see figure 7.34 to 7.37.

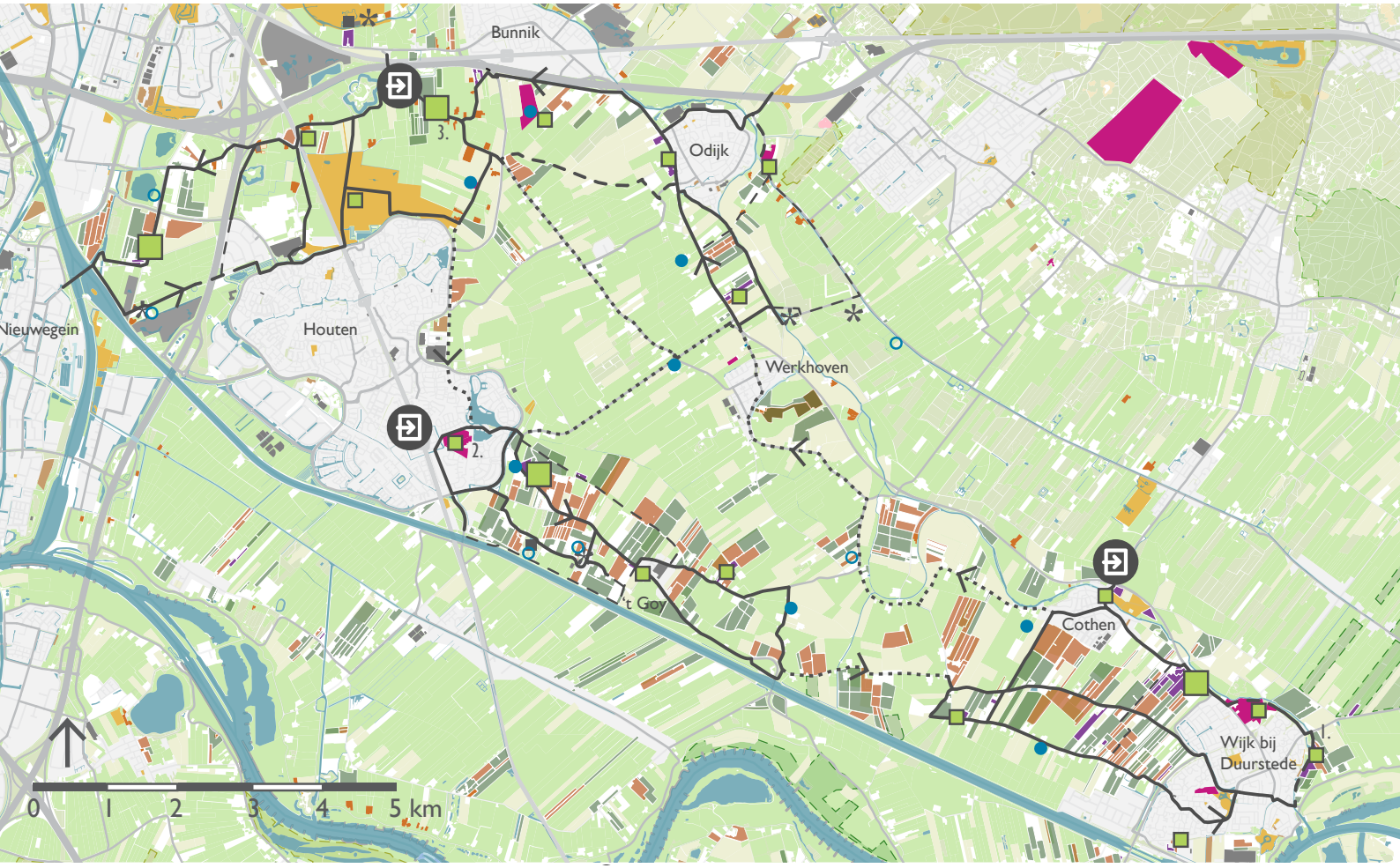


Figure 7.34 Map of the hop festival, showing circuits for walking/cycling, the hop yards and the overnight stay opportunities

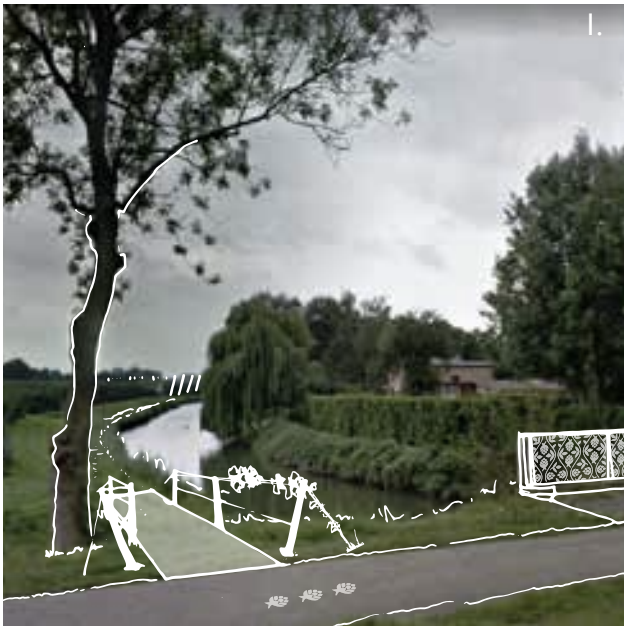


Figure 7.35-37 Sketches of hop fields and routes throughout the area. (see figure 7.34 for location) Top left: Path along the Kromme Rijn in Wijk bij Duurstede. Top right: Former urban agriculture in Houten, now a small demo field for hop. Below: Harvest hub with hop and Bunkies at the Achterdijk fruit farm, south of Bunnik. Photo source: Google Maps.

Brewers are important actors in these networks, as they are involved with attracting visitors, organising the harvest events and providing the routing during the harvest event (see figure 7.36).

Next to that brewers and their product are imagined as vehicles for new landscape inclusive food traditions that help to build a common motivation among the actors in this preferred alternative. Warren Belasco writes about the possibility to invent terroir, through identifying attractive landscapes that produce distinctive food products, entrepreneurship and a captivating origin story (Belasco, 2014, p. 45). Having the attractive landscape and entrepreneurship of brewers and farmers already sorted, the compelling origin story could come from the historic independent rulers the area has known through the ages. These local personas could include Roman rulers (referring to the Limes route that ran through the area) or the squires of the powerful castle of Ten Goye / Opgooi ('Park ten Goye' – Mooi 't Goy, no date; Blijdenstijn, 2005). See Figure 7.38 to 7.40 for the possible resulting beer labels of a fictional brewery.

Figure 7.38 to 7.40 Beer label designs for alternative 1. The beer type is hop-focussed, and makes use of local hop varieties (to be developed, currently nonexistent) Featured on the bottle are medieval soldiers and Ghiselbertus Uten Goye, lord of the Ten Goye castle 1245-1270. Image via: http://johnooms.nl/

Preferred alternative 2: Circular landscape economies at Honswijk

The second alternative is located at the Honswijk fortress, one of the fortifications that is part of the Nieuwe Hollandse Waterlinie. It was constructed between 1841 and 1848 as a fortress that protected the advance of a potential enemy over the both the dike, the floodplains and the water of the river Lek. On the other side of the river Fort Everdingen was constructed to together guard the access via the river to Utrecht. Fort Honswijk is the main structure out of a small defence line (Stelling van Honswijk) that also includes a lunet (triangular fortification), a diked and covered by trees inundation canal, another fortress half way the canal (Werk aan de Korte Uitweg) and a group concrete group shelters surrounding the fort (Stichting Honswijk-Everdingen, 2019), see figure 7.46 on page 96.

Spent grain as a substrate for fungi has multiple applications. The applications that are intended to be explored in this alternative are the cultivation of culinary mushrooms and mycelium based packaging and insulation materials, see figure 7.42 to 7.44. From some of the references for these products it was deducted that spent grain ought to be mixed with other fibrous materials to provide sufficient structure to the composite (Plant Chicago, 2017). Therefore the floodplains and flood basins inside the dike can be used to either cultivate or collect biomass. Sources include poplar, willow or hemp (Jodha, 2016; Ecovative, 2018). Especially hemp has a historic significance, as the village of Oudewater on the west side of Utrecht was known for its hemp and rope production (Blijdenstijn, 2005).

Figure 7.41 Collage for alternative 2

Figure 7.42 to 7.44 From left to right: Spent grain, mushrooms growing on spent grain substrate and mycelium based packaging. Image source: Marchakitus, 2018; Jodha, 2016; Ecovative, 2017

Figure 7.45 Map of water ways and water adjacent brewers that could be participating in the alternative. Around Fort Honswijk the route and stops of the Liniepont (ferry service) is indicated

The alternative intents to maximise the potential of Fort Honswijk as a hub, for both the food system as well as the landscape. The surrounding meadows have good growing conditions for the fibrous materials required, which can be collected and processed at Honswijk. The fortress's earthworks are integrated in the dike, positioning the fort as a node in the landscape between the river, the hinterland and the floodplains. The function is strengthened by the presence of a small harbour at the river side, where until 2017 a small ferry used to moor and transport hikers and cyclists to Fort Everdingen (Uiterwaarde, 2019).

The fortress's access to the water therefore opens up the possibility to transport the resources by boat, especially since some of the larger breweries in the region are located at the water front. These breweries include Brouwerij de Leckere, Stadkasteel Oudaen, Brouwerij Oproer and Brouwerij Kromme Haring, see figure 7.45. As these breweries all have a brew pub as well, the new "*bostelboot*" (English: spent grain boat) could have a secondary function as a ferry for patrons of these breweries. In the case of Fortbrouwerij Duits & Lauret, which is the brewery at Fort Everdingen, the *bostelboot* could reinstate the ferry connection between the two fortresses. This could be the final incentive to develop the harbour, as the fortress's owner the municipality of Houten seeks to develop the harbour and the buildings on site (Van Raay, 2017).

An estimated calculation of the amount of spent grain that could be processed shows that it is unlikely all the collected spent grain can be processed into either mushrooms or mycelium products, see figure 7.47. Hence a collaboration is needed with livestock farmers near the fortress where the residual spent grain can be deposited. Within 1,5 kilometres from Honswijk several cow, pig and goat farms can be found, as was observed in a site visit. Additionally, these farmers could be hired with growing the fibres used in the substrate. A two year rotation scheme of for example willow coppice is proposed, which also allows the farmer to use the leaves and twigs that are unsuitable as fibres as fodder for his cattle (Van Meir, 2012). This principle is called a *voederboom* (fodder tree) and has been experimented with to be multifunctional as both fodder and biomass (Van Eekeren et al., 2014).

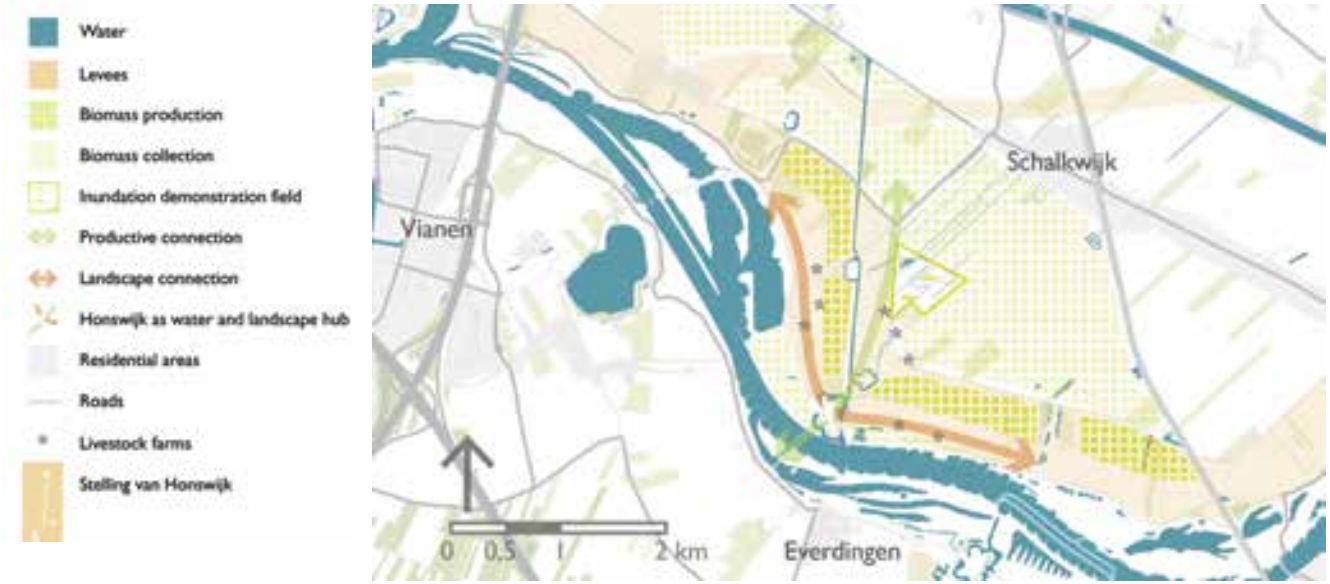


Figure 7.46 (above) Map of Fort Honswijk as hub for landscape connections and circular food system
Figure 7.47 (below) Sankey diagram of proposed food system at Honswijk

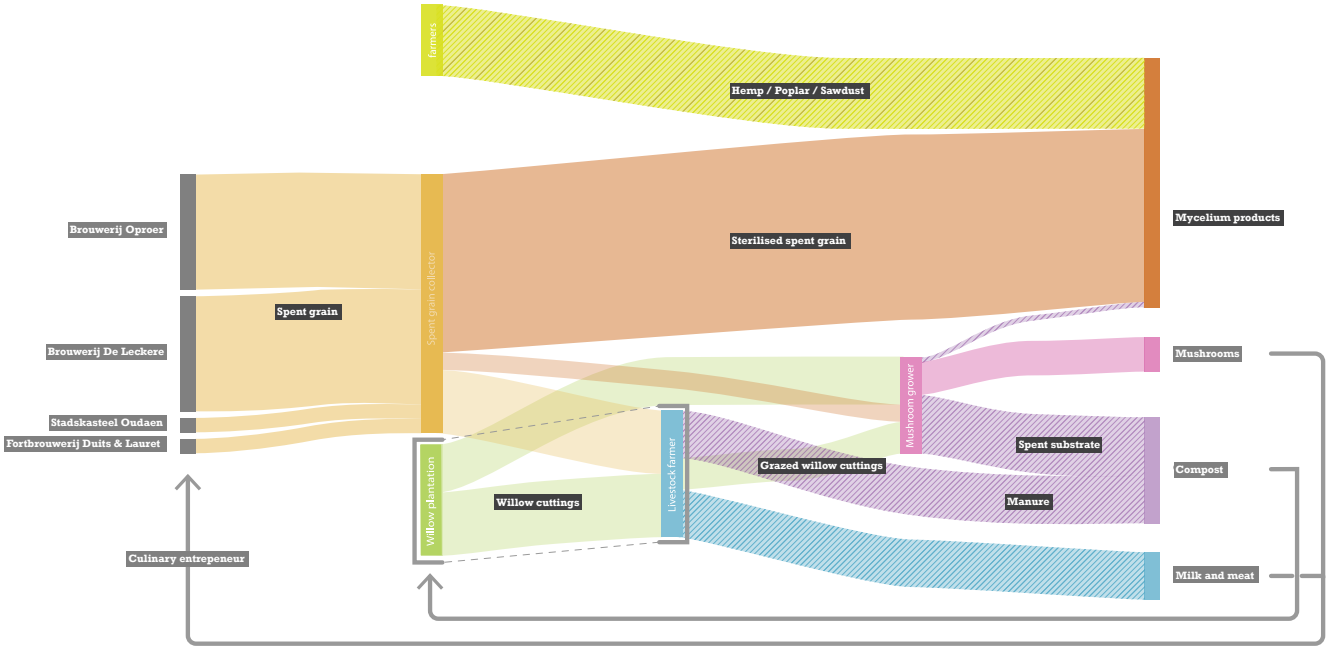


Figure 7.48 Sketced aerial image of Fort Honswijk and proposed interventions

With the focus on transport over water, the importance of the water network in Utrecht for transport is emphasised and the historic narrative of the beer boat is reinterpreted. Figure 7.49 shows a design for a beer label that could reflect this narrative, including wordplay referencing both a cereal and shipping. The products that are developed at the fortress furthermore have an application for brewers as packaging material, making the new food system around Honswijk circular in nature and contributing to the sustainability efforts of brewers.

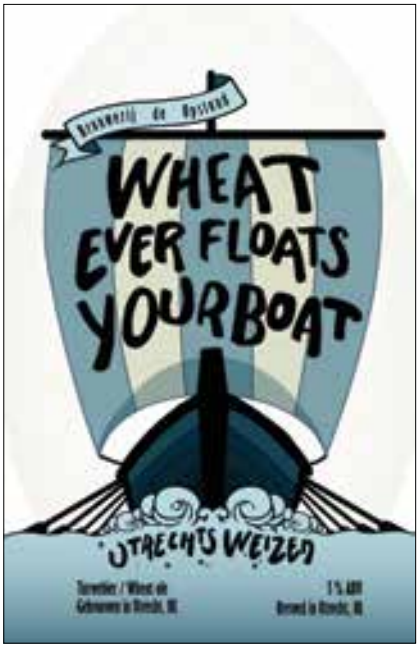


Figure 7.49 (top left) Design beer label alternative 2
Figure 7.50 (top right) Mock-up label alternative 2
Figure 7.51 (left) Mock-up in mycelium box.

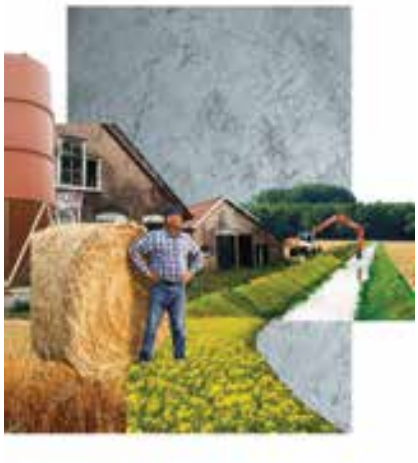


Figure 7.52 Collage of preferred alternative 3

Figure 7.53 Panorama of the Gooyerwetering, near Leersum, looking in the northeastern direction. Image by author

Preferred alternative 3 : Malting estate for better soils and water

The third alternative is located at the fringe of the Utrechtse Heuvelrug, where the water system is fed with seepage from the glacial push moraine. The water board Stichtse Rijnlanden has identified multiple problems in this area that threaten the quality of the landscape, see figure 7.54. Especially the higher grounds on the foot of the push moraine that are in agricultural use are faced with draught in summer, while the lower fields near the canal Langbroekerwetering are faced with water damage. Nature-inclusive farming and water management, and the increase of the storage capacity in surface water have been proposed as solutions (Klaarenbeek, Genders and Blom, 2008; HDSR, 2018).

Both along the fringe as well as the Langbroekerwetering you can find (former) castles and estates that give the landscape allure and a historic sense of grandeur (Wijngaarden, 2017). Next to that, the National Park Utrechtse Heuvelrug borders the area, including some of the many protected nature areas maintained by nature developers Staatsbosbeheer, Natuurmonumenten and Utrechts Landschap. The spatial quality of the area is however threatened by future vacancy of agricultural buildings. Figure 7.55 shows some of the hot spots in the area where farms and farm yards are likely to get out of use in the coming decade (Wageningen Environmental Research, 2017b).

Within this alternative it is proposed to involve some of the vacating farms in a sustainable farming strategy that reconnects the farms to their surroundings. The objective is to grow crops in such a way that they contribute to the improvement of the water system, while the quality of the landscape is maintained or

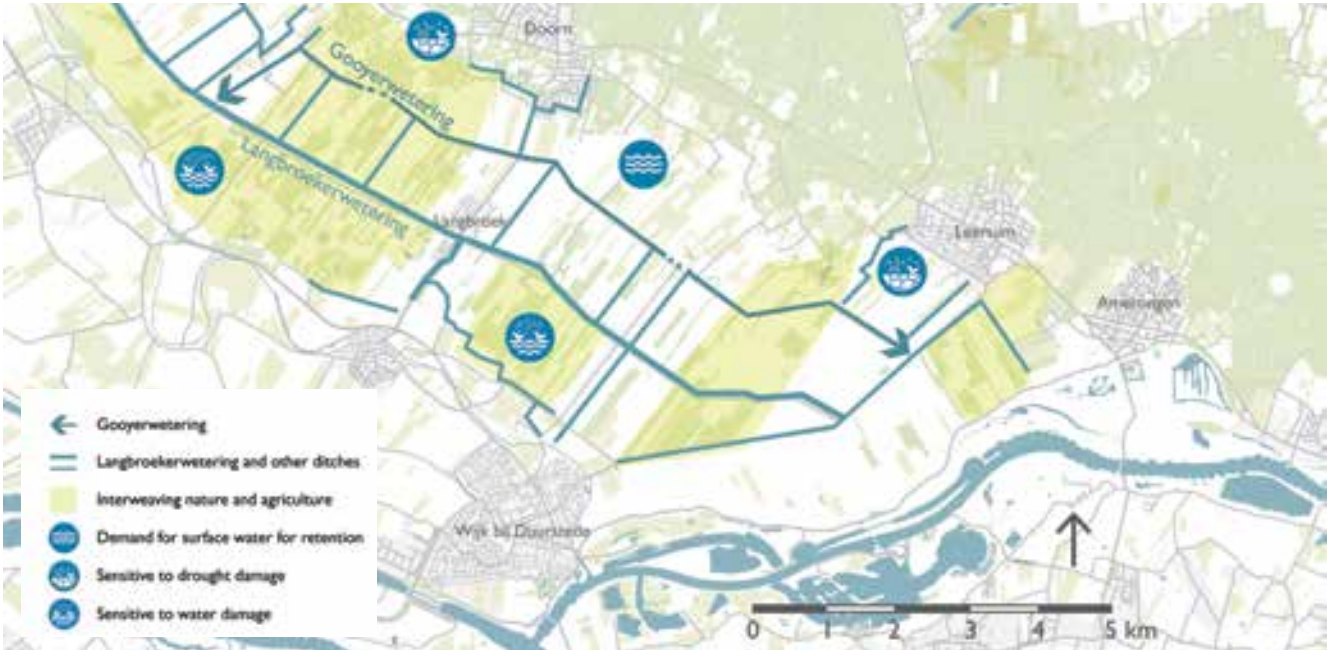
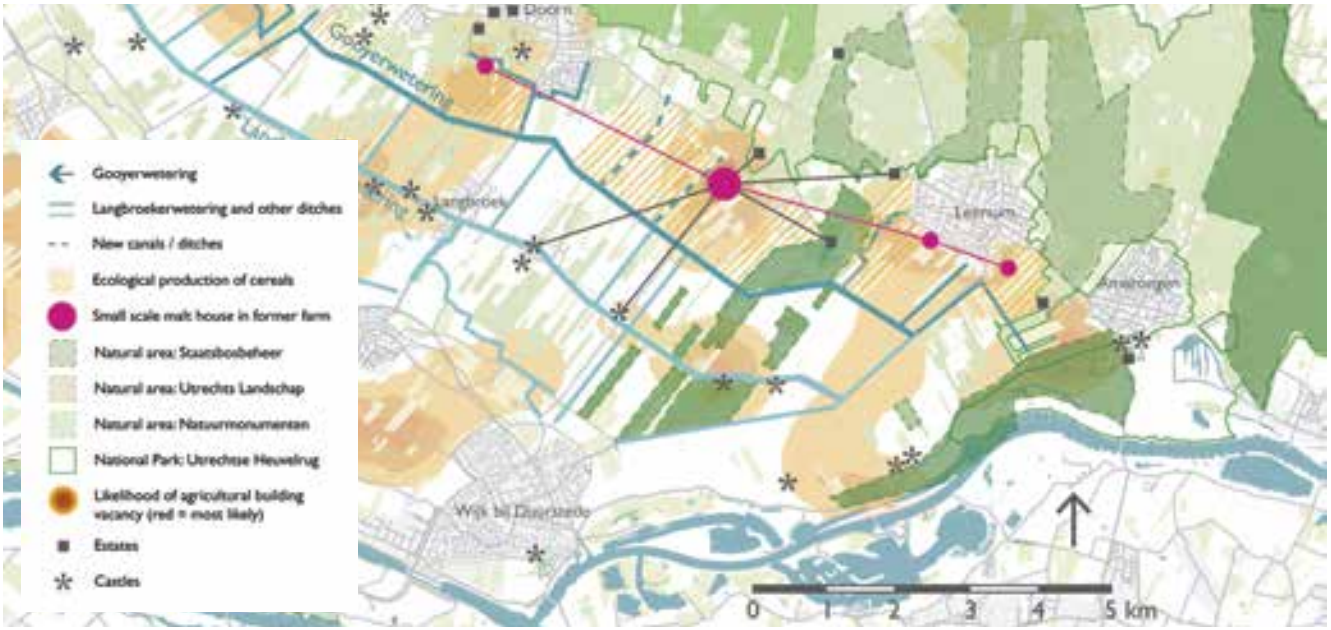


Figure 7.54 (above) Map of water system related issues faced by the Waterboard Stichtse Rijnlanden.
Figure 7.55 (below) Map of proposed location for malting estate in relation to agricultural vacancies, nature areas, estates and catles in the surroundings.



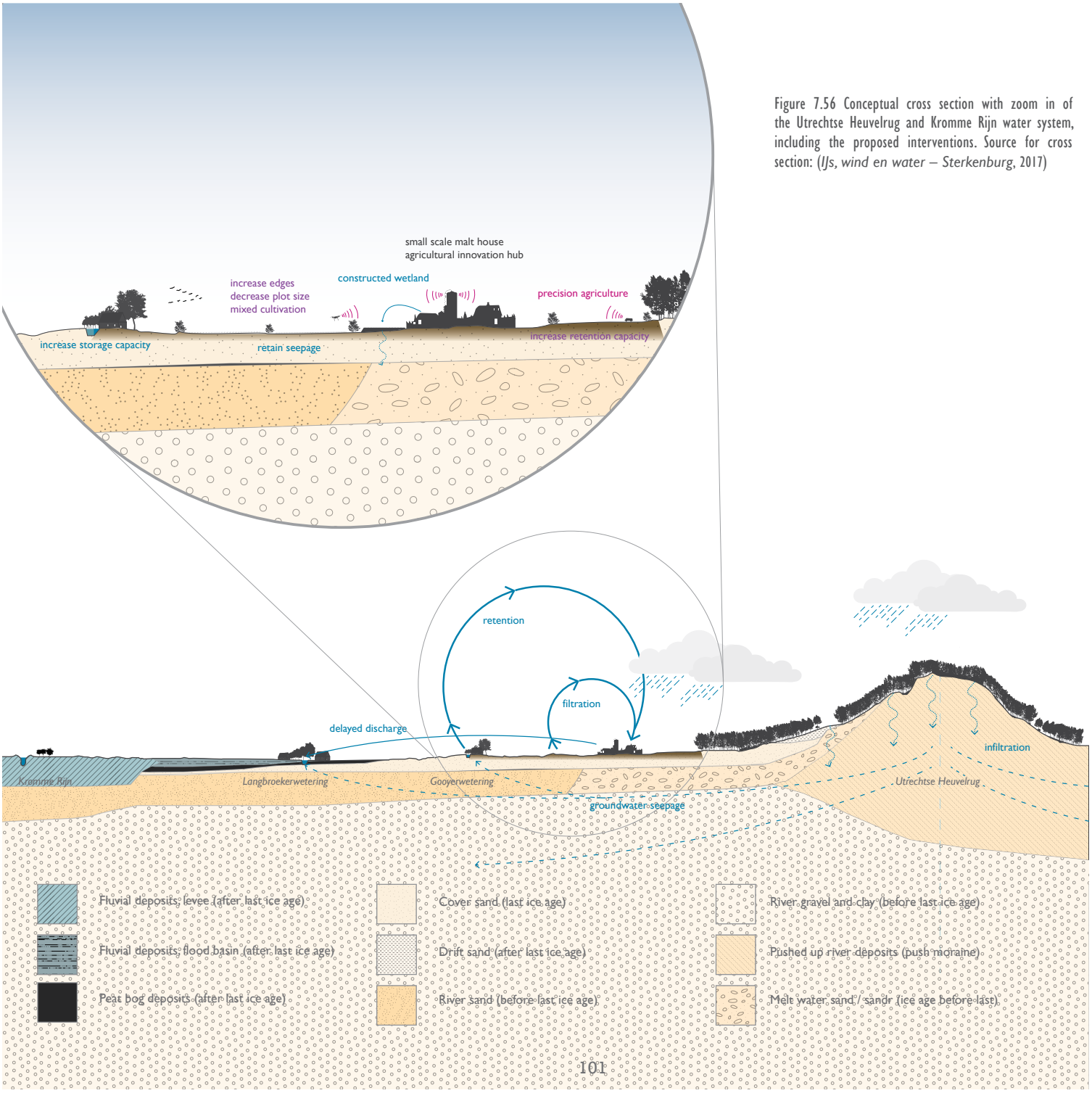


Figure 7.56 Conceptual cross section with zoom in of the Utrechtse Heuvelrug and Kromme Rijn water system, including the proposed interventions. Source for cross section: (*IJs, wind en water – Sterkenburg*, 2017)

Figure 7.57 Collage of malting estate.

even developed as part of the allure of the estates. The contribution to the issues in water system is made through choosing farming practices that improve the retention capacity of the soil and slow down discharges to the surface water during peak precipitation. Creating further retention capacity through increasing ditches and designing constructed wetlands will make it possible for this areas to deal with both draught and water surpluses. Figure 7.56 shows a cross section of the water system, including the interventions at farm scale.

In the intercropping system cereals are sown alternated in rows with another crop that increases the organic matter content, soil structure, the yield of the crop in the field and decreases the amount of pesticides used (Sukkel and Van der Werf, 2017). This increases the land use diversity in the area. Decreasing plot sizes back to historical plot sizes yields smaller batches of cereals that can be processed at the small scale malt house at one of the farms. The scale of operations there allows the batches to be exactly fitted to the demands of the micro brewer (Olsson, Rahbek Christensen and Frausing, 2009).

The malt house and the farms are thus a hub for not only the produced cereals in the region, but also a hub for farmers with an interest in sustainable farming, brewers and other beer enthusiasts. Similarly, neighbouring nature organisations or estate owners that aid monitoring of the contribution of the farming system have a new hub where they could organise activities or meet with partners. Nature organisations have been developing strategies to help farmers convert to more nature inclusive types of farming (Staatsbosbeheer, 2016; Groen Kennisnet, 2017), and this alternative could be a new initiative that does not only help the farmer but also the food system at large to become more sustainable. A collage of the malting estate is given in figure 7.57.

Figure 7.58 to 7.60 Mock up of beer bottles of several regional breweries form the Province of Utrecht, with the Das Mout logo added to their packaging design.

Figure 7.61 Logo design for the mark of quality, mentioning the use of cereals from the Utrechtse Heuvelrug for artisanal malts.

To market the malt and reflect the contribution the alternative is making to farming and product sustainability, a logo was designed that pits a new local hero for the brand. The badger is one of the bigger animals that lives on the Heuvelrug and its territory has slowly been restoring over the last few decades. One of the main reasons the presence of the badger was threatened was a lack of food sources. The type of agriculture that is introduced in the alternative is likely to contribute to the diet of the badger through increased soil fauna and crop diversity. The image and name of the badger is introduced as a brand (Das mout, see figure 7.61) as well as a mark of quality for participating breweries and a new sustainability narrative for drinking audiences. For some examples of how the mark of quality might be incorporated, see figure 7.58 to 7.60. Next to that, it can be adopted as a new corporate identity for a estate-like development at the participating farms, reflected in the painting of shutters like at old lease farms and overall setting of the farm yard, see figure 7.57 on the previous page.

8 Conclusion Discussion

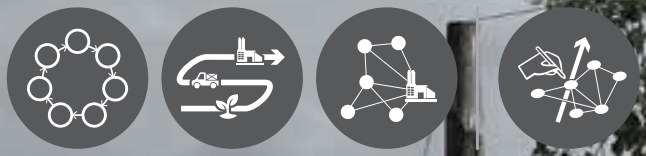


Figure 8.1 Hops and cereals for local beers growing next to each other at Landerij Vantosse, near Oss. Photo by author

This last chapter is organised to convey the results of this research. First the conclusions are described, by answering the research questions. This is followed by a discussion of the findings, including the methods and the significance of this research.

8.1 Conclusion

RQ1: What is the current food system of brewing beer?
The current food system of brewing beer is a diverse system with clearly defined food system sectors. In the past processes of urbanisation, professionalisation and industrialisation contributed to the development of clearly defined food systems sectors that are nowadays spread out globally. As a result, environmental factors and the influence of the landscape have been contained mostly at sector level. Information of the food system seems to be historically biased towards the sectors of Food Production and Processing. The remaining sectors of the food system are considered to be unjustly underexposed and will need to play an equivalent part in the rest of the research.

Due to the craft beer movement, we can clearly distinguish a global industrialized focus and a regional craft beer focus among brewers. The two foci can be best observed related to the realm of the brewery: in what sectors does the brewery have an influence? It can even be argued that much of the variation and contradictions within the food system stem from this divide. The niche of craft brewing has not evolved into its own complete food system in most cases, so the consequential demand for hop, barley and other ingredients puts great pressure on the existing food system. Distinguishing between craft and industrial brewing is important, as the motivation of brewers to get involved with certain practices differ depending on their focus.

RQ2: What are the narratives of brewing beer?
Within the food system food narra-

tives cover a wide range of topics, especially within the realm of the craft brewery. The research has introduced categories for the most prevalent narratives. Originating in the Food Production sector narratives of production concern the practices that go into producing the ingredients, while narratives of origin concern the particular environmental factors that lead to the specific taste and look of a product. In the sectors of Processing, Marketing and Consumption we find narratives of craft and authenticity that have developed as part of the craft brewery movement. In Marketing, Retailing and Consumption narratives of locality and diversity are prevalent. Narratives of sustainability can be found partially in Branding, but mostly in the Resource and Waste Valorisation sector.

The connection of certain narratives to certain sectors are informative of the fact that narratives are tailored to particular audiences. For example, narratives of production around hop seldomly reach Dutch consumers. The Processing sector can be considered a breakpoint for a lot of those narratives, and therefore the influence of a brewer over the stories his product conveys should not be underestimated. The use of narratives is considered to be the most successful when narratives of locality, craft and sustainability are proportionately combined into a spatial brand.

RQ3: What is the network of brewing beer in the province of Utrecht?

As part of the network of brewing beer in Utrecht several strong hubs have been identified, including malt houses, intermediates that sell brewing supplies, breweries and urban areas. Especially breweries have developed into hubs not only for beer and beer related products, but also for engagement with customers and experiences of craft and authenticity. The optimised networks around especially food production firmly root the sector across multiple scales: from the local to the global scale. This leads us to think that even though local production might be possible, it will unlikely replace the dominance of global production in the food system.

The described hubs do provide inspiration for re-locating and re-scaling the network of brewing beer to the landscapes of Utrecht. As craft brewing is the dominant focus in this region, there might be a market and network for designing hubs where there is room for growing beer ingredients hop and barley locally; exploring beer related locations, ingredients and recipes from the region; initiating beer tourism to breweries and festivals; and capitalising on the subtle differences between networks

in urban and rural landscapes. The prevalent hypothesis for connecting the network to the landscape in the design phase is to consider the whole region as a networked territory for the food system. To find the shared motivations amongst actors in that networked territory can be the inspiration for new cooperation and coalitions.

DQ: How might the food spaces in a local food system for beer be integrated with the landscapes and experiences of the Ringpark in the Province of Utrecht?

Integrating food spaces with the landscapes and experiences of the Ringpark in the Province of Utrecht can be seen as a balancing act between the food system, the landscape system of the region and the context or the Ringpark. Based on the analysis results it could be concluded that all three of these components of the objective ought to be first explored on a regional level. A landscape analysis was made to identify regional landscape units, and to be able to pit those aspects against the regional profiles and identities already present in a model study. The resulting models represented different iterations of the balancing act and displayed a range of possible food spaces.

A selection of three models was chosen as preferred alternatives. The selection was consciously made to span as much of the food system sectors as possible, as well as to respond to the most relevant recommendations from the analysis. The final three furthermore were located around the Kromme Rijn area, leaving open the possibility to set aside this area as a new regional profile based on beer production. Eventually it was decided that the three models, when developed in more detail, had more merit as separate entities then as parts of an integrated design. Main reasons being the option to retain some of the range of solutions created by the model study and the possibility to build smaller, specific and more effective collaborations around the preferred alternatives.

The three preferred alternative all represent different elements of the food system, narratives and networks. In figures 8.2 to 8.4 a diagram is made of each alternative respectively, to highlight the new networks of actors around certain narratives or aspects of the landscape. As a base for the compact diagrams, the food system model iteration for food narratives was used as a base, combined with symbols for the involved actors (see the legend). Below he models are explained and the way of how the new food spaces is integrated with the landscapes and experiences of the Ringpark is once again highlighted.

Icons Network Models

Preferred alternative 1

Preferred alternative 1 (Hop harvest festival at Kromme Rijn, figure 8.2) extends the narratives of production into the sector of consumption and preparation to create a package of hop-related experiences for consumers. The brewery cooperates with fruit farmers and a festival organiser around the wider seasonal harvest narrative in the Kromme Rijn area and initiates the infiltration of hop as a part of that narrative [1]. The province of Utrecht helps brewers to organise temporary infrastructure at the University of Utrecht / Uithof Campus for testing and rating the harvested product and ensure brewers of the constant product quality they need [2]. Collaborating with fruit farmers and the festival organiser on the overnight stay accommodations extends the realm of the brewer into new territories where he and the farm can offer the experience of sleeping next to the ingredients to their consumers [3]. The involved municipalities and the province can be involved with the organisation and promotion of an events that could bring a broader, new local identity to their realm [4].

Preferred alternative 2

In preferred alternative 2 (Circular landscape economies at Honswijk, figure 8.3 on the next page) a new food system is created and brewers assume a completely different role as producers instead of processors. They become part of an circular food system that involves a new (culinary) entrepreneur and several farmers from the region. The Province, Municipality of Houten and the Dutch State support the facilities to make the innovative initiative possible and associate with a new sustainable narrative [1]. The location makes Fort Honswijk, the Stelling of Honswijk, the borders of the river Lek and the surroundings at the Eiland van Schalkwijk an inte-

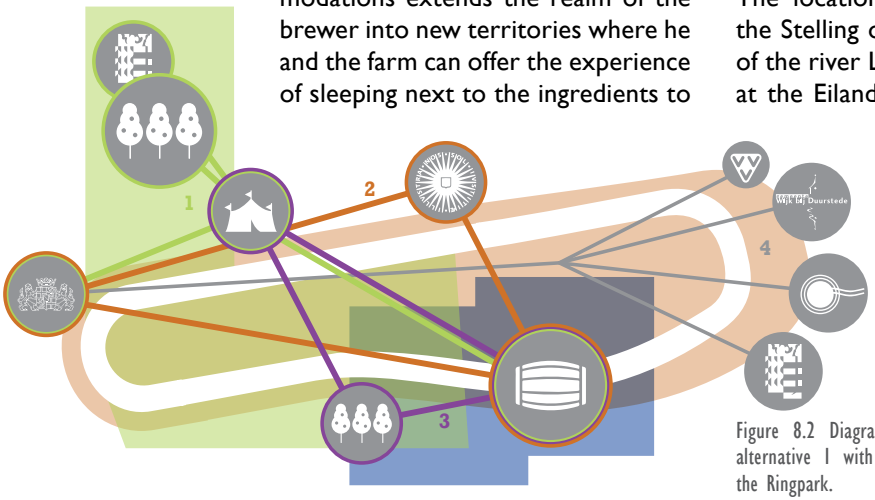


Figure 8.2 Diagram of the integration of preferred alternative 1 with the landscapes and experiences of the Ringpark.

gral part of the food system [2].

Preferred alternative 3

Preferred alternative 3 (Malting estate for better soils and water, figure 8.4) creates room for sustainable production narratives in the landscape of the Utrechtse Heuvelrug by making the production, processing and resource and waste recovery contributors to the water system. This intricate system requires the involvement of many partners, include nature developers, the water board, research institutes such as Wageningen UR and the Food Valley coalition and the Province as matchmaker [1]. The strategy to develop vacant farm yards and allocate production is developed together with the Province, the eater board, the malter and the involved municipality Utrechtse Heuvelrug [2]. A spatial brand is built around the particularities of the landscape and the contribution of the malt house to the water system, which is carried not only by brewer and malt house, but also by the actors that depend on interaction with the inhabitants of the region: nature developers Staatsbosbeheer, Natuurmonumenten and the regional tourism association VVV [3].

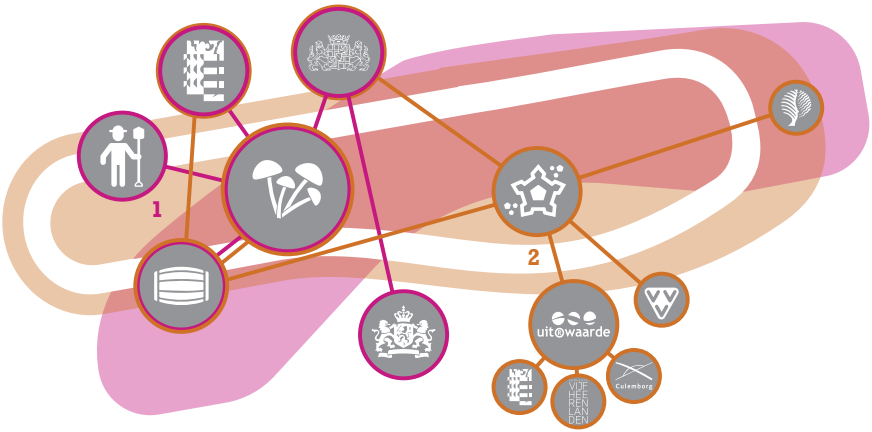


Figure 8.3 Diagram of the integration of preferred alternative 2 with the landscapes and experiences of the Ringpark.

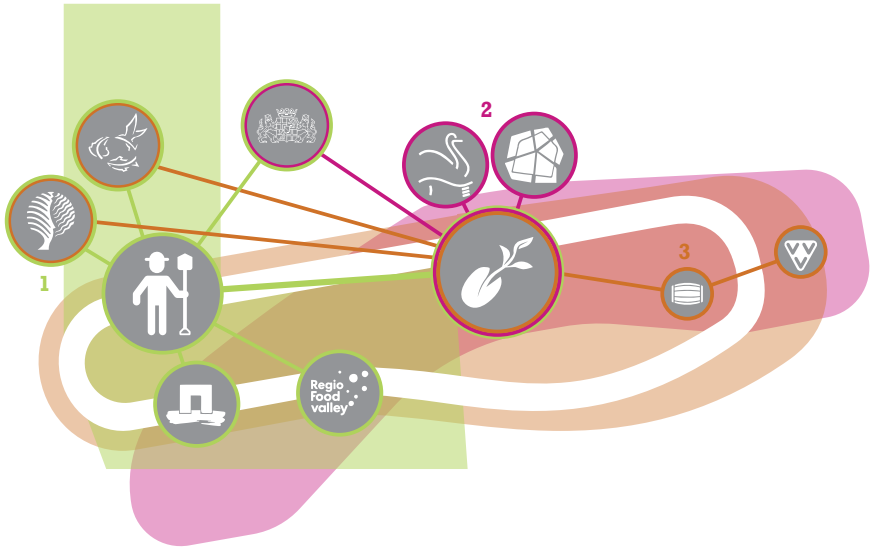


Figure 8.4 Diagram of the integration of preferred alternative 3 with the landscapes and experiences of the Ringpark.

8.2 Discussion

Bridging local and regional, quantitative and qualitative

Over the last few decades, food has become a topic with presence and impact in the practice of landscape architecture. Firstly, many qualitative approaches to food design can be observed, focusing on urban agriculture, small scale interventions and the social dimensions of food. Secondly, regional design studies with a more quantitative and technocratic approach have contributed to food system sustainability and self-sufficiency of regions.

In the article *Eating Places: Food systems, narratives, networks and spaces* Matthew Potteiger mainly used examples that come from either one of these two perspectives. The specific context of this thesis however required a qualitative approach to a complex food system, on the scale of a metropolitan region. The prime significance of this thesis to the field is therefore that it has positioned the Food Systems Approach (FSA) as a valid qualitative approach to regional food system design.

Capturing nuance

Unlike some of the examples in the article by Potteiger, beer is a product of a composite food system that ties together multiple food chains with many different actors across multiple scales. In the brewery-centred inventory stages it became clear that a craft brewer is expected to add his own innovation, story and conviction to the ingredients he uses, which at times resulted in contradictory statements of what the actual problem or opportunity for design was. These particularities of the food system required a thick description, for which the food narratives, - networks and - places analysis have proven to be useful tools.

The way in which this thesis has capitalised on the thickness and nuance of this particular food system in a designerly way can be consider as a contribution to the range of the FSA as a research and design approach (Cross, 1982). The models and preferred alternatives have shown that there can be room for the multifaceted dynamics of local beer production, without compromising on qualitative interventions in a food system. Finding the appropriate tools for analysis and design (such as the adaptable food system diagram and the beer labels) has been instrumental in making the analysis results applicable to the design.

The influence of the Ringpark

The influence of the Ringpark context in making this contribution cannot be underestimated. Besides adding

another layer to an already complex assignment, it provided the design phase with means to streamline ideas. Key elements from the context for this were: the regional profiles for zooming in to Kromme Rijn area, the incentive to build upon the landscape and water system that came through in all three alternatives and the focus on matchmaking. Without this tailoring, the project had likely drifted to one of the two dominant approaches in food design.

Limiting the scope of the interventions to the fourth park ring also positioned the project in the force field of city and country side. This meant leaving room in the research and design for the demands of a growing region, such as recreation and nature. Being aware of the influence of the city in the fourth park ring opened up the possibilities to think beyond the countryside as the place where the production sector would be located. Instead the landscape was made an integral part of all sectors of the food system. Consciously reworking and placing elements from especially the food system sectors of marketing and consumption therefore lead to the three alternatives being new attractions in the landscapes of the Utrecht region.

Towards a regional park

Initially it was thought that maximizing the production of local ingredients might introduce the beerscape as a new landscape structure to support the park. The diversity of the brewing sector and the mixed signals from brewers about participating in local production eventually led to the conclusion that this was not the idea to be pursued. From the point of view of matchmaking and looking for new coalitions this idea was also thought unrealistic.

Nevertheless the food system perspective was able to contribute to park development, be it in a more subtle way. Parks in a traditional understanding depend on programming and the activities of people to make the landscape come alive. What the societal attention for the provenance of food has shown is that local food can attribute new meaning to the landscape. Food becomes a vehicle for new (culinary) experiences, it inspires appreciation for the terroir of the landscape and it creates new expectations for what one might get from going on a walk or a bike ride through a park. Awareness of this mechanism throughout the entire thesis project is exactly what made food a contributor to the regional park.

Furthermore, the openness in the design for tried and tested spatial concepts from the region shows another way this project has contributed to park development. Examples include

the landscape estate and the fortress as a hub in the landscape. Interpreting those concepts from a food systems perspective integrated the food system of beer in several regional spatial networks. Simultaneously adding the diversity and new experiences of food to those networks, might contribute to the strength of those networks as carriers of a regional park structure.

An appropriate scale for cooperation

Some of the shortcomings of this research can be related to participation, as the willingness to participate among brewers from the region in this research has been limited. This might be caused by the popularity of craft beer beyond consumers (i.e. researchers), which left the sector overcharged. To move forward with the food system of beer as a contributor to regional park design, filling the remaining knowledge gap by quantifying and calculating the impact of the models on an agronomic, economic and landscape level is needed to check feasibility and accuracy of the design. Most importantly, participating with the sector and the other actors imagined in this research to validate or develop the proposals is inevitable. Concerning this, the study of scale that has emerged in several phases of this research might provide some leads.

All models, and especially the three preferred alternatives, demand cooperation on a local scale. At the scale level of the preferred alternative, a shared understanding exists of local identity, the functioning of the landscape and everyone's part to play in this system. This understanding is crucial for making the alternatives work, as the motivation to contribute is rooted in that particular place. An example from the research is the malt house alternative, where there the common understanding of how both farmers and nature organisation contribute to a more diverse and resilient landscape is the focal point of the assignment.

On the other hand, the models' position within the greater food system should not be disregarded. Drinking craft beer in its core remains an urban practice. As this research has shown, even local initiatives still depend on urban areas as markets for their products and therefore their impact will transcend the local scale to the scale of the region and beyond. This unique position of the models requires an initiating party that acts as matchmaker between different scales of both the landscape as well as the government.

Even though the Ringpark as a concept was initiated on the level of the Province, reasoning from the findings of this research I would like to argue for cooperation that is bound to a certain area or landscape unit and is able to adopt the shared understanding of and motivation for the landscape's functionality. Existing examples include the Food Valley alliance or several other small and strategic cooperatives to whom the Province is a driving force. Taking inspiration from the results of this research: consider building the organisation of the Ringpark on the principle of the networked territory.

References

Resources for literature review

Bamforth, C. W. (no date) Brewing materials and processes : a practical approach to beer excellence.

Beek, M. A. van Balkenende, W. P. Beekom, C. W. C. van Bom, G. J., Luyendijk, P. and Rijkslandbouwvoorlichtingsdienst voor de Zeeuwse Eilanden (1959) De Hopkultuur. Goes: Rijkslandbouwvoorlichtingsdienst voor de Zeeuwse Eilanden.

Beek, M. A. van., Balkenende, W. P., Beekom, C. W. C. van, Bom, G. J. and Luyendijk, P. (1959) De hopkultuur, Rijkslandbouwvoorlichtingsdienst voor de Zeeuwse Eilanden,. [Goes] : Rijkslandbouwvoorlichtingsdienst voor de Zeeuwse Eilanden,.

Behre, K.-E. (1999) 'The history of beer additives in Europe -a review', Vegetation History and Archaeobotany , 8, pp. 35–48.

van Dijk, M., Kroezen, J. and Slob, B. (2018) 'From Pilsner Desert to Craft Beer Oasis: The Rise of Craft Brewing in the Netherlands', in Garavaglia, C. and Swinnen, J. (eds) Economic Perspectives on Craft Beer. Cham: Springer International Publishing, pp. 259–293.

Duijnhouwer, I. D. C. and Zevenbergen, B. (1988) Richtlijnen voor de teelt van brouwersgerst, Mededelingen van de Stichting Nederlands Instituut voor Brouwgerst, Mout en Bier ; 1988-27; Mededelingen van de Stichting Nederlands Instituut voor Brouwgerst, Mout en Bier ; 1988-27. TA -. Zeist : Nibem,.

Garavaglia, C. and Swinnen, J. (2018) 'Economics of the Craft Beer Revolution: A Comparative International Perspective', in Economic Perspectives on Craft Beer. Cham: Springer International Publishing, pp. 3–51.

Gatrell, J., Reid, N. and Steiger, T. L. (2018) 'Branding spaces: Place, region, sustainability and the American craft beer industry', Applied Geography. Pergamon, 90, pp. 360–370.

Gibson, B., Geertman, J.-M. A., Hittinger, C. T., Krogerus, K., Libkind, D., Louis, E. J., Magalhaes, F. and Sampaio, J. P. (2017) 'New yeasts—new brews: modern approaches to brewing yeast design and development', FEMS Yeast Research, 17, pp. 1–13.

Hede, A.-M. and Watne, T. (2013) 'Leveraging the human side of the brand using a sense of place: Case studies of craft breweries', Journal of Marketing Management, 29(1–2), pp. 207–224.

Hoalst-Pullen, N., Patterson, M. W., Mattord, R. A. and Vest, M. D. (2014) 'Sustainability Trends in the Regional Craft Beer Industry', in The Geography of Beer. Dordrecht: Springer Netherlands, pp. 109–116.

Horijon, T. (2015) Beer from here: Place attachment of Dutch Microbreweries. Radboud University Nijmegen.

De Jongh, J. and Tramper, A. (2018) Nationaal Bieronderzoek 2018. Amsterdam.).

Lawrence, M. (1990) The encircling hop : a history of hops and brewing, SAWD. Sittingbourne : SAWD,.

Lynch, K. M., Steffen, E. J. and Arendt, E. K. (2016) 'Brewers' spent grain: a review with an emphasis on food and health', Journal of The Institute of Brewing & Distilling, (122), pp. 553–568.

Nicolas, E. (1966) Gerst en bier, Centraal Instituut voor Voedingsonderzoek T N O. Zeist: Centraal Instituut voor Voedingsonderzoek TNO,.

Priest, F. G. and Stewart, G. G. (eds) (2006) Handbook of Brewing. Second. Boca Raton, Florida: CRC Press Taylor & Francis group.

Prins, L. A. J. (1986) Knelpunten bij de produktie, afzet en verwerking van inlandse gerst voor de brouwindustrie, Mededeling / Stichting Nederlands Instituut voor Brouwgerst, Mout en Bier ; no. 26 TA -. Zeist : Nibem,.

Thorsøe, M. H., Kjeldsen, C. and Noe, E. (2017) 'It's never too late to join the revolution! – Enabling new modes of production in the contemporary Danish food system', European Planning Studies. Routledge, 25(7), pp. 1166–1183.

Volkers, K. and Kik, C. (2016) 'Nieuwe hoop voor de Nederhop? Ondergang en opleving van de hopteelt in Nederland', Tijdschrift voor Historische Geografie, 1(3), pp. 147–163.

Wilschut, M. and Koedoot, M. (2014) 'Groen bier', in Natuur & Ondernemen: winst uit vergroening. Velp: Hogeschool Van Hall Larenstein, pp. 6–15.

All references

Amerongen, O. (no date) Hoprassen Overzicht met % alfazuur, bitterheid & doel | Hopscheuten.nl, Hopscheuten. Available at: https://www.hopscheuten.nl/rassen/ (Accessed: 19 June 2018).

Anderson, R. G. (2006) 'Chapter 1 - History of Industrial Brewing', in Priest, F. G. and Stewart, G. G. (eds) Handbook of Brewing. Second. Boca Raton, Florida: CRC Press Taylor & Francis group, pp. 1–38. Available at: https://www.taylorfrancis.com/books/e/9781420015171.

Arbuckle, A. (2017) When London families spent their summers picking hops in the countryside - AOL Finance, Aol. Available at: https://www.aol.com/article/finance/2017/06/14/when-london-families-spent-their-summers-picking-hops-in-the-cou/22127456/?guccounter=1&guce_referrer_us=aHR0cHM6Ly93d3cuZ29vZ2xlLmNvbS8&guce_referrer_cs=tVWl8i8-C7-DuANAaLw52A (Accessed: 3 April 2019).

Beek, M. A. van., Balkenende, W. P., Beekom, C. W. C. van, Bom, G. J. and Luyendijk, P. (1959) De hopkultuur, Rijkslandbouwvoorlichtingsdienst voor de Zeeuwse Eilanden,. [Goes] : Rijkslandbouwvoorlichtingsdienst voor de Zeeuwse Eilanden,.

Behre, K.-E. (1999) 'The history of beer additives in Europe -a review', Vegetation History and Archaeobotany , 8, pp. 35–48. Available at: https://link.springer.com/content/pdf/10.1007%2FBF02042841.pdf (Accessed: 4 May 2018).

Belasco, W. (2014) 'No Title Terroir in D.C.? Inventing Food Traditions for the Nation's Capital', in Brulotte, R. L. and Di Giovine, M. A. (eds) Edible Identities: Food as Cultural Heritage. First. Farnham: Ashgate Publishing Limited, pp. 39–54.

Best Pellet Plant (no date) Hops Pellet Production Plant, ABC Machinery. Available at: http://www.bestpelletplant.com/hops-pellet-production-plant.html (Accessed: 25 April 2019).

Bieleman, J. (2010) Five centuries of farming. A short history of Dutch agriculture 1500-2000 Mansholt publication series - Volume 8. Edited by W. Heijman et al. Wageningen: Wageningen Academic Publishers. doi: 10.3920/978-90-8686-693-9.

Biernet (2019) Bier agenda - kalender | Bier activiteiten in Nederland & België, Biernet. Available at: https://www.biernet.nl/bier/agenda?beginDatum=06-02-2019&eindDatum=06-02-2020&categorie=1 (Accessed: 16 April 2019).

Biernet.nl (2017) Bierbrouwerijen in Utrecht, Biernet.nl. Available at: https://www.biernet.nl/bier/brouwerijen/nederland/

Blijdenstijn, R. (2005) Tastbare Tijd. Cultuurhistorische atlas van de provincie Utrecht. First. Utrecht: Provincie Utrecht.

Bok, O. (2018) Kolkbier sponsort zeemanskoor De Brulboei, inVreeswijk. Available at: https://www.invreeswijk.nl/kolkbier-sponsort-vreeswijks-zeemanskoor-de-brulboei/?fbclid=IwAR3hF_uF15vzyZHr3n1hkUJYHG8JRu7rNxsRCqCzp3YNHItStqxqbiG5878 (Accessed: 19 April 2019).

Brewferm and Brouwland (no date) Hopgids. Beverlo. Available at: https://www.brouwland.com/content/assets/docs/Hops_NL.pdf (Accessed: 29 January 2019).

Brinkley, C. (2013) 'Avenues into Food Planning: A Review of Scholarly Food System Research', International Planning Studies, 18(2), pp. 243–266. doi: 10.1080/13563475.2013.774150.

brouw-bier.nl (no date) Mouterijen, brouw-bier.nl. Available at: https://www.brouw-bier.nl/adressen/mouterijen.aspx (Accessed: 10 December 2018).

Brouwerij 't Mirakel (2017a) Brouwerij 't Mirakel – Wonderbier, Brouwerij 't Mirakel. Available at: https://brouwerij-mirakel.nl/ (Accessed: 30 July 2018).

Brouwerij 't Mirakel (2017b) 'Image: Logo Brouwerij 't Mirakel'. Amersfoort: Brouwerij 't Mirakel via Facebook. Available at: https://www.facebook.com/wonderbier/ (Accessed: 31 January 2019).

Brouwerij De Leckere (no date) De Leckere, De Leckere. Available at: http://www.deleckere.nl/ (Accessed: 30 July 2018).

Brouwerij de Plukker (2018) All Inclusive 2018, Brouwerij de Plukker. Available at: https://www.plukker.be/beers/all-inclusive/ (Accessed: 29 January 2019).

Brouwerij de Vecht (no date) Ons verhaal, Brouwerij de Vecht. Available at: https://www.brouwerijdevecht.com/our_story (Accessed: 17 April 2019).

Brouwerij Heuvel (2019) Brouwerij Heuvel. Available at: https://www.brouwerijheuvel.nl/ (Accessed: 12 April 2019).

Brouwerij Hommeles (2019) Untaped #3 At The Hop, Houtens Brouw Collectief. Available at: https://www.houtensbrouwcollectief.nl/brouwerij-hommeles/onze-bieren/hommeles-at-the-hop (Accessed: 12 April 2019).

Brouwerij Jopen (no date) 'Het Jopen Brouwproces'. Haarlem: Brouwerij Jopen, p. 1.

Brouwerij Maximus (no date) Maatschappelijk ondernemen, Brouwerij Maximus. Available at: http://www.maximusbrouwerij.nl/mvo/ (Accessed: 1 February 2019).

BuildASoil (no date) 'Malted Barley Grain for SST - Certified Organic -'. BuildASoil. Available at: https://buildasoil.com/products/barley-malted-barley-grain-for-sst?variant=8779503009909 (Accessed: 24 January 2019).

Campagne Nederlandse Bierstijlen (2015) Poster Festival Historische Nederlandse Bierstijlen 2015, Bierstijlen.nl. Available at: http://bierstijlen.nl/wp-content/uploads/2015/05/Festival-Bierstijlen-2015-poster-def.jpg (Accessed: 26 April 2019).

Cargill (no date) Voedingsmiddelen en Dranken. Available at: https://www.cargill.nl/nl/voedingsmiddelen-en-dranken (Accessed: 11 April 2019).

Cartwright, W., Gartner, G. and Lehn, A. (2009) Cartography and art. Springer Science & Business Media.

Castells, M. (2000) 'Grassrooting the space of flows', in James O. Wheeler, Yuko Aoyama, B. W. (ed.) Cities in the Telecommunications Age: The Fracturing of Geographies. 1st edn. New York and London: Routledge, pp. 18–27. Available at: https://books.google.nl/books?hl=en&lr=&id=UYI1IRa0TmQC&oi=fnd&pg=PA18&dq=space+of+flows+castells&ots=E6lFgx2pRP&sig=JDaWILXM-kNHqcEi4JBCtQ0Q1go#v=onepage&q=space of flows castells&f=false (Accessed: 16 April 2018).

CBS (2017) Statline - Akkerbouwgewassen; productie naar regio, Centraal Bureau voor de Statistiek. Available at: https://statline.cbs.nl/Statweb/publication/?DM=SLNL&PA=7100OOGS&D1=0&D2=0,3-6&D3=0,11&D4=23&HDR=G2,G3,T&STB=G1&VW=T (Accessed: 11 April 2019).

CBS (2018) StatLine - Landbouw; gewassen, dieren en grondgebruik naar regio, Centraal Bureau voor de Statistiek. Available at: https://opendata.cbs.nl/statline/#/CBS/nl/dataset/80780ned/table?ts=1531481594677 (Accessed: 13 July 2018).

Centraal Bureau voor de Statistiek (2018) Bevolking - Stand en prognose, Staat van Utrecht Databank. Utrecht: Staat van Utrecht. Available at: https://staatvanutrecht.databank.nl/ (Accessed: 6 March 2019).

Cook, Z. M. (2018) 'Craft Brewing Festivals', in Slocum, S. L., Kline, C., and Cavaliere, C. T. (eds) Craft Beverages and Tourism, Volume 2. Cham: Springer, pp. 141–157. doi: 10.1007/978-3-319-57189-8_9.

CraftBeer.com (2019) Beer Glossary, CraftBeer.com. Available at: https://www.craftbeer.com/beer/beer-glossary (Accessed: 25 April 2019).

Creswell, J. W. (2014) Research design : qualitative, quantitative, and mixed methods approaches. Los Angeles: Sage.

Cross, N. (1982) 'Designerly ways of knowing', Design Studies, 3(4), pp. 221–227. Available at: http://larossa.co/cross_1982_designerlywaysofknowing.pdf (Accessed: 9 May 2019).

Dahl, S. (2000) Cultural Values in Beer Advertising, Dahl.at. Available at: http://dahl.at/wordpress/research-publications/intercultural-communication/cultural-values-in-beer-advertising/ (Accessed: 9 April 2019).

Davies, N. (2016) 'Chapter 1 – Malts', in Brewing Materials and Processes, pp. 1–25. doi: 10.1016/B978-0-12-799954-8.00001-0.

De Jongh, J. and Tramper, A. (2018) Nationaal Bieronderzoek 2018. Amsterdam. Available at: https://www.nederlandsebrouwers.nl/site/assets/files/1395/rapport_nationaal_bieronderzoek_2018.pdf (Accessed: 1 February 2019).

De Loonbrouwerij (2017) Gebrouwen bieren, De Loonbrouwerij. Available at: https://loonbrouwerij.nl/gebrouwen-bieren/ (Accessed: 16 April 2019).

Delirious NL (2011) NL Architects Blog. Available at: https://nlarchitects.wordpress.com/2011/09/01/delirious-nl/ (Accessed: 10 April 2019).

Deming, M. E. and Swaffield, S. (2013) Landscape architecture research : inquiry, strategy, design. Wiley. Available at: https://books.google.nl/books?hl=en&lr=&id=FMgq98KFI98C&oi=fnd&pg=PA1&dq=landscape+architecture+research+deming&ots=eHiH6Yxqve&sig=b7LqFqphOSTdXDaTdDkokJjemHA#v=onepage&q=landscape architecture research deming&f=false (Accessed: 9 March 2018).

Duijnhouwer, I. D. C. and Zevenbergen, B. (1988) Richtlijnen voor de teelt van brouwersgerst, Mededelingen van de Stichting Nederlands Instituut voor Brouwgerst, Mout en Bier ; 1988-27; Mededelingen van de Stichting Nederlands Instituut voor Brouwgerst, Mout en Bier ; 1988-27. TA -. Zeist : Nibem,. utrecht?center=52.09844488032244,5.2336580592261726&zoom=10&filters=brouwerij,brouwerij_huurder (Accessed: 12 April 2018).

Eaton, B. (2006) 'An Overview of Brewing', in Priest, F. and Stewart, G. (eds) Handbook of Brewing. Second. Boca Raton, Florida: CRC Press Taylor & Francis Group, pp. 77–90.

Ecovative (2017) GROW: A Lamp YOU Grow from Mushroom Mycelium, Kickstarter. Available at: https://www.kickstarter.com/projects/growlamp/grow-a-lamp-you-grow-from-mushroom-mycelium (Accessed: 5 May 2019).

Ecovative (2018) MycoComposite Panels, Ecovative. Available at: https://shop.ecovativedesign.com/products/panels?variant=12127831916638 (Accessed: 7 November 2018).

Eriksen, S. N. (2013) 'Defining local food: Constructing a new taxonomy - three domains of proximity', Acta Agriculturae Scandinavica Section B: Soil and Plant Science, 63(Supplement 1), pp. 47–55. doi: 10.1080/09064710.2013.789123.

Eumann, M. and Schaeberle, C. (2016) 'Chapter 5 – Water', in Brewing Materials and Processes, pp. 97–111. doi: 10.1016/B978-0-12-799954-8.00005-8.

FAO (2009) Agribusiness Handbook Barley Malt Beer. Rome. Available at: www.eastagri.org, (Accessed: 11 April 2019).

Feagan, R. (2007) 'The place of food: Mapping out the "local" in local food systems', Progress in Human Geography. Sage PublicationsSage CA: Thousand Oaks, CA, 31(1), pp. 23–42. doi: 10.1177/0309132507073527.

Food and Agriculture Organisation of the United Nations (2018) FAOSTAT Database - Crops - Hops, FAO. Available at: http://www.fao.org/faostat/en/#data/QC/visualize (Accessed: 14 January 2019).

Freepik (no date) 'Background of water in motion Photo | Free Download'. Freepik. Available at: https://www.freepik.com/free-photo/background-water-motion_1101151.htm (Accessed: 24 January 2019).

Garavaglia, C. and Swinnen, J. (2018) 'Economics of the Craft Beer Revolution: A Comparative International Perspective', in Economic Perspectives on Craft Beer. Cham: Springer International Publishing, pp. 3–51. doi: 10.1007/978-3-319-58235-1_1.

Gatrell, J., Reid, N. and Steiger, T. L. (2018) 'Branding spaces: Place, region, sustainability and the American craft beer industry', Applied Geography. Pergamon, 90, pp. 360–370. doi: 10.1016/J.APGEOG.2017.02.012.

Gemeente Utrecht (no date) Bierboot, Gemeente Utrecht. Available at: https://www.utrecht.nl/wonen-en-leven/verkeer/goederenvervoer/lad-en-en-lossen/bierboot/ (Accessed: 23 November 2018).

Gemeente Utrecht Afdeling Onderzoek (2017) Bevolkingsprognose 2017. Utrecht. Available at: https://www.utrecht.nl/fileadmin/uploads/documenten/bestuur-en-organisatie/publicaties/onderzoek-en-cijfers/2017-12-Rapportage-Bevolkingsprognose.pdf (Accessed: 26 February 2018).

Geodienst Rijksuniversiteit Groningen (2018) Hop- en gerstproductie in Nederland 2017, Twitter. Available at: https://twitter.com/rug_geo/status/1053298709017051136 (Accessed: 4 December 2018).

Gibson, B., Geertman, J.-M. A., Hittinger, C. T., Krogerus, K., Libkind, D., Louis, E. J., Magalhaes, F. and Sampaio, J. P. (2017) 'New yeasts—new brews: modern approaches to brewing yeast design and development', FEMS Yeast Research, 17, pp. 1–13. Available at: https://watermark.silverchair.com/fox038.pdf?token=AQECAHi208BE49Ooan9kkhW_

Gorzolka, K., Kölling, J., Nattkemper, T. and Niehaus, K. (2016) Spatio-Temporal Metabolite Profiling of the Barley Germination Process by MALDI MS Imaging, PLoS ONE. doi: 10.1371/journal.pone.0150208.

Graanrepubliek (2019) Mouterij Kiemkracht, Graanrepubliek. Available at: https://www.graanrepubliek.nl/cooeperatie/graanverwerking/mouterij (Accessed: 14 January 2019).

Groen Kennisnet (2017) Terreinbeheerders als voorloper in natuurinclusieve landbouw, Groen Kennisnet. Available at: https://www.groenkennisnet.nl/nl/groenkennisnet/show/Terreinbeheerders-als-voorloper-in-natuurinclusieve-landbouw.htm (Accessed: 8 May 2019).

Gulpener Bierbrouwerij (2018) Gulpener Hopoogst 2018, Gulpener. Available at: https://www.gulpener.nl/gulpener-hopoogst-2018/ (Accessed: 17 April 2019).

HDSR (2018) Verbreden Gooyerwetering en Driebergse Meer, Hoogheemraadschap De Stichtse Rijnlanden. Available at: https://www.hdsr.nl/beleid-plannen/watergebiedsplannen/langbroekerwetering/verbreden/ (Accessed: 7 May 2019).

Hede, A.-M. and Watne, T. (2013) 'Leveraging the human side of the brand using a sense of place: Case studies of craft breweries', Journal of Marketing Management, 29(1–2), pp. 207–224. doi: 10.1080/0267257X.2012.762422.

Heineken Nederland, Provincie Zuid-Holland and Alterra Wageningen UR (2015) Groene Cirkels: Duurzaamheid van Wereldklasse. Zoeterwoude. Available at: https://www.groenecirkels.nl/upload_mm/0/0/3/5fdea1b1-0e15-4926-9402-a167324d0613_GroeneCirkels-DuurzaamheidVanWereldklasse-digital.pdf (Accessed: 19 February 2018).

History of Craft Brewing (2017) Brewers Association. Available at: https://www.brewersassociation.org/brewers-association/history/histo-

ry-of-craft-brewing/ (Accessed: 25 January 2019).

Hoalst-Pullen, N., Patterson, M. W., Mattord, R. A. and Vest, M. D. (2014) 'Sustainability Trends in the Regional Craft Beer Industry', in The Geography of Beer. Dordrecht: Springer Netherlands, pp. 109–116. doi: 10.1007/978-94-007-7787-3_11.

Hobbybrouwen.nl (no date) Leveranciers van zelfbrouwartikelen. Available at: https://www.hobbybrouwen.nl/leveranc.html (Accessed: 11 April 2019).

Holland Malt (no date) Our malt houses. Available at: https://www.hollandmalt.com/our-malt-houses/ (Accessed: 11 April 2019).

Hop Nederland (2018) Hoptelers, HopNederland. Available at: https://hopnederland.nl/hoptelers/ (Accessed: 4 December 2018).

Hop Overkoepelende Producentenvereniging vzw (2018) Aanvraag logo | Belgische Hop, Belgische Hop. Available at: https://www.belgische-hop.be/nl/brouwer/aanvraag-logo (Accessed: 29 January 2019).

Horijon, T. (2015) Beer from here: Place attachment of Dutch Microbreweries. Radboud University Nijmegen. Available at: http://theses.ubn.ru.nl/bitstream/handle/123456789/5297/Horijon%2C_Tom_1.pdf?sequence=1 (Accessed: 9 May 2018).

Huige, N. J. (2006) 'Chapter 18: Brewery By-Products and Effluents', in Priest, F. and Stewart, G. (eds) Handbook of Brewing. Second. Boca Raton, Florida: CRC Press Taylor & Francis group, pp. 655–713. Available at: https://www.taylorfrancis.com/books/9781420015171/chapters/10.1201/9781420015171-22.

Jodha, A. (2016) Olds College enviro-prodigy is growing mushrooms from beer waste, Maclean's. Available at: https://www.macleans.ca/education/college/olds-college-enviro-prodigy-is-growing-mushrooms-from-beer-waste/ (Accessed: 5 May 2019).

Jongmans, A. G. (2013) Landschappen van Nederland : geologie, bodem en landgebruik. First. Wageningen: Wageningen Academic Publishers. Available at: https://wur.on.worldcat.org/oclc/822223154.

Kistemaker, R. E., Van Vlisteren, V. T. and Hendrikman, L. (eds) (1994) Bier! Geschiedenis van een volksdrank. Amsterdam: De Bataafsche Leeuw.

Klaarenbeek, R., Genders, H. and Blom, C. (2008) Watergebiedsplan Langbroekerwetering. Houten. Available at: file:///C:/Users/lesem001/Downloads/watergebiedsplan_langbroekerwetering.pdf.

Koninklijke Grolsch (2017) DVO jaarverslag Koninklijke Grolsch 2017 - Water, Koninklijke Grolsch. Available at: http://dvo-jaarverslag.koninklijkegrolsch.nl/#water (Accessed: 14 January 2019).

Lawrence, M. (1990) The encircling hop : a history of hops and brewing, SAWD. Sittingbourne : SAWD,.

Le Champignon de Bruxelles (2017) L'inauguration de la champignonnière de Cureghem, Le Champignon de Bruxelles. Available at: https://www.lechampignondebruxelles.be/nl/2017/10/09/linauguration-de-notre-champignonniere/ (Accessed: 7 November 2018).

Lenzholzer, S., Duchhart, I. and Koh, J. (2013) '"Research through designing" in landscape architecture', Landscape and Urban Planning. Elsevier, 113, pp. 120–127. doi: 10.1016/J.LANDURBPLAN.2013.02.003.

Local2Local (no date) Hopoogst in Odijk, Local2Local. Available at: https://www.local2local.nl/blog/hopoogst-odijk/ (Accessed: 6 December 2018).

Lynch, K. M., Steffen, E. J. and Arendt, E. K. (2016) 'Brewers' spent grain: a review with an emphasis on food and health', Journal of The Institute of Brewing & Distilling, (122), pp. 553–568. doi: 10.1002/jib.363.

Marchakitus, D. (2018) The Value in Spent Grain, Iron Hill Brewery. Available at: https://www.ironhillbrewery.com/blog/the-value-in-spent-grain (Accessed: 5 May 2019).

Masur (2010) 'S cerevisiae under DIC microscopy'. Wikimedia Commons. Available at: https://commons.wikimedia.org/wiki/File:S_cerevisiae_under_DIC_microscopy.jpg (Accessed: 24 January 2019).

Mediamatic (2016) Kunst en Natuur: Werken met Levende Organismen Mediamatic Plan 2017–2020. Available at: www.mediamatic.net/trots (Accessed: 6 November 2018).

Meesterburrie, A. (2019) 'De groei van speciaalbierbrouwers stagneert: er is wel erg veel aanbod', Business Insider. Available at: https://www.businessinsider.nl/aantal-brouwerijen-nederland-stagneert/.

Moutery Noard-West Fryslân (2019) Het Mouten. Available at: http://www.mouteryfryslan.nl/ (Accessed: 11 April 2019).

Mulville, P. (2019) Social uproar: the consciousness of Oproer, KAERU BEER. Available at: http://kaerubeer.matsudamulville.nl/portfolio/breweries-cideries/gtk_oproer/ (Accessed: 31 January 2019).

Nectar Drankengroothandel (no date) Geschiedenis Nectar, Nectar Drankengroothandel. Available at: https://www.drankenhandelnectar.nl/geschiedenis/ (Accessed: 21 January 2019).

Nefs, M., Roncken, P. and Van de Witte, Y. (2017) Ringpark Utrecht, Ruimte en Wonen. Available at: https://www.ruimteenwonen.nl/ring-

park-utrecht (Accessed: 18 October 2017).

NIBEM (2019) Brouwgerst. Available at: https://www.nibem.nl/de-keten/ (Accessed: 12 April 2019).

Nicolas, E. (1966) Gerst en bier, Centraal Instituut voor Voedingsonderzoek T N O. Zeist: Centraal Instituut voor Voedingsonderzoek TNO,.

NOHNIK (2017) Ringpark Utrecht, NOHNIK architecture and landscapes. Available at: http://www.nohnik.nl/portfolio/ringpark-utrecht/ (Accessed: 5 March 2018).

OEC (2017) Import origins of Hops to the Netherlands (2017). Available at: https://atlas.media.mit.edu/en/visualize/tree_map/hs92/import/nld/show/1210/2017/ (Accessed: 12 April 2019).

Olsson, J., Rahbek Christensen, A. and Frausing, K. B. (2009) Nordic Malt House. Oslo. Available at: http://www.nordicinnovation.org/Global/_Publications/Reports/2010/Nordic Malt House.pdf (Accessed: 22 June 2018).

Opdam, P. and Steingröver, E. (2018) 'How Could Companies Engage in Sustainable Landscape Management? An Exploratory Perspective', Sustainability, 10(1), p. 220. doi: 10.3390/su10010220.

Oproer Brouwerij (no date) Brewery – Oproer brouwerij, biercafé & biologisch, plantaardig restaurant, Oproer Brouwerij. Available at: http://www.oproerbrouwerij.nl/brewery/ (Accessed: 31 January 2019).

Palmer, G. (2017) Barley to Malt, Brewers Journal. Available at: https://www.brewersjournal.info/wp-content/uploads/2017/12/Sir-Geoff-Palmer.pdf (Accessed: 25 April 2019).

Palmer, G. H. (2006) 'Barley and malt', in Priest, F. G. and Stewart, G. (eds) Handbook of Brewing. Second. Boca Raton, Florida: CRC Press Taylor & Francis group, pp. 139–160.

Papazian, C. (2006) 'Beer Styles: Their Origins and Classification', in Priest, F. G. and Stewart, G. G. (eds) Handbook of Brewing. Second. Boca Raton, Florida: CRC Press Taylor & Francis group, pp. 41–75. Available at: https://www.taylorfrancis.com/books/e/9781420015171.

Pijpker, J. and Tuenter, G. (2019) 'Klein bier voor grote spelers', NRC Handelsblad, 30 March, pp. E12-14.

PINT (2019) Evenementen, PINT- Bierconsumentenvereniging. Available at: https://www.pint.nl/evenementen/ (Accessed: 16 April 2019).

Plant Chicago (2017) Spent Grains in Mushroom Growing | Plant Chicago, Plant Chicago. Available at: http://plantchicago.org/2017/01/24/spent-grains-mushroom-growing/ (Accessed: 7 November 2018).

Platform Nederlandse Hoptelers (2017) Initiatieven in Nederland, Platform Nederlandse Hoptelers. Available at: http://hoptelers.nl/hoptelers-in-nederland/ (Accessed: 11 January 2019).

Potteiger, M. (2013) 'Eating Places. Food Systems, Narratives, Networks, and Spaces', Landscape Journal, 32(2), pp. 261–275. doi: 10.3368/lj.32.2.261.

Potteiger, M. and Purinton, J. (1998) Landscape narratives : design practices for telling stories. New York [etc.]: Wiley.

Priest, F. G. (2006) 'Chapter 16 - Control, Microbiology and Microbiological Brewery, in the', in Priest, F. G. and Stewart, G. G. (eds) Handbook of Brewing. Second. Boca Raton, Florida: CRC Press Taylor & Francis group, pp. 607–628.

Priest, F. G. and Stewart, G. G. (eds) (2006) Handbook of Brewing. Second. Boca Raton, Florida: CRC Press Taylor & Francis group.

Prins, L. A. J. (1986) Knelpunten bij de produktie, afzet en verwerking van inlandse gerst voor de brouwindustrie, Mededeling / Stichting Nederlands Instituut voor Brouwgerst, Mout en Bier ; no. 26 TA -. Zeist : Nibem,.

Provincie Utrecht (2016) 'Bevolkingsprognose 2016-2040 Provincie Utrecht'. Utrecht: Provincie Utrecht, p. 1. Available at: http://www.wmm-provincie-utrecht.nl/excel/101115/.

Provincie Utrecht (2016) Provinciale Ruimtelijke Structuurvisie 2013-2028 (Herijking 2016). Utrecht. Available at: https://ruimtelijkeplannen.provincie-utrecht.nl/NL.IMRO.9926.SV1612PRS-VA01?s=SANMmAIEAXlMqkeEREEeSD-D_wP0beAAD (Accessed: 20 March 2019).

Provincie Utrecht (2019) Webkaart [Online map database]. Available at: https://webkaart.provincie-utrecht.nl/viewer/app/Webkaart?debug=false&version=.

Rasbak (no date) 'Hop bloemen vrouwelijke plant Humulus lupulus female.jpg -'. Wikimedia Commons. Available at: https://commons.wikimedia.org/wiki/File:Hop_bloemen_vrouwelijke_plant_Humulus_lupulus_female.jpg (Accessed: 24 January 2019).

Regio Leidsche Rijn (2018) 'Hopoogst 2018 is binnen. Opbrengst aanzienlijk beter dan vorig jaar', 9 September. Available at: https://www.regioleidscherijn.nl/2018/09/09/hopoogst-2018-is-binnen-opbrengst-aanzienlijk-beter-dan-vorig-jaar/ (Accessed: 12 April 2019).

Roberts, T. R. (2016) 'Chapter 3 – Hops', in Brewing Materials and Processes, pp. 47–75. doi: 10.1016/B978-0-12-799954-8.00003-4.

Rodrigue, J.-P., Comtois, C. and Slack, B. (2017) The geography of transport systems. Available at: https://transportgeography.org/?page_id=4898 (Accessed: 9 May 2019).

Roncken, P. A. (2017) 'Verslag Ringpark studie Augustus 2017'. Utrecht: Adviseur Ruimtelijke Kwaliteit.

Roncken, P. A. (2018) 'Advies de Utrechtse Ringparken'. Utrecht: Provincie Utrecht. Available at: https://www.provincie-utrecht.nl/actueel/nieuwsberichten/nieuwsberichten/2018/oktober-2018/ringpark-utrecht-concept-sterk-groeiende-stedelijke-regio/.

RTL Nieuws (2017) Supermarkten liften mee op de populariteit van speciaalbier, RTL Nieuws. Available at: https://www.rtlnieuws.nl/beurs/bedrijven/artikel/14266/supermarkten-liften-mee-op-de-populariteit-van-speciaalbier (Accessed: 8 April 2019).

Russell, I. (2016) 'Chapter 4 – Yeast', in Brewing Materials and Processes, pp. 77–96. doi: 10.1016/B978-0-12-799954-8.00004-6.

Schnell, S. M. and Reese, J. F. (2003) 'Microbreweries as Tools of Local Identity', Journal of Cultural Geography, 21(1), pp. 45–69. doi: 10.1080/08873630309478266.

Smith, N. (2012) Conventional Food System, Food System Wiki. Available at: http://foodglossary.pbworks.com/w/page/48854925/Conventional Food System (Accessed: 15 December 2017).

Staatsbosbeheer (2016) Boeren en natuurbeheerders: van pachters naar partners, Staatsbosbeheer. Available at: https://www.staatsbosbeheer.nl/Over-Staatsbosbeheer/Nieuws/2016/06/boeren-en-natuurbeheerders-van-pachters-naar-partners (Accessed: 8 May 2019).

Stadsbrouwerij de Dikke (2019) Stadsbrouwerij geopend!, Stadsbrouwerij de Dikke. Available at: http://www.stadsbrouwerijdedikke.nl/index.php/nl/ (Accessed: 17 April 2019).

Stadslandbouw – iedereen boer (2016) oosterwold.info. Available at: https://oosterwold.info/nuttig/stadslandbouw-iedereen-boer/ (Accessed: 15 March 2019).

Stavrakis, T. (2008) 'Wooden funerary model of a beer brewery in the Athens National Archaeological Museum'. Athens: Associated Press. Available at: https://www.spiegel.de/international/zeitgeist/alcohol-s-neolithic-origins-brewing-up-a-civilization-a-668642.html (Accessed: 26 April 2019).

Stiching Kolkbier (2018) Home - Kolkbier, Kolkbier.nl. Available at: http://kolkbier.nl/ (Accessed: 30 July 2018).

Stichting Erfgoed Nederlandse Biercultuur (2016) A Brewery - Brouwerij Verhuurder, Nederlandse biercultuur.nl. Available at: https://www.nederlandsebiercultuur.nl/databank/brouwerij?brouwerij_id=1490&task=display&controller=brewery&view=brewery&option=com_senb&b694bbcbd630a379ef4b0be74e52ecf2=1 (Accessed: 16 April 2019).

Stichting Erfgoed Nederlandse Biercultuur (2018) Grafiek aantal brouwerijen. Available at: https://www.nederlandsebiercultuur.nl/brouwerijen/grafiek-aantal-brouwerijen (Accessed: 24 July 2018).

Stichting Erfgoed Nederlandse Biercultuur (2019) Aktieve brouwerijen in de provincie Utrecht, Nederlandsebiercultuur.nl. Available at: https://www.nederlandsebiercultuur.nl/brouwerijen/brouwerijkaart?provincie_id=7&view=breweries_province&option=com_senb&bf3d938873a4230f9f4ff545dd699a2b=1 (Accessed: 18 July 2018).

Stichting Erfgoed Nederlandse Biercultuur (2019) De Groei in een Grafiek, Stichting Erfgoed Nederlandse Biercultuur. Available at: https://www.nederlandsebiercultuur.nl/brouwerijen/grafiek-aantal-brouwerijen (Accessed: 10 January 2019).

Stichting Honswijk-Everdingen (2019) Twee Forten: Wachters aan de Lek, Forten Honswijk Everingen. Available at: https://www.forten-honswijk-everdingen.nl/ (Accessed: 5 May 2019).

Stroeken, F. and Ettema, M. (2012) Vlaaien op de Neude : 2000 jaar stadslandbouw en voedsellandschap in Utrecht, Terra Incognita. Utrecht: Terra Incognita,.

Sukkel, W. and Van der Werf, W. (2017) Intercropping replaces monoculture for sustainable agriculture -, WUR. Available at: https://www.wur.nl/en/newsarticle/Intercropping-replaces-monoculture-for-sustainable-agriculture.htm (Accessed: 8 May 2019).

The Sisters Brewery (2018) Our Story, The Sisters Brewery. Available at: http://thesistersbrewery.com/#/ (Accessed: 31 January 2019).

The Swaen (no date) The Swaen - Malt for Beer. Available at: http://theswaen.com/ourproducts-malt-for-beer/ (Accessed: 11 April 2019).

Thorsøe, M. H., Kjeldsen, C. and Noe, E. (2017) 'It's never too late to join the revolution! – Enabling new modes of production in the contemporary Danish food system', European Planning Studies. Routledge, 25(7), pp. 1166–1183. doi: 10.1080/09654313.2016.1267112.

Timmer, R. D., Korthals, G. . and Molendijk, L. P. G. (2003) Groenbemesters Van teelttechniek tot ziekten en plagen. Lelystad. Available at: www.ppo.dlo.nl (Accessed: 30 January 2019).

Toerisme Poperinge, Poperinge Stad and Hopmuseum Poperinge (2018) Bier & Hoppefeesten, Hoppefeesten. Available at: http://www.hoppefeesten.be/ (Accessed: 30 January 2019).

Uiterwaarde (2019) De Lek: Liniepont, Uiterwaarde Ruimte voor Recreatie. Available at: https://www.uiterwaarde.nl/pontjes/neder-rijn-lek/liniepont (Accessed: 6 May 2019).

Uitleg - brouw-bier.nl (no date). Available at: https://www.brouw-bier.nl/theorie/grondstoffen/hop/uitleg.aspx (Accessed: 19 June 2018).

Untappd (2019) Untappd. Available at: https://untappd.com/ (Accessed: 16 April 2019).

Van der Vliet, M. (2011) Pannenbier voor Muziekpaleis, CU2030. Available at: http://cu2030.nl/archive/2011-08-24/pannenbier-voor-muziekpaleis (Accessed: 10 April 2019).

van Dijk, M., Kroezen, J. and Slob, B. (2018) 'From Pilsner Desert to Craft Beer Oasis: The Rise of Craft Brewing in the Netherlands', in Garavaglia, C. and Swinnen, J. (eds) Economic Perspectives on Craft Beer. Cham: Springer International Publishing, pp. 259–293. doi: 10.1007/978-3-319-58235-1_10.

Van Druenen, R. (2018) 'Agrobosbouw / Het landschap heeft een agro-architect nodig', Blauwe Kamer, (2), pp. 12–13.

Van Eekeren, N., Luske, B., Vonk, M. and Anssems, E. (2014) Voederbomen in de landbouw. Meer waarde per hectare door multifunctioneel landgebruik. Driebergen.

van Hellemondt, E. M. (2016) De Paradijsmethode: Opvattingen over het moderniseren van het landschap in de Nederlandse landschapsarchitectuur van de jaren zestig en zeventig van de twintigste eeuw. Vrije Universiteit Amsterdam.

Van Holle, A., Van Landschoot, A., Roldán-Ruiz, I., Naudts, D. and De Keukeleire, D. (2017) 'The brewing value of Amarillo hops (Humulus lupulus L.) grown in northwestern USA: A preliminary study of terroir significance', Journal of the Institute of Brewing. John Wiley & Sons, Ltd, 123(3), pp. 312–318. doi: 10.1002/jib.433.

Van Huijgevoort, S. (2017) 'Blurring en lokaal eten nieuwe trends in horeca', RTL Z. Available at: https://www.rtlz.nl/algemeen/economie/blurring-en-lokaal-eten-nieuwe-trends-in-horeca.

Van Meir, I. (2012) Voederbomen: een verrijking voor het rantsoen? CAH Vilitum. Available at: http://www.louisbolk.org/downloads/2799.pdf (Accessed: 7 November 2018).

Van Merkenstein, M. (2017) 'Vader en zoon Dorrestijn dragen bij aan lokale biertjes op Heuvelrug', Algemeen Dagblad, 30 March. Available at: https://www.ad.nl/utrecht/vader-en-zoon-dorrestijn-dragen-bij-aan-lokale-biertjes-op-heuvelrug~aa33ff6f/ (Accessed: 12 April 2019).

Van Otterloo, J. (2018a) 'Provincie Utrecht, Ontwikkelvisie [Presentation Slides]'. Utrecht: IMOSS Stedenbouw Landschap Buitenruimte. Available at: https://gallery.mailchimp.com/4d77bb80a11e1413282cf900b/files/5748aa57-ffbf-4a56-a1e6-9b09f935e409/Presentatie_Imoss_.pdf?ct=t(Nieuwsbrief_april_2017) (Accessed: 6 March 2019).

Van Otterloo, J. (2018b) Provincie Utrecht, Ringpark en een integrale leefomgeving. - IMOSS, IMOSS . Available at: https://imoss.nl/project/provincie-utrecht-ringpark-u10/ (Accessed: 6 March 2019).

Van Raay, J. (2017) Visie en Plan van aanpak Fort Honswijk. Houten. Available at: https://www.houten.nl/fileadmin/user_upload/Bijlage_1_-_Plan_van_Aanpak_Fort_Honswijk.pdf (Accessed: 28 February 2019).

Vereniging Deltametropool, Wageningen UR, Rijksdienst voor het Cultureel erfgoed, Staatsbosbeheer and RU Delft (2017) SPOT ON. Available at: http://urbanchange.eu/downloads/20170901 SPOT ON download spreads.pdf (Accessed: 19 October 2017).

Vitens (2018) Floortje Dessing opent in Utrecht pop-up waterwinkel van Vitens - Waterforum, Waterforum. Available at: https://www.waterforum.net/floortje-dessing-opent-in-utrecht-pop-up-waterwinkel-van-vitens/ (Accessed: 30 January 2019).

Vloermouterij Masterveld (2019a) 'Image: batch of malted barley at Vloermouterij MAstervled'. Winterswijk: Vloermouterij Masterveld via Facebook. Available at: https://www.facebook.com/vloermouterijmasterveld/photos/a.158114866527468 0/2156019131120961/?type=3&theater (Accessed: 31 January 2019).

Vloermouterij Masterveld (2019b) Vloermouterij Masterveld, Nederlands enige ambachtelijke mouterij, Vloermouterij Masterveld. Available at: http://www.vloermouterijmasterveld.nl/ (Accessed: 14 January 2019).

Voedingscentrum (no date) Regionale landbouw en streekproducten. Available at: http://www.voedingscentrum.nl/encyclopedie/regionale-land-

bouw-en-streekproducten.aspx (Accessed: 31 January 2018).

Volkers, K. (2017a) Nieuw bier (1850 - 1980), Stichting Erfgoed Nederlandse Biercultuur. Available at: https://www.nederlandsebiercultuur.nl/historie/het-nieuwe-bier (Accessed: 25 January 2019).

Volkers, K. (2017b) Revival (1980 - heden), Stichting Erfgoed Nederlandse Biercultuur. Available at: https://www.nederlandsebiercultuur.nl/historie/revival (Accessed: 11 January 2019).

Volkers, K. and Kik, C. (2016) 'Nieuwe hoop voor de Nederhop? Ondergang en opleving van de hopteelt in Nederland', Tijdschrift voor Historische Geografie, 1(3), pp. 147–163. Available at: http://hoptelers.nl/wp-content/uploads/2017/02/THG-artikel-hop-def.pdf (Accessed: 9 May 2018).

Vroom, M. J. (2005) Lexicon van de tuin-en landschapsarchitectuur. Second. Edited by M.T.A. Ettema. Wageningen: Blauwdruk.

VVV Kromme Rijnstreek (2019) Streekproducten en Landwinkels in de Kromme Rijnstreek, VVV Kromme Rijnstreek. Available at: https://www.vvvkrommerijnstreek.nl/nl/wat-te-doen/streekproducten-en-landwinkels (Accessed: 4 May 2019).

Wageningen Environmental Research (2017) De VAB-opgave in de provincie Utrecht - Samenvatting. Wageningen. Available at: https://www.omgevingsweb.nl/cms/files/2017-04/externe-samenvatting-vab-rapport-utrecht.pdf (Accessed: 7 August 2018).

Welvaert, M. (2016) The future food system: the world on one plate? | FAO, Committee on World Food Security. Available at: http://www.fao.org/cfs/home/blog/blog-articles/article/en/c/448182/ (Accessed: 7 March 2018).

Wijngaarden, V. R. (2017) Buitenplaatsen op de Utrechtse Heuvelrug. Utrecht: Uitgeverij Matrijs.

Wilschut, M. and Koedoot, M. (2014) 'Groen bier', in Natuur & Ondernemen: winst uit vergroening. Velp: Hogeschool Van Hall Larenstein, pp. 6–15.

Wiskerke, J. S. C. (2009) 'On places lost and places regained: Reflections on the alternative food geography and sustainable regional development', International Planning Studies, 14(4), pp. 369–387. doi: 10.1080/13563471003642803.

Yntema, R. J. (1994) 'Tot welvaren der brouwers. Gilden en brouwersorganisaties in de 17de en 18de eeuw', in Kistemaker, R. E. (ed.) Bier! Geschiedenis van een volksdrank. First. Amsterdam: De Bataafsche Leeuw, pp. 118–131.

Zwaan, M. (2012) 'Wat te doen met de bostel'. Forum Hobbybrouwen.nl. Available at: https://www.hobbybrouwen.nl/forum/index.php?topic=19924.0 (Accessed: 21 January 2019).