Socially sustainable food hubs in Amsterdam

The ideal socially sustainable food hub in Amsterdam based on literature and (best practices from) existing food hubs in the Netherlands

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Abstract

Current food systems cause significant negative impact both environmentally and socially. In response, food hubs have emerged as a potential solution towards a more sustainable food system. By directly linking producers to consumers, food hubs have the potential to create localized food systems, which can enhance both environmental and social sustainability. However, the concept of food hubs remains poorly defined and its exact contributions to social sustainability in specific are not yet fully understood.

Therefore, this research addresses the question "*What would an ideal socially sustainable food hub in Amsterdam look like, based on literature and (best practices of) existing food hubs in the Netherlands?"* . Using a combination of literature review, interviews and a co-creation session, this study explores the current contribution of food hubs to social sustainability and envisions an ideal socially sustainable food hub in the H-buurt, Amsterdam Southeast.

Findings reveal that food hubs differ in their social sustainability impact depending on their food hub type and position within the food chain. Most significant impact is made at the interplay of producer and consumer. In the context of the H-buurt, residents envision a food hub that incorporates both local food production with the redistribution of surplus food. The hub is led by the community and there is a strong emphasis on fostering social cohesion. The insights regarding the ideal food hub can be used in the further development of a food hub in the H-buurt.

Keywords: Food hubs, social sustainability, co-creation

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List of abbreviations

AFN	Alternative Food Network
GHG	Greenhouse gas
SFCD	Sustainable food community development
USDA	United States Department of Agriculture
VASCA	Value-based agri-food supply chain approach

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1. Introduction

In response to the growing world population in the second half of the twentieth century, global food supply and distribution expanded quickly (Vermeulen et al., 2012). This system developed into a highly productive one with high food output, but also one with many negative environmental and social consequences (Friedmann, 2005; Berti & Mulligan, 2016). Such environmental effects are resource depletion, biodiversity loss and various types of greenhouse gas (GHG) emissions (Vermeulen et al., 2012; La Trobe & Acott, 2000). In 2015, as much as 35% of anthropogenic GHG's were caused by food systems (Crippa et al., 2021; Wezel et al., 2020). Examples of social consequences are vulnerability of small family farms as less people are employed on the land and health problems due to chemical applications and pesticides (La Trobe & Acott, 2000; Berti & Mulligan, 2016). Acknowledging the challenges posed by these systems, both academic and public institutions are advocating a transition to sustainable agri-food systems.

A movement that emerged in response to the need for more sustainable food systems is that of Alternative Food Networks (AFN). As described by Misleh (2022, p. 1028) AFN's "engage in new forms of food production and distribution, thus creating more sustainable, territorially embedded, quality-oriented alternatives". AFNs are alternatives to the conventional food system and include various types of distribution and/or production practices, such as farmer's markets, consumer food co-operatives and organic agriculture (Forssell & Lankoski, 2015; Misleh, 2022; Harris, 2010). Harris (2010) notes that AFNs seek to localize food systems and encourage contact between food producers and consumers. By doing so, food systems can act according to local ecological and cultural needs (De Krom & Muilwijk, 2019).

Yet, in the current globalized food system, shifting towards local food production and consumption is hindered. Farmers typically require economies of scale to achieve profitability, meaning they are inclined to produce a small variety of crops in large quantities. This however results in supply exceeding local demand. Consequently, the physical structures meant for the distribution of food are aimed at facilitating efficient movement of larger quantities of crops to markets (Diamond & Barham, 2011; Cleveland et al., 2014). This poses challenges for localization, as the appropriate structures for connecting locally grown food with local consumers are missing. Most food is purchased in places that are vertically linked to the global food system, both physically and economically, (Cleveland et al., 2014).

To address this issue of missing structures, food hubs emerged in North America in the early 2000's as a logistical missing middle, being an aggregator for small farms (Hardy, 2020). Food hubs aim to directly connect producers with consumers, fostering more sustainable food systems. The United States Department of Agriculture (USDA) defines food hubs as: "a centrally located facility with a business management structure facilitating the aggregation, storage, processing, distribution, and/or marketing of locally/regionally produced food products" (Barham, 2010). Since their emergence in the early 2000's in North America, food hubs have been implemented in other parts of the world as well.

While there is growing interest in food hubs, there is also confusion about what a food hub is and what it is not (Barham et al., 2012). In literature two primary types of food hubs are distinguished, those motivated either by social objectives to build socially, economically and environmentally sustainable food communities that connect farmers with consumers as directly as possible (Berti & Mulligan, 2016; Hardy, 2020; Manikas et al., 2019) or those motivated by a focus on supply chain and market efficiencies that aim to scale up local food sales by aggregating multiple small and medium-sized producers (Berti & Mulligan, 2016). Many authors also note the existence of hybrid food hubs, adhering to both

definitions (Cleveland et al., 2014). As many types of food hubs with different goals and structures exist, it can be challenging to consistently assess their impact on sustainability.

Since food hubs are seen as a potential approach to create sustainable food systems, it is important to evaluate their actual impact on sustainability. Sustainability is generally understood to be built upon three interconnected pillars: the environmental pillar, the economic pillar, and the social pillar (Purvis et al., 2019). Among these, the social dimension requires particular attention. Social sustainability concerns human well-being but has no universally accepted definition. Different stakeholders interpret social sustainability in varying ways, complicating the task of setting clear objectives and indicators. Without such indicators, efforts aimed at improving social sustainability risk having a lack of focus and coherence. While several methods exist for evaluating social sustainability, they have not yet been applied to food hubs (Hardy, 2020). To effectively promote social sustainability through food hubs, a clearer understanding of the concept and its measurement tools are needed (Desiderio et al., 2022).

In addition to the need for research on social sustainability of food hubs, there is also a geographic gap present in literature. Most existing studies on food hubs are focused on North America, while research in the European context remains limited (Manikas et al., 2019; Sgroi & Marino, 2022). Further, urban areas in particular offer a compelling context for research to food hubs for several reasons. Urban areas deal with specific food related challenges due to their unique characteristics, such as high demand for food and competition for space due to dense populations. Urban food related challenges regard issues such as food and nutrition insecurity, and health disparities (Knorr et al., 2018). Besides, urban inhabitants consume relatively more meat, sugar, and processed food, leading to increased health risks such as obesity and cardiovascular disease (Regmi and Dyck, 2001; Satterthwaite et al., 2010; Kearney, 2010; Knorr et al., 2018). Key priorities relating to food in the urban area relate to improving access to healthy food and reducing food waste. Food hubs offer a possible solution for these issues, by improving social and environmental sustainability. They can enhance public health, foster social justice, and support environmental sustainability in cities (Cohen et al., 2022).

Combining the need for more research into the social sustainability impact of food hubs, food hubs in Europe, and the specific opportunities for food hubs in the urban context, this thesis investigates how food hubs in Amsterdam can contribute to social sustainability. Through the investigation of existing food hubs, a case study in Amsterdam on future food hubs will be informed. In Amsterdam food hubs are still being developed. By identifying what it means for a food hub to be socially sustainable in Amsterdam, this research seeks to guide future implementation of food hubs.

By doing so, this research has two primary objectives:

1. Investigate how existing food hubs, both globally and in the Netherlands, contribute to social sustainability.
2. Explore the ideal socially sustainable food hub in Amsterdam.

To answer these aims, the central research question of this research will be: *"What would an ideal socially sustainable food hub in Amsterdam look like, based on literature and (best practices of) existing food hubs in the Netherlands?"*

The following sub-research questions will be used to answer the main research question:

1. How is social sustainability included in the context of food hubs in literature?
2. How is social sustainability included in existing food hubs in the Netherlands?

3. What indicators are relevant for the ideal socially sustainable food hub in the context of Amsterdam

This research aims to make a scientific contribution by clarifying the notion of social sustainability in the context of food hubs, both globally and in the Netherlands. It addresses a gap in academic literature regarding the limited exploration of food hubs within the context of Europe. In addition to assessing the current impact of food hubs on social sustainability, the study explores the ideal socially sustainable food hub in Amsterdam Southeast, the H-buurt. By doing so, this thesis aims to further develop the concept of social sustainability, specifically in the context of food hubs.

This thesis aims to make a societal contribution by taking the first exploratory steps towards envisioning what a socially sustainable food hub in Amsterdam could look like. As food hubs are still a developing concept within the city, there are various scenarios in which these food hubs can make a social impact. This early stage of development presents a unique window to integrate (social) sustainability. By identifying the social impact the ideal food hub makes, this vision can be incorporated into actual food hub development. Therefore, this research can serve as a guide or source of inspiration for the development of socially sustainable food hubs in Amsterdam.

This thesis consists of six chapters of which this introduction covers the first chapter. In chapter 2 an overview of the concepts used in this thesis will be presented, containing elaboration on food hubs and social sustainability. Chapter 3, the methodology, concerns the steps that are taken to answer the central research question of this thesis, including a literature review, interviews and a co-creation. In chapter 4 the results of this thesis are described, presented per used method. The discussion of chapter 5 regards a discussion of the results and a broader reflection on the existing literature, theory and the methods. Chapter 6 exists of the conclusion, including both practical and academic recommendations.

2. Theoretical framework

As this research will dive into the concepts of social sustainability and food hubs, both concepts will be elaborated on.

2.1 Food hubs

As explained, food hubs were introduced as a logistical missing middle connecting small farms to consumers. Food hubs enable local consumers to eat local produce by directly connecting consumers to producers. Over time many food hubs expanded their focus beyond local food to also include environmental and social sustainability. In literature the concept of food hubs is defined in various ways. Several authors note the existence of dichotomous interpretations of food hubs (Berti & Mulligan, 2016; Curry, 2021; Hardy, 2020; Avetisyan et al., 2023; Hermiatin et al., 2022; Hyland & Macken-Walsh, 2022; Manikas et al., 2019). These two definitions are framed as "sustainable food community development", referring to food hubs motivated by social objectives, and "value-based agri-food supply chain approach", referring to food hubs motivated by economic objectives (Berti & Mulligan, 2016). Other authors argue that despite these contrasting definitions, food hubs can be hybrids, adhering to both definitions. Food hubs can be physical places, but also digital ones (Sgroi & Marino, 2022).

Sustainable food community development (SFCD) food hubs are enterprises or networks of community-based organizations or individuals motivated by social objectives to build socially, economically and environmentally sustainable food communities that connect farmers with consumers as directly as possible (Berti & Mulligan, 2016; Hardy, 2020; Manikas et al., 2019). SFCD food hubs, rooted in the idea that a sustainable future is created through bottom-up communities, can be classified as an alternative food network (AFN) with the potential to scale up beyond direct markets (Berti & Mulligan, 2016). However, Prost (2019) notes that in order for SFCD food hubs to function as an alternative food network, they need to (1) address the challenges of balancing ethical aspirations for environmental sustainability, social justice, community and individual health, (2) develop skills required for participation in civic food networks, and (3) achieve a wider impact on the food system transformation beyond niche solutions. SFCD food hubs often face the challenge of achieving economic viability while simultaneously achieving social and environmental goals (Hermiatin et al., 2022; Curry, 2021). While their long-term goals are driven by a social mission, their short-term priorities typically concern maintaining business operations (Hardy, 2020).

Value-based agri-food supply chain approach (VASCA) food hubs are innovative business models with a focus on supply chain and market efficiencies that aim to scale up local food sales by aggregating multiple small and medium-sized producers. This is done by moving locally produced food into mainstream markets in an effective and cost-efficient manner (Berti & Mulligan, 2016). The emergence of VASCA food hubs is rooted in the belief that a sustainable future is shaped through economics (Berti & Mulligan, 2016).

As previously stated, besides the dichotomous definitions of food hubs, many authors argue that hybrid food hubs exist, having characteristics from both definitions. Cleveland et al. (2014, p. 27) argue that hybrid food hubs are most impactful as *"it is in this hybridity that [food hubs] have the potential to capture many of the advantages of both alternative direct marketing and mainstream large-scale distribution systems, while minimizing the disadvantages of each"*. In practice, most food hubs are hybrids, both in relation to their goals (sustainability or logistical objectives) as well as the scale they operate in (alternative direct marketing or mainstream large-scale distribution systems) (Cleveland et al., 2014). Moreover, Blay-Palmer et al. (2013) state that a food hub means different things to different people, while Hardy (2020) notes that the term is self-appropriated. The degree to which sustainability

goals are achieved vary per hub and depend on their unique community priorities and assets (Blay-Palmer et al., 2013).

Food hubs, as part of the food system, operate at the intersection of the environment and social and economic development. This interplay is relevant for both profitability as well as sustainability of the food system (Desiderio et al., 2022). While the food sector has introduced many good practices regarding the balance of the natural environment and economic development, a gap remains regarding the improvement and implementation of social aspects (Desiderio et al., 2022). Adams et al. (2021) highlight that if in this balance social costs are excluded and treated as externalities, the food system will never be truly sustainable.

Bridging this gap, however, requires a proper definition of social sustainability. This definition is needed to establish indicators and measurement tools for social sustainability. Desiderio et al. (2022) call out the need for maturation of the concept of social sustainability and the need for operationalization in the context of food systems. More specifically, this operationalization of social sustainability in the context of food systems, will be applied to food hubs. This operationalization is needed to create a truly sustainable food system, also including social sustainability.

2.2 Social sustainability

Sustainability as a concept was first introduced in the Brundtland report of the United Nations in 1987 (Brundtland, 1987). In this report sustainability is defined as meeting "the needs of the present generation without compromising the ability of future generations to meet their own needs" (WCED, 1987). This definition of sustainability recognizes the challenge of balancing the aspiration for an improved quality of life with the constraints imposed by the natural environment (Kuhlman & Farrington, 2010). Although this definition initially emphasized environmental concerns, the importance of social dimensions of sustainability gained recognition over time (Åhman, 2013). While debate persists about their interrelationships, it is widely accepted that sustainability is built upon three interconnected pillars: the environmental pillar, the economical pillar and the social pillar. This research will focus on this latter pillar of social sustainability (Purvis et al., 2019).

The social pillar of sustainability concerns human wellbeing (Desiderio, 2022). Human well-being can be understood as "a state of being with others, where human needs are met, when individuals can act meaningfully to pursue self-defined goals, and when they can enjoy a satisfactory quality of life" (Hicks et al., 2016, p. 38). Well-being is multidimensional and consists of both objective and subjective elements (Béné et al., 2019).

While social sustainability is a useful practical or strategic concept for policymakers or private actors, academically there are problems with the concept (Isgren & Longo, 2024). Social sustainability remains to be an ill-defined concept and is critiqued to be under-theorized, oversimplified and assessed through a wide range of varying criteria (Isgren & Longo, 2024). No universally agreed definition of social sustainability exists, and there are various arguments for this notion. For instance, social sustainability is an open and arguable concept that is theoretically difficult to understand, as it is linked to non-universal values (Boström, 2012). Practical use of social sustainability is contested as well, as it is objectively hard to measure, in comparison to for instance the measurement of atmospheric carbon levels (Toussaint et al., 2021). Moreover, social sustainability indicators are often based on practical judgements of plausibility rather than on theory (Eizenberg & Jabareen, 2017).

To address these critiques, there is need for more research into social sustainability and how to operationalise it. Because the definition of social sustainability depends on who you ask, various methodologies to measure social sustainability exist (Desiderio, 2022). Therefore, when implementing

social sustainability effectively, it is necessary to get a better understanding of the term, as well as its accompanying tools (Desiderio, 2022).

An example of such an assessment tool is the use of indicators. Sannou et al. (2023) acknowledge that it is a common challenge to systematically integrate indicators that objectively assess social sustainability and support informed decision-making in agrifood systems. To measure the social sustainability of the agri-food system, Sannou et al. (2023) have developed a comprehensive list of social sustainability indicators. The list of indicators was derived from a systematic literature review on social sustainability. The framework consists of eight themes focused on social sustainability within the agri-food system. An overview of the themes and corresponding sub-themes can be found below in table 1 and in Appendix I. These social sustainability indicators by Sannou et al. (2023) will be used as the basis of this research.

Food security	**Healthy and safe food products**	**Farmers' health & safety**	**Labour & working conditions**
			
• Food insecurity of **access** • **Nutrient** needs/dietary **diversity**	• **Safety/quality** of food products • **Social acceptability** of products/**animal welfare** • **Fair** trading **practices**	• Access to **health care** • Farmers **aging** • Access to **potable water** • Health risk (**pesticide use**) • Health risk (**work related**)	• **Labour productivity**/efficiency • **Workload** • **Labour needs** and **avialability** • **Labour cost** • **Household/family** labour supply • **Off-farm income**/occupation • Farm transfer to **future generation** • Contribution to **job creation** • **Labour rights**, fair working conditions, forced & child labour
Decent livelihoods	**Farmer's training**	**Social cohesion, security & conflict**	**Land and property rights**
			
• **Resilience** & vulnerability • **Equity** (social, gender, generational) • Availability and access to **infrastructure & technology** • Access to input and **financial assistance** • Farmer's **satisfaction** • Household **wealth** and **well-being** • **Diversification** of the **production**	• Access to &/or frequency of **agricultural extension services** • **Knowledge and information sharing** among farmers • Farmer's & labour's **training** and **experience** in agriculture • Farmer's **education level**	• **Participation** & social capital • **Coexistence** & conflicts • **Communication** and awareness • **Population pressure** • **Migration**	• **Land tenure**

Table 1. Social sustainability indicators by Sannou et al. (2023), edited and visualized by Anneke Haverlag

In summary, food hubs have diverse objectives, some prioritizing sustainability (SFCD), others focus primarily on logistics (VASCA), while others integrate both aims (Hybrid). In this thesis, the three definitions of food hubs will be used. These different definitions show that food hubs act according to different objectives and as a result, the impact generated by food hubs is diverse. To assess whether food hubs can be effectively used to promote sustainability, it is important to determine their impact. The dimension of social sustainability requires particular attention in relation to food hubs. Unlike environmental and economic sustainability, social sustainability is a loosely defined concept, especially in the context of agri-food systems. Therefore, the term needs more clarification. The given of various objectives and impacts of food hubs and the loose concept of social sustainability presents a knowledge gap on how food hubs contribute to social sustainability. The methods for answering this gap are presented in the next chapter.

3. Methodology

This chapter outlines the methods used to answer the research question of this thesis. This study adopts an exploratory approach, as the concept of social sustainability within food hubs is still vaguely understood. To answer the research question, multiple qualitative methods are used in three different phases (see figure 1). Each phase and its corresponding methods are described in detail below.

The three phases are used to answer the research question "What would an ideal socially sustainable food hub in Amsterdam look like, based on literature and (best practices of) existing food hubs in the Netherlands?". Based on the following sub research questions, the different phases are divided.

1. How is social sustainability included in the context of food hubs in literature?
2. How is social sustainability included in existing food hubs in the Netherlands?
3. What indicators are relevant for the ideal socially sustainable food hub in the context of Amsterdam?

The aim of this research is to investigate how existing food hubs in the Netherlands contribute to social sustainability by identifying their best practices, and to explore how food hubs in Amsterdam can contribute to social sustainability.

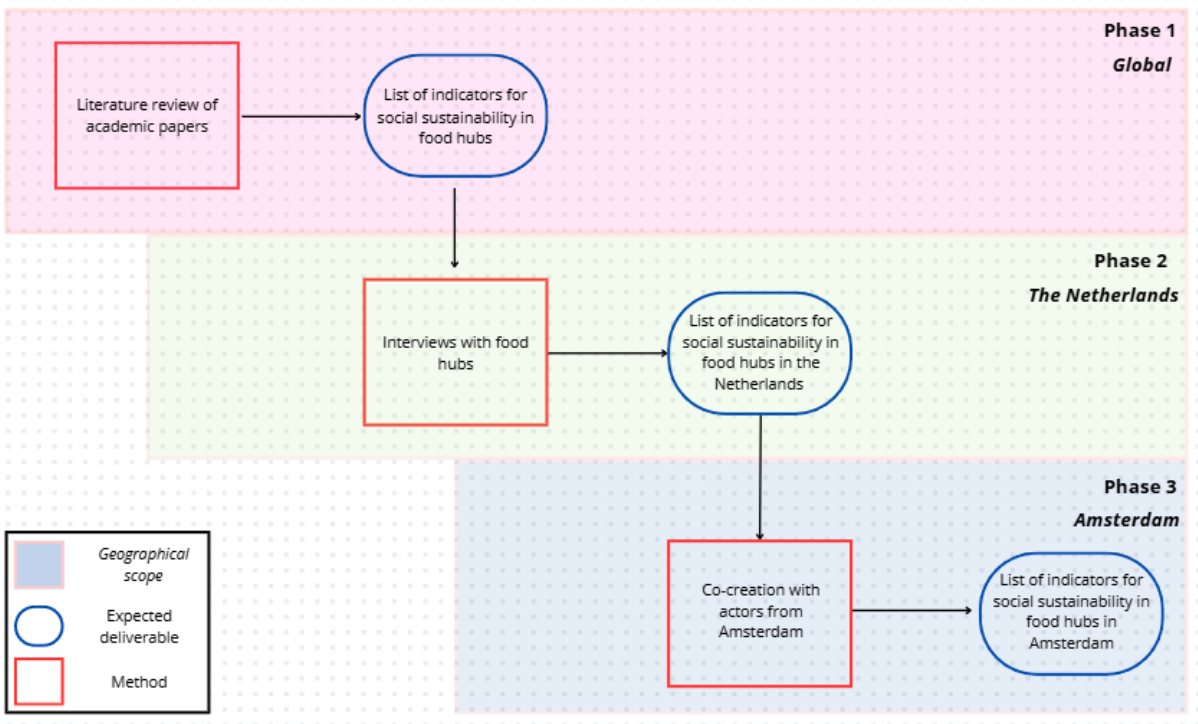

Figure 1. overview of methodology

3.1 Phase 1: literature study on social sustainability in food hubs

The primary objective of phase one is to investigate how food hubs contribute to social sustainability. The sub question of this phase is: "How is social sustainability defined in the context of food hubs in literature?". This question was answered through a literature review. To assess the current state of academic literature on social sustainability in food hubs, the following search query was used in both

Scopus (within all fields) and Google Scholar: '("social sustainability" OR "social sustain" OR "socially sustainable" OR "socially sustainability') AND ("food hubs OR "food hub" OR "foodhubs")'.

The search was executed on the 17th of February 2025. The two search systems, Google Scholar and Scopus, were used to gain a more comprehensive overview of existing relevant articles. Google Scholar provided more than 10.000 articles. Therefore, the choice was made to include only the first twenty retrieved articles that resulted from the search query, based on relevance. These are the articles sorted as most relevant according to Google. The yielded articles were screened and excluded if they: did not address food-related topics, did not primarily focus on food hubs, focused solely on the logistics aspect of food hubs, or if they were not freely accessible. This screening process yielded 12 relevant papers.

These papers were then subjected to backwards snowballing. The reference lists were searched using the search term "food hub". Relevant articles were screened using the same criteria. Additionally, 8 relevant articles were yielded through this backwards snowballing. In total, 20 articles were included in the final literature review (See appendix II for an overview of the retrieved articles). See figure 2 for an overview of the search process.

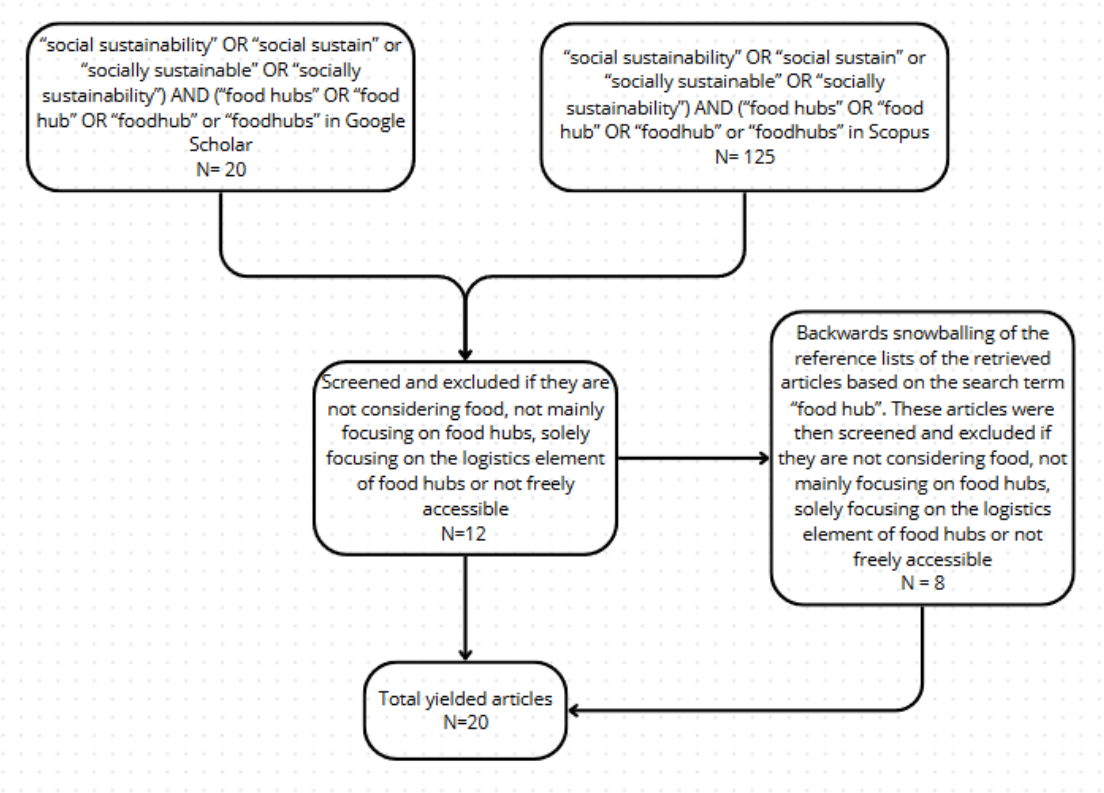

Figure 2. Search process literature review social sustainability of food hubs

The selected articles were analysed using the social sustainability framework for agri-food systems developed by Sannou et al. (2023). As mentioned before, this framework was created out of need for measuring sustainability impacts within the agri-food sector. It consists of a set of indicators focused on eight themes regarding social sustainability within the agri-food sector. An overview of the themes and corresponding sub-themes can be found Appendix I.

The framework, however, is predominantly focused on farmers/producers. Therefore, the framework was adapted for this thesis to account for broader stakeholder groups involved in food hubs. This means that the theme of food security, including the indicators of food insecurity of access and nutrient needs/dietary diversity, was broadened to not only include farmers, but also consumers. This choice was made as food hubs are a place where consumers are at play as well.

The literature review was guided by the following questions:

- What is the geographical scope of the retrieved articles?
- How are food hubs defined in literature?
- To what extent do different definitions of food hubs relate differently to social sustainability?
- What are recurring themes/contributions and indicators of social sustainability?

These questions were used to analyse the 20 papers. An overview of this analysis was made in Excel, in which information regarding the geographical scope of the papers was included, its food hub type (SFCD, VASCA or Hybrid) and the social sustainability indicators addressed by the food hub. The papers were then compared to each other, to gain insights into the social sustainability contribution of food hubs in literature.

3.2 Phase 2: Interviews with existing food hubs in the Netherlands

The aim of phase 2 was to see how social sustainability is included in existing food hubs in the Netherlands. In phase 2, semi-structured interviews were conducted with employees/representatives of Dutch food hubs. This phase served as a validation step to assess whether the indicators proposed by Sannou et al. (2023) are applicable within the Dutch context and to check whether they make sense for food hubs in practice.

Semi-structured interviews were used (SSI). As both concepts of food hubs and social sustainability are not clearly defined and are context-dependent, it is important to know the individual perspectives of the interviewees. SSIs allow for a balance between structured pre-determined questions and new themes that might emerge during the conversation (Adams, 2015). The limitations of SSI's needs to be acknowledged as well. They are time consuming and require a lot of time and effort. Additionally, SSI sample sizes are often not large enough to make substantive and generalizable conclusions (Adams, 2015). Therefore, as mentioned, the interviews were meant as validation for the indicators, rather than to derive conclusions from.

Interviewees were found through experts in the field. Criteria for interviewees were that they were associated with a running food hub, of which the hub also self-identified as food hub (facilitator). Interviewees were also asked to suggest other existing food hubs in the Netherlands that could be interviewed. In addition, the internet was used to find other existing foods in the Netherlands, using the search term "voedselhub Nederland". This dual approach aimed to include a comprehensive range of food hubs in the Netherlands.

Based on the indicators of Sannou et al. (2023), an interview guide was established (see Appendix III). In this guide, structured questions and themes were included, aligning with the research objectives of this thesis. This guide began with a general introduction of the food hub, focusing on its goals and customers. This information was then used to categorize the food hubs type (VASCA, SFCD or Hybrid). Then, the social sustainability impact of the food hub was explored, following the framework of Sannou et al. (2023). Interviewees were asked for extra input regarding these indicators, specifically if they thought there were any indicators missing that did not properly cover the impact of their food hub. As SSIs allow for input from the interviewee, during the interview there was space to do so. In total three food hubs in the Netherlands were interviewed. All interviewees were presented with a consent form, which they either signed or verbally agreed upon before the interview (see appendix IV).

After completing the interviews, they were transcribed in the original language. Using coding, the interviews were analysed. Coding enables the identification of recurring patterns and themes across interviews (Williams & Moser, 2019). The indicators of Sannou et al. (2023) were used as codes to analyse the interviews. As these are the same indicators used for the analysis in phase 1 as well, it allowed for comparison between the results of phase 1 and 2, meaning the social sustainability impact of food hubs from literature could be compared to the impact of the interviewed food hubs. This overview was once again made with help of Excel.

3.3 Phase 3: Co-creation in Amsterdam

Phase three of this research aimed at exploring how food hubs in Amsterdam can be socially sustainable. As food hubs are still being developed, this phase focused on the "ideal" socially sustainable food hub in the local context of Amsterdam Southeast. This phase was guided by the question: "What indicators are relevant for the ideal socially sustainable food hub in the context of Amsterdam?". This question was answered by creating a vision for an ideal socially sustainable food hub through co-creation. This co-creation served as a first exploration in establishing how social sustainability should be integrated within food hubs in Amsterdam Southeast. Based on the co-creation a handbook was developed for food hub practitioners with recommendations for the inclusion of social sustainability in food hubs in Amsterdam Southeast (see appendix VII). Before going into the methodological description of the co-creation, the case study in which it was performed will be described.

3.3.1 Case study: food hubs in Amsterdam Southeast, H-buurt

The co-creation session on sustainable food hubs was held in the H-buurt neighbourhood in the district Amsterdam Southeast as part of an ongoing local initiative. Two active residents (affiliated with GroenplatVorm Zuidoost and Bloei & Groei) were exploring the realisation of a food hub in the H-buurt. Together with them, three meetings were organised to investigate the potential of a food hub in the H-buurt. The first meeting was used for participants to get to know each other, identify challenges in the local food system, and discuss how a food hub could create a meaningful impact in the H-buurt. The second meeting concerned the identification of current initiatives in the H-buurt that could be included within a food hub. This session was also used to host the co-creation on a sustainable food hub, which is part of this thesis. The third meeting was used to establish concrete first steps towards the implementation of a food hub. All sessions were conducted in Dutch.

The development of food hubs in Amsterdam connects with ongoing work of the municipality of Amsterdam. In Amsterdam two types of food hubs are being implemented (Smolders, personal communication, 11 December 2024). These are 'voedselverbindingsplekken' (last mile hubs) and 'voedselhubs' (first mile hubs). In this case, the first mile hubs correspond mostly to the value-based agri-food supply chain approach (VASCA) food hub, focusing on the logistical character of food hubs by connecting local farmers to local consumers. The last mile hub, corresponding to the Sustainable Food Community Development (SFCD) food hub, focusing on connecting rest streams of food to consumers, having a clear social goal.

Both types of these food hubs are included in the municipal 'voedselstrategie' (food strategy). Part of this strategy is to create six area-specific 'voedselverbindingsplekken' by 2026, combining food production and consumption, processing, distribution, logistics, consumption, culinary meetings, and gatherings. These food hubs should be combined with usage of green space and urban agriculture for edible greenery and local food production (Gemeente Amsterdam, 2023). The 'voedselstrategie' uses six lines of action. These are 1) fair and affordable food for all, 2) food waste and organic waste streams, 3) healthy food environment, 4) urban agriculture and short chains, 5) entrepreneurship and

AmsterDoen, and 6) more plant based. The first five lines of action are linked to the implementation of voedsel hubs (first mile hub). The voedselverbindingsplekken (last mile hubs) are linked to actionlines 1, 2, 3, 5 and 6. To guide the development of food hubs, a 'kwartiermaker voedselhubs' (quartermaster food hubs) was assigned.

The focus of the co-creation in Amsterdam Southeast was on the last mile hubs (voedselverbindingsplekken). Firstly, this is because the last mile hubs align with the sustainability focus of SFCD food hubs. As this research concerns social sustainability, SFCD hubs are theoretically more suitable. From a practical perspective, focusing on last mile hubs is convenient as they are currently further developed than the first mile hubs in Amsterdam.

3.3.2 Methodological approach

3.3.2.1 Co-creation and Theory U

Co-creation originates as a strategy of businesses to increase customer satisfaction and increase value proposition for the customer (De Vries et al., 2024). In academic research, co-creation is referred to as a process of co-design and open innovation (Ind & Coates, 2013). In this process, companies and end-users are involved (Chesbrough, 2003). Co-creation enables the wide array of actors involved in food hubs to come together and collectively shape the to be developed food hub. Including a broad range of (local) actors enables the inclusion of context-specific and local knowledge.

The guiding theory of the co-creation session was that of Theory U. Theory U, developed by Otto Scharmer (MIT), provides methods to develop appropriate skills and attitudes to truly listen to each other. The listening, and true understanding is a gateway to transformative change. Through this type of dialogue, interaction between different stakeholders leads to the building of new knowledge and insights (Roo et al., 2021).

Based on Theory U, Pearson et al. (2018) have developed art-based methods for co-creation. Theory U provides a clear outline for change management that is easily adaptable to different contexts and scales. Theory U can be broken down into three stages: observe, reflect and act. For the sake of the art-based methods, the stages of convene and harvest are added by Pearson et al. (2018) (see figure 3). Linking to these different Theory U stages, Pearson et al. (2018) have created various co-creation methods that are art-based.

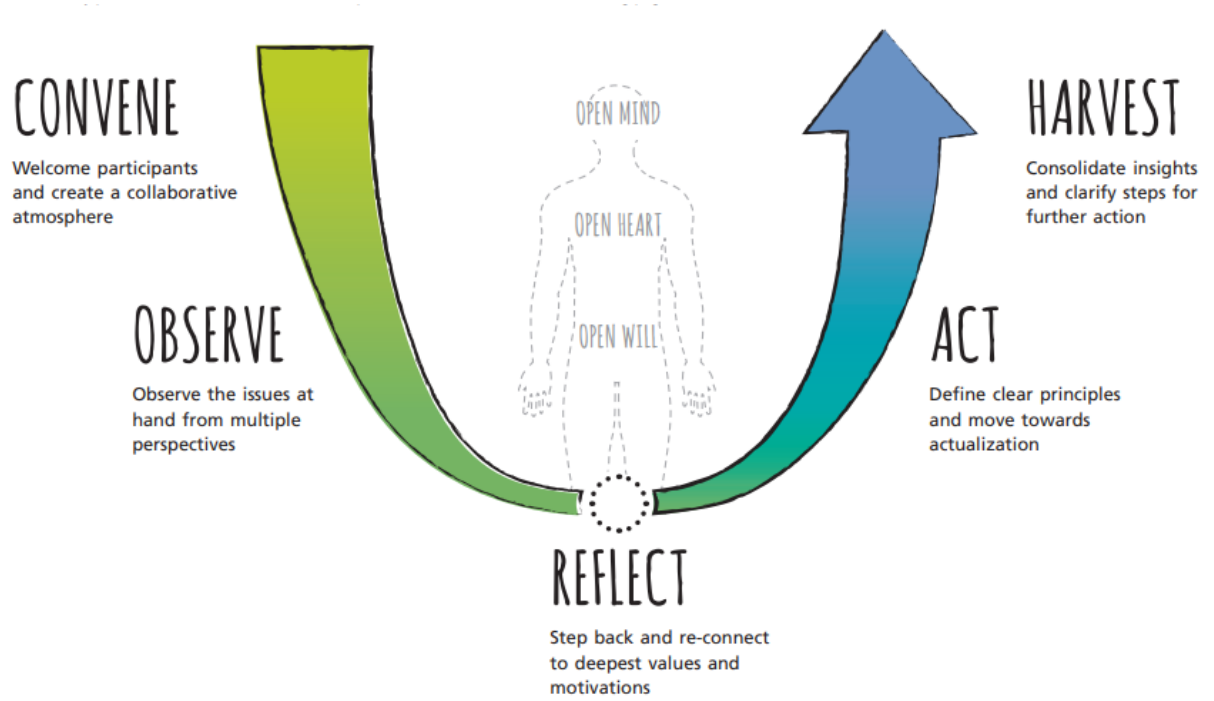

Figure 3. Theory U by Pearson et al. (2018)

3.3.2.2. Co creation protocol

Ideally, the co-creation would include stakeholders from the quadruplehelix, existing of research organisations, public agents, private enterprises and civil society (Stephens, 2025). While civil society has traditionally not been included in innovation processes, its inclusion can enhance the alignment of solutions with societal concerns (Stephens, 2025). As noted by Stephens (2025), this is particularly important in domains such as health, food, energy, and transport. For this reason, civil society was actively involved in shaping the vision for a socially sustainable food hub in this project. The participants were invited with help of the two active residents, with which the other sessions were organized as well. They invited people from their network and opened the session for anyone interested. While sought to include the complete quadruple helix, it was only managed to include stakeholders from private enterprises and civil society.

The protocol below (table 2) provides an overview of the exercises performed during the co-creation. The protocol includes the different methods used and the corresponding Theory U steps.

Main theme	**Time**	**Description**	**Method**
Get to know everyone **(Convene)**	5 min	Through a simple exercise, participants can get to know each other.	Circle of objects
Introduce the session	5 min	The aim of the session is explained. Background information about the thesis is shared.	
Familiarize with indicators	10 min	Participants are asked to read the indicators of Sannou et al. (2023).	Visualize indicators & link to previous

		Afterwards, they are asked to match the identified themes from a prior session.	established themes (from the first session)
Pick 5 most important indicators	5 min	Participants are asked to individually pick the 5 indicators they deem most important for a food hub in the H-buurt.	
Define what it means for a food hub to be socially sustainable **(Observe, reflect & act)**	30 min	In groups (3-4 people), participants are asked to design their ideal social food hub based on the indicators. Based on their prioritized indicators a vision for a food hub is made.	Collage
Discuss the collages **(Harvest)**	10 min	The different collages are discussed and merged into one final collage.	Essential title
Merge visions	10 min	Participants are asked to merge their different visions into one, creating a shared vision for a H-buurt food hub.	
Wrap up & thank you	5 min	End the session. Participants are thanked and it is explained how the results will be used.	

Table 2: co-creation protocol

For participants to get familiar with the social sustainability indicators, an introductory step was taken. The indicators of Sannou et al. (2023) were translated to Dutch and visualized (See Appendix V). Participants were asked to read the indicators. Then, to familiarize with the indicators, participants were asked to match them with the identified themes of the first session (including circularity, affordable meals and collectivity).

Following, participants were asked to individually pick the five indicators of Sannou et al. (2023) they deemed most important for a food hub in the H-buurt. Using the five selected indicators, participants worked in groups of 3-4 to design their vision of an ideal socially sustainable food hub. Together, they needed to narrow down their picked indicators to the top 5 most important indicators of the group, to use in their joint collage. The goal of this collage activity was to identify which social sustainability indicators participants considered most important. Their task was to visualize a food hub that embodies these values. As described by Pearson et al. (2018, p. 42) "collage allows both rational and emotional reasoning through the free combination of images which, due to their evocative power, can contribute inspiration to new imaginative horizons". Collage was used as it can be an inclusive method, allowing participants from broad age ranges to join and partly reduces the barrier of language. The collages were made with pictures and texts from magazines. These pictures and texts were cut out beforehand to save time during the actual session. Various types of magazines and various types of visuals were cut out, to offer a large variety of material to work with.

To wrap up the collage session, participants were asked to share their collages with each other. This step served as a way to harvest all future visions and ask why certain indicators were picked. Participants were asked to summarize their collage in one sentence: the essential title method. "*Participants are asked to come up with a catchy title that communicates the most important message of the creative works produced during the workshop." (Pearson et al., 2018, p. 58).* Then, they were asked to merge their different visions into one, creating a shared vision for a H-buurt food hub.

The co-creation was analysed two-fold. Firstly, the picked indicators by the individual participants were again analysed based on the framework of Sannou et al. (2023). This allowed easy comparison between phase 1, 2 and 3. Then, the two separate collages and the joint collage were analysed as well. The collages were analysed based on the used pictures, the picked indicators from the individual participants, and the explanation and reasoning by the groups. During the co-creation session, notes were taken. These notes were used to understand the reasoning behind the used pictures and indicators of the collage.

4. Results

This chapter will provide the results from the three methodological steps, including a literature review, multiple interviews and a co-creation with the case study of Amsterdam Southeast, H-buurt. The results will be presented per methodological phase.

4.1 Phase 1: literature study on social sustainability in food hubs

The next section presents the relevant literature on social sustainability of food hubs and offers a critical analysis of the existing literature in this area. The aim of this chapter is to explore how food hubs are defined in existing literature and to examine their potential to contribute to social sustainability. The central research question of this chapter is:

1. How is social sustainability included in the context of food hubs in literature?

Given that the concept of food hubs is relatively new and understood differently by different people, a literature review is essential to clarify what a food hub is and how it can be socially sustainable. Gaining insights into this is essential for creating a framework that supports the assessment and design of food hubs with a focus on social sustainability. To align with this objective, this review is guided by the following questions:

- What is the geographical scope of the retrieved articles?
- How are food hubs defined in literature?
- To what extent do different definitions of food hubs relate differently to social sustainability?
- What are recurring themes/contributions and indicators of social sustainability?

4.1.1 Geographical scope of the retrieved articles

The literature review was performed on 20 articles. Figure 3 depicts the distribution of the geographical scope level of the articles, either focussing on a global, continental or country level. Most of the papers are focused on North America and Europe. More specifically, 30% of the papers concern the U.S. context, which could be explained by the fact that food hubs originate from the United States. While two papers discuss food hubs in the global context, no papers specifically address the continents South America, Africa or Asia.

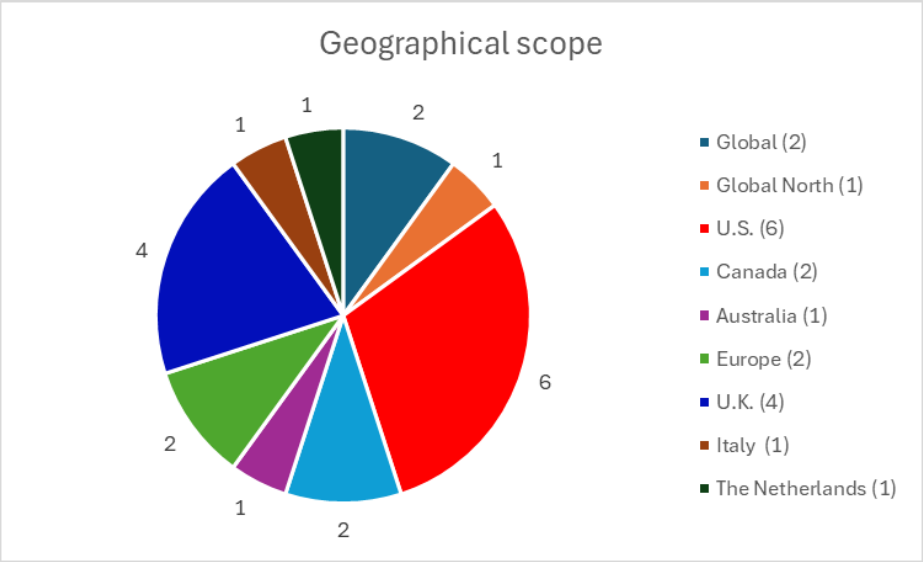

Figure 4: geographical scope of retrieved papers

4.1.2 Definitions of food hubs in literature

As established before in chapter 2.1, various definitions of food hubs exist in literature. Several authors highlight that food hubs are subject to dichotomous interpretations (Avetisyan et al., 2023; Berti & Mulligan, 2016; Curry, 2021; Hardy, 2020; Hermiatin et al., 2022; Hyland & Macken-Walsh, 2022; Manikas et al., 2019). These include the 'sustainable food community development' (SFCD) food hubs and the 'value-based agri-food supply chains approach' (VASCA) food hubs. Other authors argue for the existence of hybrids of these definitions.

4.1.3 Different food hub definitions and social sustainability

Within the analysed literature, 11 papers adopt a hybrid approach, 8 use the SFCD approach and one paper makes use of the VASCA approach. Given the literature review's focus on social sustainability, it makes sense that most retrieved papers have a sustainability focus and thus use either SFCD or hybrid definitions of food hubs. A slight majority of the papers adopts the hybrid definition, possibly indicating that hybrid food hubs are most prevalent.

4.1.4 Recurring themes/contributions and indicators of social sustainability

To analyse the recurring themes and indicators of social sustainability within food hubs, the framework of Sannou et al. (2023) was used. This framework includes social sustainability indicators in the agri-food system. See table 3 below for an overview of the most addressed indicators in orange (with themes and sub-themes). The 20 retrieved articles were analysed based on these indicators. See table 4 and appendix VI for an overview of the analysis.

Food security	Healthy and safe food products	Farmers' health & safety	Labour & working conditions
			
• Food insecurity of **access** • **Nutrient** needs/dietary **diversity**	• **Safety/quality** of food products • **Social acceptability** of products/**animal welfare** • **Fair** trading **practices**	• Access to **health care** • Farmers **aging** • Access to **potable water** • Health risk (**pesticide use**) • Health risk (**work related**)	• **Labour productivity**/efficiency • **Workload** • **Labour needs** and **avialability** • **Labour cost** • **Household/family** labour supply • **Off-farm income**/occupation • Farm transfer to **future generation** • Contribution to **job creation** • **Labour rights**, fair working conditions, forced & child labour
Decent livelihoods	**Farmer's training**	**Social cohesion, security & conflict**	**Land and property rights**
			
• **Resilience** & vulnerability • **Equity** (social, gender, generational) • Availability and access to **infrastructure & technology** • Access to input and **financial assistance** • Farmer's **satisfaction** • Household **wealth** and **well-being** • **Diversification** of the **production**	• Access to &/or frequency of **agricultural extension services** • **Knowledge and information sharing** among farmers • Farmer's & labour's **training** and **experience** in agriculture • Farmer's **education level**	• **Participation** & social capital • **Coexistence** & conflicts • **Communication** and awareness • **Population pressure** • **Migration**	• **Land tenure**

Table 3. Recurring social sustainability themes in food hubs

Author	Food hub definition	Social sustainability indicators							
		Food security	Healthy and safe food products	Farmer's health & safety	Labour & working conditions	Decent livelihoods	Farmer's training	Social cohesion, security & conflict	land and property rights
Avetisyan et al., 2023	Hybrid	x	x	x	x				x
Blay-Palmer et al., 2013	SFCD	x						x	
Berti & Mulligan, 2016	VASCA	x	x			x		x	
Canal Vieira et al., 2021	SFCD	x	x						
Cleveland et al., 2014	Hybrid	x	x	x			x	x	
Curry, 2021	SFCD	x	x					x	
Fridman & Lenters, 2013	SFCD	x			x			x	
Hardy, 2020	SFCD	x	x					x	
Hermiatin et al., 2022	Hybrid	x	x			x	x	x	
Hyland & Macken-Walsh, 2022	Hybrid	x	x			x	x	x	
Kim, 2023	SFCD	x	x		x	x	x	x	x
Manikas et al., 2019	Hybrid	x	x		x	x	x	x	x
Martin et al., 2016	Hybrid	x					x	x	
O'Hara, 2017	Hybrid	x	x		x		x	x	
Prost, 2019	SFCD	x					x	x	
Psarikidou et al., 2019	SFCD	x	x		x			x	
Shariatmadary et al., 2023	Hybrid	x		x			x		
Shariatmadary et al., 2023	Hybrid	x	x	x			x		
Sgroi & Marino, 2022	Hybrid	x	x			x	x	x	
van den Boer et al., 2021	Hybrid	x	x		x		x	x	

Table 4. Concise overview literature review

The literature review revealed that certain indicators were most prevalent regarding the social sustainability of food hubs. Either entire themes comprising multiple indicators had the greatest impact, or specific individual indicators within a theme were most influential. The most prevalent themes were those of food security (including the indicators food insecurity of access and nutrient needs/dietary diversity) and healthy and safe food products (including the indicators of safety/quality of food products, social acceptability of products/animal welfare and fair trading practices). The specific indicators regard participation and social capital (part of theme social cohesion, security & conflict), access to &/or frequency of agricultural extension services (part of theme farmer's training), knowledge and information sharing among farmers (part of theme farmer's training), and contribution to job creation (part of theme labour & working conditions). In the section below, a more elaborate explanation is provided on how exactly food hubs contribute to these themes.

Food security

The most prominent contribution of food hubs to social sustainability is through food security. All reviewed studies discuss the role of food hubs in improving food security, with 19 papers specifically noting how food hubs mitigate food insecurity of access, and 15 papers highlight improvements in dietary diversity and nutrient intake.

Food insecurity of access

Food hubs have the potential to improve food insecurity of access by increasing access to (healthy) food, including fruits and vegetables, at affordable prices. Food hubs can target specific groups for which food quality is specifically of importance, such as children, students, hospital patients and staff, and residents in senior care facilities (Shariatmadary et al., 2023, a). Furthermore, food hubs have the potential to contribute to an increased level of food security by donating their unsold produce (Shariatmadary et al., 2023, a).

The availability and access to (healthy) food is an important aspect of social sustainability, as lack of it can have implications for health and well-being. Implications for health relate to food-related illnesses such as diabetes, obesity and heart disease (Shariatmadary et al., 2023, a). Unequal food access is often amplified by these health implications, as those in poor health often struggle to generate sufficient income (Shariatmadary et al., 2023, a).

It is important that produce within food hubs is available and affordable for all residents, including low-income consumers, and not just serve the wealthy and educated living in the right areas (Berti & Mulligan, 2016; Fridman & Lenters, 2013; Kim, 2023). While having the potential to enhance food security, food hubs are also critiqued for supplying to niche markets of mostly affluent middle-class consumers (Psarikidou et al., 2019). Food hubs struggle to address broader issues of unequal distribution and inequitable access to quality food. While maybe wanting to address these issues, many food hubs face a conflict between their economic and social sustainability objectives, limiting their ability to provide food access, particularly in low-income neighbourhoods (Psarikidou et al., 2019; Shariatmadary et al., 2023, a; Shariatmadary et al, 2023, b). Low contributions to improved food security may not stem from a lack of commitment, but rather from financial constraints.

Dietary diversity and nutrient intake and education

Nutrient needs are improved by food hubs through the availability of healthy food or eating options. Another way through which food hubs can contribute to dietary diversity and nutrient intake is through education. While not being a specific sub-theme of the framework by Sannou et al. (2023), education is often mentioned in relation to food hub's efforts. The idea is that education on healthy eating can help people make healthier choices regarding their diet.

Food hubs have the potential to play a proactive role in providing educational and training programs for their customers (Shariatmadary et al., 2023, b). Such educational initiatives could involve cooking classes, healthy eating programs, and education on reducing food waste or nutrition and food safety. Or they could be aimed at preparing healthy meals on a budget. For this type of education to be effective, they must be culturally sensitive. Also, the social pressure associated with food preparation traditions and eating habits should be considered (O'Hara, 2017).

All papers thus mention food hubs' potential to improve food access, indicating it to be a vital function of a food hub (Avetisyan et al, 2023; Berti & Mulligan, 2016; Blay-Palmer et al., 2013; Canal Veira et al., 2021; Cleveland et al., 2014; Curry, 2021; Fridman & Lenters, 2013; Hardy, 2020; Hermiatin et al., 2022; Hyland & Macken-Walsh, 2022; Kim, 2023; Manikas et al., 2019; Martin et al., 2016; O'Hara, 2017; Prost, 2019; Psarikidou et al., 2019; Shariatmadary et al., 2023, a; Shariatmadary et al., 2023, b; Sgroi & Marino, 2022; van den Boer et al., 2021).

It is important to note that while Sannou et al. (2023) use two indicators to measure food security, it is generally agreed upon that food security consists of four dimensions (World Bank Group, n.d.). These are availability, access, utilization and stability. Availability concerns the supply side of food security

and relates to the amount of food being produced. Access is about the economic and physical access of food. Utilization regards nutrition and energy intake. Lastly, stability regards the consistency of the listed dimensions. While the indicators used by Sannou et al. (2023), food insecurity of access and, dietary diversity and nutrient intake, reflect the three dimensions of availability, access and utilization, it is important to explicitly note the different components. Specifically, availability and access regard different components, but in this framework are understood as one indicator. Food hubs mostly improve the access component of food security, rather than the availability component.

Healthy and safe food products

Food hubs also contribute to the theme of healthy and safe food products, mostly through promoting fair trading practices, as well as providing products that are socially acceptable.

Fair trading practices are established by providing farmers an increased income (Berti & Mulligan, 2016; Canal Veira et al., 2021; Cleveland et al., 2014; Curry, 2021; Hermiatin et al., 2022; Kim, 2023; Manikas et al., 2019; Psarikidou et al., 2019; Sgroi & Marino, 2022). Fairer prices relate to farmers earning more appropriate prices. They also relate to more fair processes by enabling a more even balance in the share of power of different stakeholders (Manikas et al., 2019; Psarikidou et al, 2019).

Social acceptability of products mostly relates to the use of sustainable practices by farmers (Avetisyan et al, 2023; Canal Veira et al., 2021; Hardy, 2020; Hermiatin et al., 2022; Kim, 2023; O'Hara, 2017; Shariatmadary et al., 2023, b; van den Boer et al., 2021). Additionally, it relates to the food that is available in the food hub. When being socially acceptable, the food provided needs to fit eating behaviours of the consumers (Van den Boer, 2021).

Participation and social capital (part of theme social cohesion, security & conflict)

Following, 14 papers note how food hubs contribute to participation and social capital (Berti & Mulligan, 2016; Blay-Palmer et al., 2013; Cleveland et al., 2014; Curry, 2021; Fridman & Lenters, 2013; Hardy, 2020; Hermiatin et al., 2022; Kim, 2023; Manikas et al., 2019; Martin et al., 2016; Prost, 2019; Psarikidou et al., 2019; Sgroi & Marino, 2022; van den Boer et al., 2021). As food hubs are at the interplay of producers and consumers, food hubs can foster a sense of community and drive community development by supporting both producers and consumers (Kim, 2023; Hardy, 2020; Manikas et al., 2019; van den Boer, 2021). Food hubs can facilitate interaction and closer connections between farmers and consumers and in this way facilitate the development of trust and social capital, which can lead to a sense of (local) community (Hardy, 2020). Besides, food hubs can contribute to participation and social capital by providing opportunities for the involvement of new or different groups of people in local communities and agriculture (Manikas et al., 2019).

Further, Fridman & Lenters (2013) note how food hubs, serving as a connection point between neighbourhoods and the municipality, can make it possible for people to get closer to decision-making at the city level. This connection is of importance, as engagement of local experts is needed to correctly interpret the local context in which the food hub is situated (O'Hara, 2017).

Food hubs foster possibilities to build connections within and between communities through community gatherings and neighbourhood-based food initiatives (Manikas et al., 2019; Fridman & Lenters, 2013; Hardy, 2020). Additionally, food hubs can serve as incubators for new food business ideas, enabling individual capacity and empowerment of communities (Fridman & Lenters, 2013). Youth empowerment is one example of how food hubs contribute to community development (Hardy, 2020). More specifically, Fridman & Lenters (2013) describe community kitchens as a type of food hub that can help building capacity, connections and resilience within a community.

Agricultural extension services (part of theme farmer's training)

Additionally, nine studies emphasize the potential of food hubs to provide agricultural extension services (Avetisyan et al, 2023; Berti & Mulligan, 2016; Blay-Palmer et al., 2013; Hermiatin et al., 2022; Hyland & Macken-Walsh, 2022; Shariatmadary et al., 2023, a; Shariatmadary et al., 2023, b; Sgroi & Marino, 2022; van den Boer et al., 2021).). These services include information provision, technical assistance and expert advice in the form of agricultural advisors, and the opportunity to share information with one another. This indicator plays into the need of farmers for receiving technical assistance on various farming aspects (Shariatmadary et al., 2023, b).

Knowledge and information sharing (part of theme farmer's training)

Food hubs facilitate knowledge and information sharing among farmers (Cleveland et al., 2014; Hermiatin et al., 2022; Hyland & Macken-Walsh, 2022; Kim, 2023; Manikas et al., 2019; Shariatmadary et al., 2023, b; Sgroi & Marino, 2022). Food hubs can facilitate the sharing of local knowledge. For instance, as sustainable agriculture practices are shared, small farmers' knowledge is shared and consequently their identity is maintained (Manikas et al., 2019). This knowledge exchange can lead to sustainable competitive advantage of food hubs (Manikas et al., 2019).

Job creation (part of theme labour & working conditions)

Lastly, food hubs make considerable efforts to create jobs (Avetisyan et al., 2023; Fridman & Lenters, 2013; Kim, 2023; Manikas et al., 2019; O'Hara, 2017; Psarikidou et al., 2019; van den Boer, 2021). This is specifically relevant for social sustainability when the jobs are created for people within the community the hub is in (Berti & Mulligan, 2016; Manikas et al., 2019; Kim, 2023; O'Hara, 2017). Food hubs can facilitate local entrepreneurs by assisting people in training and technical support to implement their business plan, linked to food hub activities (O'Hara, 2017).

Less often occurring themes

While the above themes are mentioned relatively often, certain themes of social sustainability receive comparatively limited attention. Issues directly relating to farmer's well-being, such as farmer's health and safety, labour and working conditions, and land tenure are less frequently addressed. This may reflect the more intermediary role of food hubs, with a primary function in connecting producers with consumers, rather than actively improving farmer's practices and well-being.

The fact that food hubs mostly make an impact in their intermediary role suggests that food hubs are not necessarily created from a food system perspective. In other words, food hubs do not approach the food system in a holistic manner but rather create action in a very specific part of the food chain, namely on the intersection between farmers and consumers.

4.1.5 To what extent do different definitions of food hubs relate to social sustainability indicators?

Based on the literature review it seems that hybrid food hubs cover a broader range of social sustainability indicators than SFCD food hubs. In total, hybrid food hubs address nineteen unique indicators, while SFCD food hubs cover twelve unique indicators. This could indicate that SFCD food hubs make a more specific impact, mostly concerned with the earlier mentioned themes of food security, healthy and safe food products, and social cohesion, security & conflict. Hybrid food hubs

seem to address a broader range of social sustainability indicators, also including themes as decent livelihoods and farmer's training.

This broader coverage could be explained by the notion that the types of food hubs that can be classified as hybrids have a relatively high variation within them. Meaning that hybrid food hubs seem to differ from each other more than SFCD food hubs do. Thus, the more variation within food hub type, the more variation within its impact on social sustainability and vice versa.

This broader impact of hybrid food hubs is also noted in literature. For instance, Manikas et al. (2019) argue that it is in its hybridity that food hubs have the potential to make the most impact, as they capture the advantages and minimize the disadvantages of both alternative and mainstream food systems. Others also mention the relevance of the place-based character of food hubs. Food hubs emerge in response to community needs. Since each community has unique assets and resources, their sustainability goals differ, and the food hub will therefore also make a unique impact (Blay-Palmer et al., 2013).

The notion of hybridity and place-based implications are important to note, as it means that a socially sustainable food hub means something different in different circumstances. This also means that its success depends on the goals of the food hub itself (Manikas et al., 2019).

Conclusion

Concluding, food hubs seem to make the most consistent impact on the theme's food security, participation and social capital, provisioning of agricultural extension services, knowledge and information sharing, contribution to healthy and safe food products, and job opportunities. Food hubs make less impact on theme's associated directly with farmer's well-being, such as farmer's health and safety, labour and working conditions, and land tenure. This distribution indicates that food hubs make the most impact as intermediaries between producers and consumers.

Further, it seems that hybrid food hubs make a broader impact on social sustainability than SFCD food hubs do. SFCD food hub's impact seems to be more specific. Only one article refers to VASCA food hubs. This can probably be explained by the notion that VASCA food hubs do not focus on (social) sustainability, but rather on logistics and efficiency.

Based on this literature review, it seems that the framework of Sannou et al. (2023) is useful in showing the social sustainability impact of food hubs. The framework will therefore be used in the same way in phase 2.

4.2 Phase 2: Interviews with existing food hubs in the Netherlands

In this chapter, the results of the interviews with food hub representatives will be presented. These interviews were conducted to verify the results from the literature review, as well as to investigate whether the Dutch context is of difference. This chapter was guided by the question:

2. How is social sustainability included in existing food hubs in the Netherlands?

Firstly, the three interviews will be discussed individually. Following, a general summary will be provided, regarding food hubs in the Netherlands. Table 5 depicts a summary of the addressed social sustainability indicator themes per interviewed food hub. A more extensive description of the interviews will be given below.

Food hub	Type of food hub	Social sustainability indicator							
		Food security	Healthy and safe food products	Farmer's health & safety	Labour & working conditions	Decent Livelihoods	Farmer's training	Social cohesion, security & conflict	Land and property rights
Voedsel Surplus	SFCD	x	x		x			x	
Voedselhub Oosterwold	Hybrid	x	x	x	x	x	x	x	x
Voedselhub Nijmegen	SFCD	x	x	x	x			x	

Table 5: Identified social sustainability themes of the interviewed food hubs

4.2.1 Stichting Voedsel Surplus

Stichting Voedsel Surplus serves as an initiator and facilitator of food hubs, primarily connecting supermarkets with community centres. These centres receive surplus food from supermarkets and use it to prepare meals for residents. Once these hubs run independently, Voedsel Surplus' efforts stop. Voedsel Surplus is classified as a SFCD food hub, as its primary goals focus on social impact. Importantly, Voedsel Surplus is not a food hub itself, but a foundation that helps setting them up. Therefore, the indicators in table 5 reflect both Voedsel Surplus' direct impact as well as their indirect impacts through the hubs they have initiated.

The most prominent social sustainability indicators impacted by Voedsel Surplus are those of food security, healthy and safe food products (specifically relating to safety of food products and social acceptability of products), contribution to job creation (part of the theme labour & working conditions), as well as social cohesion, security and conflict. Food security is increased as hubs provide affordable meals using leftover produce. Some food hubs also collect leftover fresh produce from farmers, promoting healthy food and nutrient needs. Healthy and safe food products are considered as community kitchens have control over hygiene, staff, and preparation. Voedsel Surplus also provides HACCP (Hazard Analysis Critical Control Point) training to improve food security and reduce waste. The community centres include social acceptability by tailoring meals to the dietary needs of the visitors. Further, food hubs linked to Voedsel Surplus can create work opportunities for retirees and people distanced from the labour market, mostly through voluntary work. Lastly, the indicator of social cohesion is addressed, as the meals are served in a social setting. However, it could be argued that this social setting is created by the community centres regardless of Voedsel Surplus. It is thus debatable whether this indicator is targeted through Voedsel Surplus.

The addressed themes align with the commonly impacted themes within SFCD food hubs. What sets Voedsel Surplus apart from other food hubs is its facilitating/intermediary role and position within the

food chain. Voedsel Surplus connects left over food at the end of the food chain to community centres, rather than engaging with food producers.

4.2.2 Voedselhub Oosterwold

Voedselhub Oosterwold is a food hub located in the residential area of Oosterwold in Almere, the Netherlands. Residents in this area are required to dedicate half their plot for urban farming. The food hub is a cooperative of residents that pool their produce. Voedselhub Oosterwold is classified as a hybrid food hub, focusing on local food production, as well as environmental and social sustainability aspects.

The Voedselhub Oosterwold impacts all social sustainability themes, addressing at least one indicator per theme. Through urban agriculture, the food hub improves access to fresh, affordable local produce. As the food hub provides a broad range of produce, it could be argued that this adds to the dietary diversity of the food hub users. Voedselhub Oosterwold ensures food safety by checking and washing all incoming food in the food hub. The hub aims to raise acceptability of different products by showing people the various diverse types of fruits and vegetables available that might not be present in regular supermarkets. Where possible, organic production is the starting point. Agreements are made with residents not to use pesticides or fertilizer. The food hub plans on including a knowledge centre to provide education on urban farming. The goal is to train residents as urban farmers and support community-based initiatives. By coordinating crop management of the various residents via an app, the hub encourages crop diversification. The hub may collaborate with large-scale farmers in the future, blending large-scale agriculture with niche crops. Currently, over 50 types of crops are grown in the plot next to the food hub. Rather than compete on scale, the focus of the hub is on diverse and unique produce.

The Voedselhub Oosterwold impacts a wide range of social sustainability indicators, which aligns with the findings of the literature review on hybrid food hubs. The local context the food hub is in, where residents dedicate half of their plot to agriculture, has given shape to the functioning and impact of the hub. The strongest social sustainability impact of the Voedselhub Oosterwold is on the production-related indicators, as the hub sources produce from the resident growers.

4.2.3 Voedselhub Nijmegen

Voedselhub Nijmegen collects leftover food from farms, urban gardens and supermarkets. This leftover produce is then distributed to social eating initiatives, such as community centres and neighbourhood restaurants. The hub was initiated by the previously discussed Voedsel Surplus. Voedselhub Nijmegen is classified as an SFCD food hub, as its focus is on social impact.

Key social sustainability indicators impacted by Voedselhub Nijmegen are those of food security, healthy and safe food products, specifically relating to the safety of food products, contribution to job creation, as well as social cohesion, security and conflict.

Food security is improved by redistributing leftover food which is turned into affordable meals. At some community centres, producers from self-picking gardens engage directly with the guests, promoting knowledge exchange. Community kitchens monitor food safety and shelf life. Most produce comes from organic farms, supporting farmers' health and reducing harmful exposure, contributing to both healthy and safe food, as well as farmers' health and safety. The food hub contributes to job creation as several volunteers work at the Voedselhub Nijmegen. This gives volunteers some sense of purpose and some social contacts. The meals at the community centres foster connection, both through shared cooking and eating, impacting the indicator of social cohesion. The Voedselhub Nijmegen acts at the

end of the food chain, as they pool leftover produce from supermarkets, urban gardens and supermarkets. The social sustainability themes Voedselhub Nijmegen impacts are consistent with the identified themes of SFCD food hubs.

4.2.4 General conclusion

As previously explained, phase 2 served as a step to validate the findings from phase 1 and explore how the Dutch context might differ from literature. The interviews align with the findings of the literature review. Food hubs consistently show the strongest impact on key (sub)themes of food security, health and food safety, job creation, and participation and social capital. In contrast, their impact on themes directly related to farmer well-being appears significantly weaker. The pattern where hybrid food hubs tend to have a slightly broader impact on social sustainability indicators compared to SFCD food hubs was reaffirmed within the interviews.

A key insight from the interviews is the difference in social sustainability impact based on a food hub's position in the supply chain. They do so in different stages, either closer to producers or consumers. Voedselhub Nijmegen for example, operates at the end of the food chain, concerned with consumers. They rescue unsold food from supermarkets and occasionally from farmers or gardens. In contrast, Voedselhub Oosterwold focuses on the production side of the chain, working directly with farmers. Therefore, its social sustainability efforts are more oriented towards producers.

The interviews also highlighted the importance of local context in the way the food hub is given shape to and how it makes an impact. For example, Voedselhub Oosterwold is classified as a hybrid food hub and focuses on urban agriculture, serving residents who cultivate on their own plots. On the other hand, Voedselhub Nijmegen collaborates with community centres and is primarily consumer oriented. Both being food hubs, their impact is different, and the local setting is relevant for how the hub operates and makes social impact. The local context seems to be of greater relevance than the fact that these hubs are located in the Netherlands.

Further, the interviewees were asked whether the used framework or if there were indicators missing. All interviews stated that their food hubs social efforts were covered by the used indicators.

In conclusion, both the type of food hub and its position within the food supply chain are critical for its social sustainability impact. These findings will be used in phase 3, to define the ideal socially sustainable food hub in Amsterdam Southeast.

4.3 Phase 3: co-creation in Amsterdam

This chapter presents the results of the co-creation on the ideal social sustainable food hub in Amsterdam Southeast, the H-buurt. This chapter was guided by the question:

1. What indicators are relevant for the ideal socially sustainable food hub in the context of Amsterdam?

During the co-creation seven participants were present. These participants were either living or working in the H-buurt. Firstly, participants were asked to individually pick their top 5 social sustainability indicators. An overview of the picked themes is presented below (see table 6). Some people picked social sustainability themes, while others specified their top 5 indicators. Therefore, some participants picked less than 5 themes, as some indicators fell into the same theme.

	Social sustainability indicators							
Participant	Food security	Healthy and safe food products	Farmer's health and safety	Labour & working conditions	Decent Livelihoods	Farmers' training	Social cohesion, security & Conflict	Land and property rights
1	X	X	X			X	X	
2	X	X			X	X	X	
3		X		X		X	X	X
4		X	X		X		X	
5	X	X	X				X	X
6	X				X	X		X
Total	4	5	3	1	3	4	5	3

Table 6: prioritized social sustainability theme's co-creation

After this first step, the group split in two. Each group was asked to create a shared vision, based on the indicators. Then, they were invited to create a collage of this vision.

Group 1

The first group presented their collage (see picture 1). The summary of their collage in one sentence was: Voedselhub groene hart. Diversiteit (freely interpreted: Foodhub Green heart. Diversity).

Picture 1: Collage food hub group 1

The food hub envisioned by the first group provides space for talent and growth. Local residents are trained to work on the land in collaboration with professional farmers, combining the existing knowledge of residents with new skills. Through training they become capable of contributing to food production. This is visualised with the visual 'talent' (talent) and 'plant erin' (plant it), and can be linked to the indicator 'farmers' & labour's training and experience in agriculture. Next, there is a focus on sustainable food production by focusing on biodiversity and organic produce, which is visualised with the visual 'bio-brood' (organic bread) and the logo of organic food and could be linked to the indicator 'health risk (pesticide use)'.

Next, their own composting is made, linked to the visual of 'recycle' (recycle). Importantly, the land is owned by the food hub itself. This is not visualized but was explained by the participants. This links to the indicator of 'land and property rights'.

The participants describe the hub as one that is open to all and entirely voluntary. Yet, it's not without commitment. Volunteers play a vital role in maintaining the gardens. The atmosphere of the hub is warm and welcoming, with an emphasis on mindfulness and comfort, because when people feel good and comfortable, they're more open to each other. Mindfulness is of specific importance in the gardens. Here, people will become more mindful. The open atmosphere of the hub where volunteers work links to indicators of 'participation and social capital' and 'coexistence and conflict'. This is visualised in the collage with the visuals 'open', the mop that refers to the maintenance of the gardens, 'bewuster' (more aware), 'mindful & comfortabel' (mindful & comfortable), 'we' (we), 'leuk' (fun), 'schuif gezellig aan' (join in), 'niet zeuren' (don't whine), 'gevoel' (feeling), and the visual of 'a small gathering'.

The hub places a strong focus on producing food that is healthy, safe and delicious. This is visualised through the different visuals of food, as well as the visual 'gezond' (healthy), 'lekker' (tasty), 'smaak' (taste), 'consumeren' (consume) and the visual of a 'field with flowers'. They deem 'food security' an important indicator, as well as 'safety/quality of food products'.

In the long term, the hub aspires to supply to local supermarkets, giving consumers a clear understanding of where their food comes from. The hub will begin as a small initiative but is designed to grow into a fully operational enterprise. This is visualised with the 'LIDL and DIRK banner', which are chains of supermarkets in the Netherlands.

Group 2

The second group presented their collage (see picture 2). The summary of their collage in one sentence was: gevarieerd voedsel voor iedereen. Een beetje voedselverspilling, een beetje vers en een beetje van de boerderijen. Heel divers (freely interpreted: varied food for all. Some food waste, some fresh food and some from farmers. Very diverse.)

Picture 2: Collage food hub group 2

The food hub focuses on two types of food collection: the collection of leftover food and self-produced crops from neighbourhood gardens. These crops can be produced in existing neighbourhood gardens, on land that is currently not used, or other types of green spaces. Collectively as a food hub, it might be easier to gain access to this type of land, possibly impacting the indicator 'land tenure'. On a larger scale, a collaboration with farmers in the 'Flevopolder', a polder in the Netherlands with relatively close proximity to Amsterdam, might be possible. This is visualized with 'collectieve inkoop' (collective purchasing). It is important that no pesticides are used and that a broad variety of crops are grown, impacting the indicators of 'health risk (pesticide use)' and 'diversification of the production'. The second type of food collection is through the collection of leftover food. These two streams of food are visualised with the various visuals of food, as well as the visual of 'waar gaat dat heen' (where is it going) and 'lekker dichtbij' (comfortably close).

Combining these two types of food collection, food packages will be created from a mix of self-produced organic produce and nonorganic leftover food. These packages are made available for residents at an affordable price. When people cannot pay with money, they can volunteer and get the food as a reward. An affordable price is possible as the packages are made from either left over products or self-made produce. This relates to the indicator 'food insecurity of access'. These packages are assembled in the food hub and those preparing them receive a small fee for their work. This is visualised with 'je moet goed kunnen organiseren' (you have to have organizational skills), visual of money, 'eerlijk alles delen' (fair sharing), 'verdienmodel' (business model).

As this approach blends donated food with local produce, minimal financial support from the municipality is needed. It remains attractive for volunteers who can contribute to the community. At the food hub, there is attention for a diverse and nutritious diet with care for the cultural aspect of food. This is visualised with 'hip' (trendy), 'blijf op de hoogte' (stay informed), 'veiligheid' (safety) and relates to the indicator 'nutrient needs/dietary diversity' and 'social acceptability of products/animal welfare'.

The last visuals of 'samen' (together), 'bewust' (mindful), 'gezellig' (cosy), 'body & mind' and 'ik' (me) refer to the food hub that organizes sessions in the morning that start with yoga practice across the neighbourhood, focusing on body and mind. Afterwards, participants come together to have breakfast, fostering a sense of well-being, balance and connection among participants. This makes an impact on the social sustainability indicator of 'participation & social capital'.

Similarities collages

Both collages have a few similar indicators that they address. These are that of health risk (pesticide use), food insecurity of access and participation & social capital. After presenting their collages, the group discussed how they deem it to be important for the food hub to be accessible and open for all. Not only for the underprivileged, but also for others who you might assume do not need immediate help.

Joint collage

Next, the two collages were merged into one collage. The ideas the two groups found most important were combined in the final joint collage (see picture 3). The final collage presents a food hub where diverse food, existing of self-produced food and leftover food, is combined into little packages that are sold. These packages will be affordable and increase food security for residents in the neighbourhood. The food from the gardens is produced organically and thereby improving farmer's health and safety.

The selling of these packages is part of the revenue model of the hub. The hub is open to all and there is a nice social atmosphere. In the hub various activities will be organised where people can work out together and have breakfast afterwards. Residents can learn how to produce from experienced farmers, playing into the indicator of farmer's training. Eventually, the hub will sell their produce to existing supermarkets.

Picture 3: Joint collage food hub. The written text is freely translated to We make food packages every

week. Saved and home grown food for low budget. We learn to plant in this neighborhood. Become a farm hand at Green heart farmers. Mindful sports at 7 o'clock, then breakfast together at several locations.

4.3.1 Analysis co-creation

Based on the joint collage, it becomes apparent that the ideal food hub in the H-buurt will be a combination of a first and last mile hub, with produce from community gardens, as well as leftover produce. There is a focus on the social sustainability indicators of social cohesion, food security, healthy and safe food products, farmer's health and safety, and farmer's training. An ideal food hub in the H-buurt would be classified as a SFCD food hub, as it is a bottom-up food hub by the community. Not only does the hub bring consumers closer to producers, but consumers also actually become producers.

The municipality of Amsterdam plans to implement a 'last mile hub' in Amsterdam Southeast. Following the 'Voedselstrategie', this hub should address the action lines of fair and affordable food for all, food waste and organic waste streams, healthy food environment, entrepreneurship and AmsterDoen, and more plant-based. The only actionline not linked to 'last mile hubs' are that of urban agriculture and short chains. However, the ideal socially sustainable food hub in the H-buurt, created by the residents, does include production through community gardens.

It becomes apparent that the ideal vision of a food hub in the H-buurt does not necessarily match with the impact food hubs currently make in practice. For instance, neighbourhood gardens in the H-buurt are often temporary. Therefore, land and property rights are often mentioned to be important for a food hub in the H-buurt. However, both literature (literature review) and practice (interviews) show that food hubs barely make an impact on land and property rights.

5. Discussion

The aim of the discussion chapter is to provide a critical reflection on the research. The findings will be presented separately per method and placed within existing literature. Then, the framework of Sannou et al. (2023) will be reflected on, and finally a reflection on the methods will be presented.

5.1 Interpretation of the results

This thesis started with the question *"What would an ideal socially sustainable food hub in Amsterdam look like, based on literature and (best practices of) existing food hubs in the Netherlands?".* Through a combination of a literature review, interviews, and co-creation with residents and practitioners, the research offered insights into the role food hubs can play in advancing social sustainability.

5.1.1 phase 1: Literature review

Based on the literature review it was discovered that food hubs show strongest impact on social sustainability through the themes of food security, and healthy and safe products and the sub-themes of participation and social capital (part of theme social cohesion, security & conflict), provision of agricultural extension services (part of theme farmer's training), knowledge and information sharing (part of theme farmer's training) and contribution to job creation (part of theme labour & working conditions). In contrast, indicators directly related to farmer's well-being were less frequently addressed by food hubs.

A notable difference was observed between the impact of SFCD and Hybrid food hubs. SFCD food hubs consistently address a narrow but focused set of indicators, namely those of food security, healthy and safe food products and the subtheme participation and social capital. Other indicators are rarely addressed. SFCD hubs demonstrate a high level of uniformity in their social sustainability impact. Hybrid food hubs on the other hand impact a broader range of indicators, but in a less consistent manner. This variability might suggest that hybrid hubs differ more significantly from each other in their objectives and impacts, while SFCD hubs share more similar objectives and therefore also impacts. Thus, it seems that the type of food hub is related to the type of impact a food hub makes on social sustainability. SFCD makes a strong impact on a small range of indicators, while hybrid food hubs make a broader, but less consistent impact on social sustainability.

Furthermore, the social sustainability impacts of food hubs are mostly related to the interplay between farmer and consumer. For instance, food hubs improve food security by granting access to healthy and affordable food, linking consumers (more) directly to producers. The focus on this producer-consumer interplay suggests that while food hubs can contribute meaningfully to aspects of social sustainability, their capacity to drive system level transformation remains limited. Food hubs have limited influence over 'upstream' factors in the supply chain. For instance, if the production practices of farmers remain unsustainable, then the aggregation and distribution facilitated by food hubs alone cannot create a sustainable food system. The sustainability impact of food hubs is (partly) dependent upon the practices of the producers they source from. Without sustainable production, the role of food hubs in fostering broader sustainability remains constrained.

Indicators directly tied to farmer's wellbeing are often underrepresented in food hubs initiatives. This may be due to contextual factors (e.g. universal access to potable water in countries like the Netherlands making it unnecessary for food hubs to address potable water), or because indicators fall outside the scope or influence of most food hubs. Food hubs' social sustainability impact related to farmers is more common when food hubs are established as farmers collectives, where farmers' needs and interests are more explicitly embedded in the hub's objectives.

These insights helped with providing further insights into the concept of social sustainability in the context of food hubs. As stated by Desiderio et al. (2022) there is specifically a need for the further development and maturation of the concept of social sustainability, specifically in the context of food systems. This thesis contributes to that maturation by providing more insights into the way social sustainability functions in the context of food hubs. Food hubs primarily impact social sustainability through the interplay between producers and consumers. This makes them most effective in improving social sustainability through activities related to these consumer-producer interactions. This insight is important, as it reveals where food hubs are most effective and how they can be used to drive change. Food hubs are most suitable for improving consumer-producer relations, specifically regarding improved food security, healthy and safe food products and increased social cohesion.

At the same time, if food hubs are to be used as tools for systemic transformation of the food system, their implementation must be holistic. This means embedding sustainability throughout the whole food chain, such as by sourcing exclusively from producers who follow sustainable agricultural practices. On the other hand, as food hubs can be so diverse, they can be a useful tool for playing into context-specific challenges in the food system.

5.1.2 phase 2: Interviews

The interviews revealed that food hubs can play a role at different stages of the food chain, by intervening at the beginning of the food chain, the end, or sometimes both. At the beginning of the food chain food hubs work with farmers or community agriculture initiatives. At the end of the food chain, food hubs engage in reducing food waste by managing surplus or discarded food, typically through redistribution or processing of residual food streams.

The local context proved to be of influence on the impact of the food hubs. For example, the Voedselhub Oosterwold is primarily focused on the production side of the food chain. This is due to the design of the Oosterwold Neighbourhood, where residents need to allocate 50% of their plot to food production. The hub serves to pool produce from these residents. In contrast, Voedselhub Nijmegen is mainly oriented towards the end of the food chain. It focuses on reducing food waste by collaborating with local supermarkets and other retailers to collect and redistribute surplus food.

This finding is in line with the findings of Blay-Palmer et al. (2013). They argue that the degree to which sustainability goals are achieved vary per hub and depend on their unique community priorities and assets. The literature review highlighted the influence of a food hubs type on its social sustainability impact. Findings from the interviews underscored the role of local context. These discoveries underscore that the contribution of food hubs to social sustainability is context-dependent and can be quite varied. It implies that a one-size-fits-all approach to food hub policy or design might not be successful. Food hubs function differently, and their social sustainability impact is shaped by both their position in the food chain and the specific needs and assets of their communities. As a result, future development and policymaking should explicitly account for local conditions.

Thus, both the type of food hub and its position in the food chain influence the social sustainability impact made. This pattern is observed both in literature on the global scale, as well as in the interviews on Dutch scale.

5.1.3 phase 3: Co-creation

The co-creation session revealed that the residents in the H-buurt envision a food hub that combines properties of a first and last mile hub, combining food production with waste streams. Through

community gardens residents cultivate organic fruits and vegetables, which directly supply the food hub. Simultaneously, the hub makes use of surplus food from supermarkets and other local initiatives. This dual focus enables improved availability and affordability of food, while also promoting goals as social cohesion, healthy and safe food products and farmer's health and training. The food hub not only shortens the distance between consumer and producer, but consumers become producers themselves through the community gardens. The community-led hub focused on improving food access to healthy and affordable food can be classified as a SFCD hub.

A central finding from the research is the gap between this ideal vision and the reality of current food hub impacts. Residents emphasized the importance of land and property rights, either in relation to the hub building itself or the community gardens. However, existing food hubs rarely address this issue in practice. This might partly be explained by the general urban trend of densification in cities, which leads to the reduction or removal of green spaces (Haaland & van Den Bosch, 2015). Without active involvement of for example the municipality, it is questionable whether food hubs on their own can secure land or property for the long-term. Targeted municipal action, such as making vacant land or spacious parks available for food production could bridge this gap.

Another key finding is related to the municipal food strategy of Amsterdam. This strategy includes two types of food hubs, broadly classified as first or last mile hubs. These last mile hubs are planned to be installed in each city district. These last mile hubs are linked to five action lines of: fair and affordable food for all, food waste and organic waste streams, healthy food environment, entrepreneurship and AmsterDoen, and more plant-based. Notably, the action line of urban agriculture and short supply chains is missing. This presents a slight mismatch between the ideal food hub wanted by the residents of the H-buurt and the municipal food strategy, who explicitly noted the inclusion of community gardens. As mentioned, such gardens face limitations in dense urban settings, but the residents see them as an essential element of their ideal hub, once again underscoring the need for municipal support in securing land.

Lastly, the food strategy of the municipality remains quite abstract in how it expects a food hub to impact the lines of action. The ideal vision of a food hub in the H-buurt, created by residents and practitioners, is a more concrete vision of what kind of hub to work towards. It can help as a guide in the development of a food hub in the H-buurt.

Overall, these findings show the importance of the local context in the development of food hubs. A one-size-fits-all approach risks overlooking community assets, needs and challenges. This research has shown that food hubs exist in various types, with different impacts on sustainability. It is important to acknowledge this diversity and make use of it. This is however only possible if local policy allows and supports this, ensuring the potential of each hub individually.

5.2 Reflection on framework of Sannou et al. (2023)

The framework of Sannou et al. (2023) was used to assess the social sustainability impact of food hubs in both literature and practice, and it was used for the co-creation session on the ideal food hub in the H-buurt. As this research was conducted with the framework of Sannou et al. (2023), a critical reflection on its usage will be presented. The framework of Sannou et al. (2023) was created in response to the need for a framework on social sustainability in the agri-food system. In this thesis the framework was applied to food hubs, as a specific part of the agri-food system.

Literature review

The framework of Sannou et al. (2023) was firstly used to analyse literature on social sustainability of food hubs. Before the analysis, the framework was slightly adapted. The indicator of food security was broadened to include not only farmers, but also consumers. This was done as food hubs not only concern farmers, but also consumers. Arguably, it could be recommended to make this a standard alternation of the framework. When working towards a sustainable food system, not only the impact on farmers is of importance. The impact of the food system on its consumers is important as well.

A second issue concerns the operationalization of food security. Generally, food security is understood to be existing of four components of availability, access, utilization and stability (World Bank Group, n.d.). However, Sannou et al. (2023) only use 2 indicators combining the components of availability, access and utilization. Access and availability are combined into the indicator of food insecurity of access and utilization is represented in the indicator dietary diversity and nutrient intake. For better application of the framework in agri-food systems, it is recommended to use the four components of availability, access, utilization and stability, instead of the two indicators used currently. This, as the separate components distinguish different problems for which different solutions are needed. For example, when availability needs to be improved, actions need to be taken regarding the supply side, while problems with access might relate to the improvement of infrastructure. Combining the components under one indicator makes it harder to identify where targeted efforts are needed.

Finally, many food hubs support social sustainability by educating consumers on healthy diets. In this thesis education impact was categorized under food security. However, it could be made a separate indicator or even a separate theme, to highlight the role education plays in promoting healthy and sustainable diets.

A small adaptation is suggested regarding the theme of healthy and safe food. This theme includes the indicators of safety/quality of food products, social acceptability of products/animal welfare, and fair trading practices. While the indicator of safety/quality of food products does indeed concern healthy and safe food products, the other two indicators do so less. To better reflect the broader scope, a more accurate name of the theme is suggested, for instance ‘acceptability of food product(ion)’.

Overall, based on the literature, the framework of Sannou et al. (2023) was comprehensive enough to cover all relevant social sustainability indicators. It was remarkable that food hubs covered a specific set of the indicators, especially those related to the interplay between producers and consumers. However, the indicators of food security and healthy and safe food could be slightly altered.

Interviews

The framework was used again for the interviews with practitioners of existing food hubs in the Netherlands. As mentioned before, the interviews showed similar impact of food hubs on social sustainability as the literature, meaning that the framework comprehensively covered social sustainability impact. When asked whether any indicators were missing, all interviewees indicated that

the framework included all relevant indicators. This suggests that the framework of Sannou et al. (2023) again covers a complete and extensive range of social sustainability indicators and is a useful tool for assessing social sustainability in agri-food systems, specifically in the case of food hubs, both in literature and in practice.

Co-creation

In the co-creation, the framework of Sannou et al. (2023) again proved useful, with participants not indicating any missing themes or indicators. However, participants did envision themselves becoming producers within the food hub. This highlights the development where consumers simultaneously become producers. In the framework of Sannou et al. (2023), producers are explicitly mentioned as farmers. It might be more suitable to change the themes to producers, as this includes a broader range of stakeholders, such as the residents of the H-buurt, who intend to engage in food production without becoming professional farmers.

Concluding remarks

Overall, the framework of Sannou et al. (2023) proved to be exhaustive and complete, with some room for small adjustments. These adjustments are mostly aimed at making the framework cover a broader and more inclusive range of actors. With these adjustments, the framework could become an even stronger tool for assessing and guiding social sustainability in agri-food systems.

5.3 Reflection on the methods

The methods adopted in this thesis were used to provide a thorough understanding of the impact of food hubs on social sustainability. As both concepts are subject to ambiguity, there was a need for more clarity regarding the concepts. To address this, multiple methods were employed. A literature review was used to examine food hubs on a global level. Interviews provided insight into the Dutch context, and the co-creation was used to inquire the local context of the H-buurt in Amsterdam Southeast. Together, these steps contributed to clarifying the concept of social sustainability within the context of food hubs.

The use of the framework on social sustainability by Sannou et al. (2023) provided an innovative approach for the research on food hubs. In the case of food hubs, this approach has not been applied before. While indicators are typically used to measure impact, in this thesis they were used to determine which indicators were relevant before any actual impacts were made that could be measured. This approach helped participants of the co-creation envision a food hub more concretely by identifying the desired objectives of the hub beforehand.

The co-creation helped create a shared vision for an ideal food hub emerged. This vision has already been used in practice with the actual development of a food hub in th H-buurt. Following the three organized sessions, first steps have been taken towards this development. For instance, a group chat was made in which existing initiatives in Southeast are being shared. Besides, the group chat is used to organize a first pilot food hub in the neighbourhood. Lastly, the co-creation was used to make a handbook (see appendix VII), aimed at practitioners working on the creation of socially sustainable food hubs.

Despite its strengths, several limitations must be acknowledged. First, the literature review included only twenty academic papers. While care was taken to select relevant articles, potentially valuable papers might have been overlooked that could have enriched the understanding of food hubs. As the term food hub remains vaguely defined, initiatives that align with its principles but do not identify as food hubs are not included in the research.

A second limitation concerns the restriction in participants of both interviews and the co-creation. Only three interviews were conducted with food hub representatives in the Netherlands. This constraint was caused both by the limited number of food hubs in the Netherlands and a lack of responsiveness from some potential participants. Similarly, the co-creation session included only seven participants, with no participants from public institutions or academic researchers. Therefore, the vision primarily reflects the perspective of civil society. As a result, the developed vision reflects the views of residents or practitioners already engaged in community initiatives, potentially limiting its generalizability. The co-creation should therefore be viewed as a first exploration rather than a definitive outcome. While the municipality and other stakeholders are expected to be involved in the broader development of which this research is a part, their absence from this phase means their perspectives are not yet reflected in the vision. Moreover, because participants were recruited through two active residents, there is a possibility of selection bias, as those already engaged in similar initiatives were more likely to participate.

In conclusion, the methodological framework has provided a valuable first exploration of social sustainability of food hubs in both global contexts, as well as the local context of the Netherlands. Its findings should be interpreted with awareness of the mentioned limitations. Nevertheless, this research offers a starting point that can inform further dialogue, and policy development aimed at the development of a food hub in the H-buurt.

6. Conclusion

This thesis seeked to answer the research question: *"What would an ideal socially sustainable food hub in Amsterdam look like, based on literature and (best practices of) existing food hubs in the Netherlands?"*. The study addressed the gap in literature regarding the lack of research on the social sustainability of food hubs. To effectively implement social sustainability within food hubs, it is important to gain an understanding of what the concept entails. This research employed a combination of literature review, interviews and a co-creation with stakeholders in the H-buurt neighbourhood to discover the social sustainability impact of food hubs on various scales (global, the Netherlands and Amsterdam Southeast).

It was discovered that food hubs make a consistent contribution to social sustainability, specifically related to the interplay between producers and consumers. The impact of food hubs on farmers is less significant. Furthermore, the impact on social sustainability is dependent on the type of food hub (SFCD, VASCA or Hybrid) and its position within the food chain. The co-creation process in the H-buurt revealed the community's vision of an ideal food hub, which encompasses characteristics from first and last mile hubs, combining production with leftover food. This combination ensures the offer of healthy, fresh and affordable food. Further, social cohesion turned out to be a critical function of the hub, welcoming everyone in an open atmosphere.

Based on the findings and limitations of this research, several recommendations can be made for both future research and practical application. For future research into the social sustainability of food hubs it is recommended to ensure the inclusion of the complete quadruple helix, including the private and public sector, academia and users/residents. Doing so provides a more representative vision for an ideal food hub. Next, more case studies could be investigated to further examine the context-specificness that influences how food hubs make an impact on social sustainability. Last, a more extensive literature review could be performed, including not only academic literature, but grey literature as well. Potentially, the inclusion of grey literature also provides a more diverse vision of food hubs in practice.

Practically, it is recommended to include the created vision of the ideal food hub as a starting point for the further development of a food hub in the H-buurt. This vision ensures alignment with the community's needs and assets. The integration of both production through communal gardens and usage of leftover food is recommended, to enhance affordable and healthy food access. Besides, emphasis should be placed on the community aspect of the hub. It is run by residents and open to all. Possibly, existing initiatives can be coupled with the food hub. These are important conditions for the further development of a food hub in the H-buurt. Further, municipal action should be taken regarding the support of urban agriculture and land and property rights of the food hub.

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8. Appendices

8.1 Appendix I - Social sustainability indicators

Theme	**Sub-themes**
Food security	Food insecurity of access
	Nutrient needs/dietary diversity
Healthy and safe food products	Safety/quality of food products
	Social acceptability of products/animal welfare
	Fair trading practices
Farmers' health & safety	Access to health care
	Farmers aging
	Access to potable water
	Health risk (pesticide use)
	Health risk (work related)
Labour & working conditions	Labour productivity/efficiency
	workload
	Labour needs and availability
	Labour cost
	Household/family labour supply
	Off-farm income/occupation
	Farm transfer to future generation

	Contribution to job creation
	Labour rights, fair working conditions, forced & child labour
Decent livelihoods	Reslience & vulnerability
	Equity (social, gender, generational)
	Availability and access to infrastructure & technology
	Access to input and financial assistance
	Farmer's satisfaction
	Household wealth and well-being
	Diversification of the production
Farmer's training	Access to &/or frequency of agricultural extension services
	Knowledge and information sharing among farmers
	Farmer's & labour's training and experience in agriculture
	Farmer's education level
Social cohesion, security & conflict	Participation & social capital
	Coexistence & conflicts
	Communication and awareness
	Population pressure
	Migration
Land and property rights	Land tenure

Table 1: overview of social sustainability indicators by Sannou et al. (2023).

8.2 Appendix II - List of articles literature review

Avetisyan, T., Ross, R. B., & Wright, W. (2023). Social entrepreneurship in agri-food systems: the case of food hubs. *International Food and Agribusiness Management Review*, *26*(4), 641-654.

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8.3 Appendix III - Interview guide

Interview questions: food hubs

Tell interviewee the aim of this interview

General introduction of the food hub

- Can you tell a bit about the backstory of [name]
    - When was [name] created
- What kind of business model is used: direct-to-consumer model, business2business, and hybrid model
- What is your target customer group?
- Are you familiar with the concept of food hubs?
    - Would you describe [name] as a food hub?

Social impact of food hub

- What are (social) drivers/motivations for [name]
- Do you measure your social impact?
    - How do you prove you make an impact
- What are dilemmas you face regarding social contributions?
- What are best practices regarding social sustainability/inclusion and economic profit?

Social sustainability indicators

- Which identified indicators do you think are relevant [*Include indicators from literature review]*
- Which indicators are of importance for your food hub?
    - Are there indicators missing?
- How did you establish which indicators your food hub focuses on?

Interview vragen: voedselhub

Geïnterviewde doel van het interview vertellen

Algemene introductie van de voedselhub

- Kunt u wat achtergrondinformatie geven over de voedselhub [naam]
    - Wanneer is [naam] opgericht?
- Welk bedrijfsmodel wordt er gebruikt: direct-to-customer, business-2-business, hybride model?
- Wat is de doelgroep van de voedselhub?
- Bent u bekend met het concept voedselhub?
    - Zou je [naam] omschrijven als een voedselhub?

Sociale duurzaamheidsindicatoren

- Welke geïdentificeerde indicatoren vindt u relevant? [*Opnemen indicatoren van de literatuuranalyse]*
- Welke indicatoren zijn van belang voor jullie voedselhub?
    - Ontbreken er indicatoren die voor jullie voedselhub relevant zijn?
- Hoe is er bepaald op welke indicatoren de voedselhub zich richt?

Sociale impact voedselhub

- Wat zijn (sociaal/maatschappelijke) drijfveren/motivaties voor [naam]?
- Wordt de sociale impact gemeten?
    - Hoe wordt bewezen dat er impact wordt gemaakt?
- Tegen welke dilemma's wordt aangelopen als het gaat om maatschappelijke/sociale impact
- Wat zijn 'best practices' met betrekking tot sociale duurzaamheid en economische winst?

8.4 Appendix IV - Consent Form

Informatie deelname scriptie onderzoek sociale duurzaamheid van Voedselhubs in Nederland
Februari 2025

Doel van het onderzoek

Het doel van dit onderzoek is achterhalen wat een sociaal duurzame voedselhub zou zijn in de context van Amsterdam. Hiervoor worden interviews gedaan om de sociale impact van voedselhubs in Nederland te achterhalen. Dit onderzoek wordt uitgevoerd door Anneke Haverlag.

Hoe ga ik te werk?

U neemt deel aan een onderzoek waarbij informatie vergaard zal worden door interviews. Dit interview zal worden opgenomen via een audio-opname met een telefoon of laptop. Er zal ook een transcript worden uitgewerkt van het interview. De audio-opnames en transcripten zullen niet gedeeld worden met anderen.

Potentiële risico's en ongemakken

Er zijn geen fysieke, juridische of economische risico's verbonden aan uw deelname aan dit onderzoek. De vragen die tijdens dit onderzoek gesteld zullen worden, zijn naar verwachting niet persoonlijk. U hoeft echter geen vragen te beantwoorden die u niet wilt beantwoorden. Uw deelname is vrijwillig en u kunt uw deelname op elk gewenst moment stoppen.

Vertrouwelijkheid van gegevens

Ik doe er alles aan om uw privacy zo goed mogelijk te beschermen. De audio-opnamen en aantekeningen die in het kader van dit onderzoek worden gemaakt, zullen na zes maanden worden verwijderd, na het afronden van het onderzoek. De gegevens worden opgeslagen in een map op de onderzoekers' laptop en worden na overzetting direct verwijderd van de telefoon.

Vrijwilligheid

Deelname aan dit onderzoek is geheel vrijwillig. U kunt als deelnemer uw medewerking aan het onderzoek te allen tijde stoppen, of weigeren dat uw gegevens voor het onderzoek mogen worden gebruikt, zonder opgaaf van redenen. Het stopzetten van deelname heeft geen nadelige gevolgen voor u. Als u tijdens het onderzoek besluit om uw medewerking te staken, zullen de gegevens die u reeds heeft verstrekt, verwijderd worden.

Wilt u stoppen met het onderzoek, heeft u vragen en/of klachten? Neem dan contact op.

TOESTEMMINGSVERKLARING

Voor deelname aan afstudeeronderzoek Metropolitan Analysis, Design & Engineering (Wageningen University & Research en Technische Universiteit Delft)

De ideale sociaal duurzame voedselhub in Nederland

Ik verklaar dat:

-Ik de informatiebrief heb gelezen. Ook vragen kon stellen. Mijn vragen zijn voldoende beantwoord.
-Ik genoeg tijd had om te beslissen of ik meedoe.
-Ik weet dat meedoen vrijwillig is. Ook weet ik dat ik op ieder moment kan beslissen om toch niet mee te doen of te stoppen met het onderzoek. Daarvoor hoef ik geen reden te geven.
-Ik geef toestemming voor het verzamelen en gebruiken van mijn gegevens voor de beantwoording van de onderzoeksvraag in dit onderzoek.
-Ik weet dat voor de controle van het onderzoek sommige mensen toegang tot (een deel van) mijn gegevens kunnen krijgen. Die mensen staan vermeld in deze informatiebrief (appendix A). Ik geef toestemming voor die inzage door deze personen.
- Ik wil meedoen aan dit onderzoek.

Naam proefpersoon:

Handtekening:
Datum : __ / __ / __

Ik verklaar dat ik deze proefpersoon voldoende heb geïnformeerd over het genoemde onderzoek.

Als er tijdens het onderzoek informatie bekend wordt die de toestemming van de proefpersoon zou kunnen beïnvloeden, dan breng ik hem/haar daarvan tijdig op de hoogte.

Naam onderzoeker:

Handtekening:
Datum: __ / __ / __

De proefpersoon krijgt een volledige informatiebrief mee, samen met een getekende versie van het toestemmingsformulier.

Appendix A: contactgegevens

Onderzoeker

Anneke Haverlag

Begeleiders

Anke Brons

Mirjam Schoonhoven-Speijer

8.5 Appendix V - Visualisation indicators Sannou et al. (2023) in Dutch

Voedselzekerheid	Gezond en veilig voedsel	Gezondheid en veiligheid boeren/telers
		
• Toegang tot **voldoende voedsel** • Toegang tot een **gevarieerd dieet** met **voldoende voedingsstoffen**	• **Veiligheid/kwaliteit** van voedsel • **Sociale aanvaardbaarheid** van voedsel en **dierenwelzijn** • **Eerlijke** handel/**prijzen**	• Toegang tot **zorg** • **Veroudering** van boeren/telers • Toegang tot **drinkwater** • **Gezondheidsrisico's** door **pesticiden** • **Gezondheidsrisico's** door het **werk**

Arbeidsomstandigheden boeren	Goede leefomstandigheden voor boeren	Opleiding van de boer/teler
		
• **Arbeidsproductiviteit**/efficiëntie • **Werklast** • **Werkvraag** en **werkaanbod** • **Arbeidskosten** • **Gezinsleden** die helpen op de boerderij • Inkomen of **beroep buiten** de **landbouw** • Overdracht van de boerderij aan de **volgende generatie** • **Arbeidsrechten**, eerlijke arbeidsomstandigheden, dwang- en kinderarbeid	• **Veerkracht** en kwetsbaarheid • **Gelijkheid** (sociaal, gender, generationeel) • Beschikbaarheid een toegang tot **infrastructuur** en **technologie** • **Financiële hulp** • **Tevredenheid** van boeren/telers • **Welvaart** en **welzijn** van het boerenhuishouden • **Diverse gewassen** worden verbouwd	• Toegang tot en/of frequentie van **landbouwvoorlichtingsdiensten** • **Kennis-** en **informatie uitwisseling** tussen boeren/telers • **Opleiding** en **ervaring** van boeren/telers in de landbouw • **Onderwijsniveau** van de boer/teler

Sociale cohesie, veiligheid & conflict	Grond- en eigendomsrechten
	
• **Participatie** en sociaal kapitaal • **Naast elkaar bestaan** en conflict • **Communicatie** en bewust zijn • **Bevolkingsdruk** • **Migratie**	• **Grondgebruik/grondbezit**

8.6 Appendix XI - Overview Literature review

		Food security		Healthy and safe food products			Farmers' health & safety				
Paper	Food hub classification	food insecurity of access	Nutrient needs/ dietary diversity	Safety/quality of food products	social acceptibility of products/ animal welfare	fair trading practices	access to health care	farmers aging	access to potable water	Health risk (pesticide use)	Health risk (work related)
Berti & Mulligan, 2016	VASCA (value chain)	1	1	1		1					
Avetisyan et al., 2023	Hybrid	1	1	1	1			1			
Cleveland et al., 2014	Hybrid		1			1				1	
Hermiatin et al., 2022	Hybrid	1	1		1	1					
Hyland & Macken-Walsh, 2022	Hybrid	1		1							
Manikas et al., 2019	Hybrid	1	1			1					
Martin et al., 2016	Hybrid	1	1								
O'Hara, 2017	Hybrid	1	1	1	1						
Shariatmadary et al., 2023 (assessing)	Hybrid	1	1							1	
Shariatmadary et al., 2023	Hybrid	1	1		1					1	
Sgroi & Marino, 2022	Hybrid	1	1	1		1					
van den Boer et al., 2021	Hybrid	1			1						
Blay-Palmer et al., 2013	SFCD (sustainability)	1									
Canal Vieira et al., 2021	SFCD (sustainability)	1			1	1					
Curry (2021)	SFCD (sustainability)	1	1			1					
Fridman & Lenters, 2013	SFCD (sustainability)	1	1								
Hardy (2020)	SFCD (sustainability)	1	1		1						
Kim, 2023	SFCD (sustainability)	1	1	1	1	1					
Prost, 2019	SFCD (sustainability)	1	1								
Psarikidou et al., 2019	SFCD (sustainability)	1				1					

		Labour & working conditions									Decent livelihoods						
		Labour productivity/ efficiency	workload	Labour needs and availability	labour cost	house hold/family labour supply	off-farm occupation	farm transfer to future generations	contribution to job creation	Labour rights, fair working conditions, forced & child labour	Resilience & vulnerability	Equity (social, gender, generational)	availability and access to infrastructure & technology	access to input and financial assistance	Farmer's satisfaction	Household wealth and well-being	diversification of the production
Berti & Mulligan, 2016	VASCA (value chain)												1	1			1
Avetisyan et al., 2023	Hybrid								1								
Cleveland et al., 2014	Hybrid																
Hermiatin et al., 2022	Hybrid										1	1	1				
Hyland & Macken-Walsh, 2022	Hybrid												1				
Manikas et al., 2019	Hybrid								1				1				1
Martin et al., 2016	Hybrid																
O'Hara, 2017	Hybrid								1								
Shariatmadary et al., 2023 (assessing)	Hybrid																
Shariatmadary et al., 2023	Hybrid																
Sgroi & Marino, 2022	Hybrid												1				
van den Boer et al., 2021	Hybrid								1	1							
Blay-Palmer et al., 2013	SFCD (sustainability)																
Canal Vieira et al., 2021	SFCD (sustainability)																
Curry (2021)	SFCD (sustainability)																
Fridman & Lenters, 2013	SFCD (sustainability)								1								
Hardy (2020)	SFCD (sustainability)																
Kim, 2023	SFCD (sustainability)								1		1						
Prost, 2019	SFCD (sustainability)																
Psarikidou et al., 2019	SFCD (sustainability)								1								

		Farmers' training				Social cohesion, security & conflict					Land and property rights
		Access to &/or frequency of agricultural extension services	Knowledge and information sharing among farmers	farmer's & labour's training and experience in agriculture	Farmers' education level	Participation & social capital	coexistence & conflicts	Communication and awareness	population pressure	migration	land tenure
Berti & Mulligan, 2016	VASCA (value chain)	1				1					
Avetisyan et al., 2023	Hybrid	1									1
Cleveland et al., 2014	Hybrid		1			1					
Hermiatin et al., 2022	Hybrid	1	1			1		1			
Hyland & Macken-Walsh, 2022	Hybrid	1	1					1			
Manikas et al., 2019	Hybrid		1			1		1			1
Martin et al., 2016	Hybrid					1					
O'Hara, 2017	Hybrid						1				
Shariatmadary et al., 2023 (assessing)	Hybrid	1									
Shariatmadary et al., 2023	Hybrid	1	1								
Sgroi & Marino, 2022	Hybrid	1	1			1					
van den Boer et al., 2021	Hybrid	1				1					
Blay-Palmer et al., 2013	SFCD (sustainability)	1				1					
Canal Vieira et al., 2021	SFCD (sustainability)										
Curry (2021)	SFCD (sustainability)					1		1			
Fridman & Lenters, 2013	SFCD (sustainability)					1					
Hardy (2020)	SFCD (sustainability)					1					
Kim, 2023	SFCD (sustainability)		1			1		1			1
Prost, 2019	SFCD (sustainability)					1					
Psarikidou et al., 2019	SFCD (sustainability)					1					

8.7 Appendix VII - Recommendations social sustainable food hub in the H-buurt (ENG & NL)

Handbook: the ideal socially sustainable food hub in the H-buurt, Amsterdam Southeast

Executive summary

In Amsterdam Southeast's H-buurt, first steps are taken towards the development of a local food hub. Both residents and the municipality are taking action towards the development of such a hub. However, as a food hub can include many different functions and goals, it is needed to establish beforehand what kind of food hub is suitable in the H-buurt.

As part of a larger research, this handbook outlines a shared vision: a socially sustainable food hub, based on the needs and aspirations of H-buurt residents and practitioners. The envisioned food hub collects locally produced food production and surpluses and redirects this to residents. The hub is based on the community's needs and there is a strong emphasis on social cohesion.

Key recommendations for the municipality include recognizing the importance of urban agriculture and community land ownership, both underrepresented in the municipal food policy regarding food hubs.

Introduction

This handbook is aimed at practitioners and residents working on the development of food hubs in Amsterdam Southeast. It draws from the thesis research by Haverlag (2025), which used co-creation methods to explore what a socially sustainable food hub could look like in the H-buurt. This handbook presents what a food hub is and why it could be of importance, what a desirable food hub would look like regarding social sustainability and lastly advice for residents and practitioners is provided.

Overview of the research

The current food system fails to provide healthy, nutritious and sustainable food for all. In the future the system will only experience more pressure due to climate change and an increasing world population that needs to be fed. Thus, there is a need for a sustainable agri-food system. However, different views exist on how to work towards such a system. A strong movement is that of localization. This means to create a more localized food system, where people eat products that are locally produced and that are suited to the local season and climate. This results in food having to travel fewer miles and less energy and water being needed for heated greenhouse gases or irrigation. However, the provision of local food is frequently challenged by a lack of distribution infrastructure and services (Barham et al., 2012).

Food hubs are introduced to enable local food consumption by overcoming these problems with infrastructure and distribution services. Food hubs function as a logistical missing middle, aggregating produce from small- and medium-sized farms and redistributing it to local consumers (Hardy, 2020). Beyond logistics, there are food hubs that also aim to improve social and environmental sustainability. Concerns such as improving access to healthy food and reducing food waste can be tackled by food hubs (Cohen et al., 2021). In the urban context, food hubs have the potential to address food and nutrition insecurity and reduce health disparities. In short, food hubs can contribute to the reduction of food waste, ensure that healthy food remains affordable and strengthen the position of local producers.

Various food hubs exist, with different goals. There is no single fixed model for a food hub. Therefore, it can be unclear what exactly a food hub is and how it can make an impact. The concept is flexible and must be tailored to the local context and needs. Therefore, there is a need for clarification regarding the concept of food hubs. This is especially the case with the social sustainability impact of food hubs. As social sustainability is often hard to measure, it is important to establish the intended impact of the food hub, to track whether the food hub is making a wanted impact.

Examination of the findings

Through co-creation, H-buurt residents and practitioners developed a shared vision for the ideal food hub.

Ideal food hub

The ideal socially sustainable food hub in the H-buurt combines both the processing of food production and processing of food surpluses. Through communal gardens, a diverse assortment of fruits and vegetables is produced organically. Food surpluses from restaurants and supermarkets are collected. Combining the two streams, affordable, healthy and diverse food is offered to the residents of the H-buurt. Not only does the hub bring consumers closer to producers, but consumers also actually become producers. The hub is a place where people can come together, learn from each other and feel welcome. The hub is open to all and there is a nice atmosphere. In the hub various activities will be organised where people can work out together and have breakfast after. Residents can learn how to produce from experienced farmers and eventually, the hub will sell their produce to existing supermarkets. The hub is operated by the H-buurt community.

Mismatches and points of attention

Mismatches
Within the municipality of Amsterdam efforts are made to work towards a sustainable food system. Through the food strategy a plan is constructed that improves the food system in Amsterdam regarding six actionlines: 1) fair and affordable food for all, 2) food waste and organic waste streams, 3) healthy food environment, 4) urban agriculture and short chains, 5) entrepreneurship and AmsterDoen, and 6) more plant-based. Within this strategy, two types of food hubs are adopted, which are food hubs and social food hubs. They both impact the action lines 1,2,3 and 5. The food hub also has an impact on action line 4 (urban agriculture and short chains), but not on action line 6 (more plant-based). The social food hub has an impact on action line 6 (more plant-based), but not on action line 4 (urban agriculture and short chains). The social food hub thus does not impact urban agriculture or short chains. However, within the strategy it is mentioned that the community gardens related to social initiatives are included.

This presents a slight mismatch between the ideal food hub wanted by the residents of the H-buurt and the municipal food strategy. The residents of the H-neighbourhood have actively indicated that they want to contribute to the food production of the food hub in the H-neighbourhood by means of community gardens. That is why I recommend focusing more actively on action line 4 in the case of the social food hub. In the ideal food hub, community gardens are not only used by neighbourhood initiatives, but also for the supply of the food hub.

Further, the residents and practitioners deemed land ownership important in their ideal food hub. They want to be the owner of the land they work with. This is not something that is currently not included in policy regarding food hubs. This should be incorporated by the municipality.

Points of attention

While the food strategy by the municipality describes how a social food hub will impact the various action lines established by the municipality, it remains unclear how the food hub will concretely contribute to the varying action points. Therefore, the created vision can be used as a practical example of what a food hub in the H-buurt could look like. In order to maintain the community-based food hub, it is recommended to further develop the food hub in collaboration between residents and the municipality.

Policy recommendations and implications

Advice for practitioners and residents working on food hub development in the H-buurt is recommended to work on a food hub that combines food production and food surpluses to provide packages of affordable and healthy food. The hub focuses on social cohesion by providing a place with an open atmosphere, where people can learn from each other. It was deemed important that the hub is run by the local community.

Extra attention should be given to enabling local production through communal gardens, as well as the landownership of the gardens and the physical location of the hub.

With the establishment of a food hub, existing initiatives can be coupled. It was established that there are already many initiatives going on. It is important that the hub does not replace existing initiatives, but rather through collective action adds value in working towards a hub that provides healthy and affordable food for all.

References

Barham, J., Tropp, D., Enterline, K., Farbman, J., Fisk, J., & Kiraly, S. (2012). Regional food hub resource guide.

Cohen, N. (2022). Roles of cities in creating healthful food systems. *Annual review of public health*, *43*(1), 419-437.

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Nederlandse versie

Handboek: de ideale sociaal duurzame voedselhub in de H-buurt, Amsterdam Zuidoost

Samenvatting

In de H-buurt in Amsterdam Zuidoost worden de eerste stappen genomen naar het ontwikkelen van een lokale voedselhub. Zowel bewoners als de gemeente ondernemen actie om zo een hub te ontwikkelen. Aangezien een voedselhub verschillende doelstellingen en functies kan hebben, moet er vooraf worden vastgesteld wat voor voedselhub gewenst is in de H-buurt.

Als onderdeel van een master scriptie schetst dit handboek een gedeelde visie: een sociaal duurzame voedselhub, op basis van de behoeften en ambities van de bewoners en professionals uit de H-buurt. De beoogde voedselhub verzamelt zowel lokaal geproduceerd voedsel en voedselreststromen en verdeelt deze onder bewoners. Er is aandacht voor de behoeften van de gemeenschap en er is een sterke nadruk op sociale cohesie.

Belangrijke aanbevelingen voor de gemeente zijn onder meer het erkennen van het belang van stadslandbouw en grondbezit, die beide ondervertegenwoordigd zijn in het gemeentelijk voedselbeleid met betrekking tot voedselhubs.

Introductie

Dit handboek is bedoeld voor professionals en bewoners die zich bezighouden met de ontwikkeling van voedselhubs in Amsterdam Zuidoost. Het is gebaseerd op de scriptie van Haverlag (2025), waarin met behulp van co-creatie is onderzocht hoe een sociaal duurzame voedselhub in de H-buurt er uit zou kunnen zien. Verder wordt er in dit handboek besproken wat een voedselhub is en waarom deze nuttig kan zijn. Daarnaast wordt de ideaal sociaal duurzame voedselhub omschreven en wordt tot slot advies gegeven aan bewoners en professionals die zich bezighouden met voedselhubs.

Overzicht van het onderzoek

Het huidige voedselsysteem slaagt er niet in om iedereen te voorzien van gezond, voedzaam en duurzaam voedsel. In de toekomst zal dit alleen maar lastiger worden door een groeiende wereldbevolking en klimaatverandering. Er is dus noodzaak voor een ander voedselsysteem. Er bestaan echter verschillende visies op hoe dat bereikt moet worden. Een sterke beweging is die van lokalisatie. Dit betekent dat er een meer gelokaliseerd voedselsysteem moet worden gecreëerd, waarbij mensen producten eten die lokaal worden geproduceerd en die zijn afgestemd op het lokale seizoen en klimaat. Hierdoor hoeft voedsel minder afstand af te leggen en is er minder energie en water nodig voor o.a. de verwarming van kassen of het irrigeren van voedsel. Het lokaal aanbieden van voedsel wordt alleen vaak bemoeilijkt door een gebrek aan geschikte infrastructuur (Barham et al., 2012).

Voedselhubs kunnen dit probleem oplossen. Ze fungeren als een logistieke schakel tussen boeren en hun producten en consumenten, door deze producten te verzamelen en te herverdelen onder lokale consumenten (Hardy, 2020). Naast logistieke functies zijn er ook voedselhubs die zich actief richten op het verbeteren van sociale en ecologische duurzaamheid. Dit gebeurt bijvoorbeeld door het verbeteren van toegang tot gezond voedsel en het verminderen van voedselverspilling (Cohen et al., 2021). In de stedelijke context kunnen voedselhubs bijdragen aan voedselzekerheid en het aanpakken van gezondheidsproblemen door gezonde voeding aan te

bieden. Kortom, voedselhubs kunnen bijdragen aan de vermindering van voedselverspilling, betaalbaar voedsel en de positie van lokale producenten versterken.

Er bestaan veel verschillende voedselhubs met verschillende doelen. Er is geen vast model voor een voedselhub een daardoor kan het onduidelijk zijn wat een voedselhub precies is en hoe deze impact kan maken. Het concept voedselhub is flexibel en moet worden afgestemd op de lokale context en de lokale behoeften. Er is behoefte aan verduidelijking van het concept. Dit geld voornamelijk in verband met de impact op sociale duurzaamheid. Het concept sociale duurzaamheid is vaak moeilijk te meten en daarom is het extra belangrijk om te weten hoe voedselhubs bij kunnen dragen aan sociale duurzaamheid, om te kunnen volgen of voedselhubs de gewenste impact maken.

De bevindingen

Door middel van co-creatie hebben bewoners en professionals uit de H-buurt een gezamenlijke visie ontwikkeld voor de ideale voedselhub.

Ideale voedselhub

De ideale sociaal duurzame voedselhub in de H-buurt combineert zowel de verwerking van zelf geproduceerd voedsel als de verwerking van voedseloverschotten. Via gemeenschapstuinen wort een divers assortiment aan fruit en groente op biologische wijze geteeld. Voedseloverschotten van restaurants en supermarkten worden ook ingezameld. Door deze twee stromen te combineren, wordt betaalbaar, gezond en divers voedsel mogelijk gemaakt voor de bewoners van de H-buurt. De hub brengt consumenten niet alleen dichter bij producenten, consumenten worden zelfs producenten. De hub is een plek waar mensen samen kunnen komen, van elkaar kunnen leren en zich welkom voelen. De hub staat open voor iedereen en er heerst een prettige sfeer. In de hub worden verschillende activiteiten georganiseerd waarbij mensen bijvoorbeeld samen kunnen sporten en daarna kunnen ontbijten. Bewoners kunnen van ervaren boeren leren hoe ze moeten produceren en uiteindelijk zal de hub zijn producten aan bestaande supermarkten verkopen. De hub wordt beheerd door de gemeenschap uit de H-buurt.

Miscmatches en aandrachtspunten

Mismatches

Door de gemeente Amsterdam wordt gewerkt aan het creëren van een duurzaam voedselsysteem. Door middel van de voedselstrategie wordt hiervoor ingezet op zes actielijnen: 1) eerlijk en betaalbaar voedsel voor iedereen, 2) voedselverspilling en organische reststromen, 3) gezonde voedselomgeving, 4) stadslandbouw en korte ketens, 5) ondernemerschap en AmsterDoen en 6) meer plantaardig. Binnen deze strategie wordt gebruikt gemaakt van twee soorten voedselhubs. De voedselhubs en de sociale voedselhubs. Beiden hebben invloed op de actielijnen 1, 2, 3 en 5. De voedselhub heeft ook invloed op actielijnen 4 (stadslandbouw en korte ketens), maar niet op actielijn 6 (meer plantaardig). De sociale voedselhub heeft invloed op actielijn 6 (meer plantaardig), maar niet op actielijn 4 (stadslandbouw en korte ketens). Bij de sociale voedselhub zijn wel Tuinen betrokken die al zijn gelinkt aan bestaande initiatieven.

Dit leidt tot een klein verschil tussen de voedselstrategie en de ideale voedselhub die de bewoners van de H-buurt voor ogen hebben. De bewoners van de H-buurt hebben actief aangegeven dat ze willen bijdragen aan de voedselproductie van de voedselhub in de H-buurt door middel van gemeenschapstuinen. Daarom adviseer ik om bij de sociale voedselhub meer aandacht te

besteden aan actielijn 4. In de ideale voedselhub worden gemeenschapstuinen niet alleen gebruikt door buurtinitiatieven, maar ook voor de bevoorrading van de voedselhub.

Verder vinden de bewoners en professionals grondbezit belangrijk in hun ideale voedselhub. Ze willen eigenaar zijn van de grond waarop ze werken. Dit is iets wat momenteel niet is opgenomen in het beleid over voedselhubs. Dit zou door de gemeente moeten worden opgenomen.

Aandachtspunten

Hoewel de voedselstrategie van de gemeente beschrijft hoe een sociale voedselhub van invloed zal zijn op de verschillende door de gemeente vastgestelde actielijnen, blijft het onduidelijk hoe de voedselhub concreet zal bijdragen aan de verschillende actiepunten. Daarom kan de gecreëerde visie worden gebruikt als een praktisch voorbeeld van hoe een voedselhub in de H-buurt eruit zou kunnen zien. Om de gemeenschapsgerichte voedselhub in stand te houden, wordt aanbevolen om de voedselhub verder te ontwikkelen in samenwerking met bewoners en de gemeente.

Beleidsaanbevelingen en implicaties

Advies voor professionals en bewoners die zich bezighouden met de ontwikkeling van een voedselhub in de H-buurt is om te werken aan een voedselhub die voedselproductie en voedseloverschotten combineert in pakketten die betaalbaar en gezond voedsel aan te bieden. De hub moet zich op sociale cohesie richten door een plek te bieden met een open sfeer, waar mensen van elkaar kunnen leren. Het is belangrijk dat de hub wordt gerund door de lokale gemeenschap.

Er moet extra aandacht worden besteed aan het mogelijk maken van lokale productie door middel van gemeenschappelijke tuinen, evenals aan het eigendom van de tuinen en de fysieke locatie van de hub.

Met de oprichting van een voedselhub kunnen bestaande initiatieven ook aan elkaar worden gekoppeld. Er is vastgesteld dat er al veel initiatieven gaande zijn. Het is belangrijk dat de hub bestaande initiatieven niet vervangt, maar door middel van collectieve actie iets toevoegt aan het bereiken van gezond en betaalbaar voedsel voor iedereen.

Referenties

Barham, J., Tropp, D., Enterline, K., Farbman, J., Fisk, J., & Kiraly, S. (2012). Regional food hub resource guide.

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