Recipes to Grow Together

Circular Urban Agriculture for Järfälla Municipality

Urban Agriculture Group

Elise Daenekindt, Yuqi Guo, Nazanin Keshipour, Luca Mónus, Lina Schirmer

AG2129-HT24

"What happens to one happens to us all.
We can starve together or feast together.
All flourishing is mutual."

(Kimmerer, 2013)

Theme of the Supper:
Circular Urban Agriculture

Table of Content

*Note: Refer to appendix for more information on AI generated images in this project.

Introduction

Why Urban Agriculture?

Lack of food planning

Soil Contamination

Densification

With the global population set to reach 10 billion by 2050, urban centres face mounting migration challenges and a rising life expectancy (United Nations, n.d.). Cities are expanding, often at the expense of farmland, increasing dependence on long-distance food imports. In Sweden, this is especially relevant as self-sufficiency has only been achieved in three crops: sugar, carrots, and cereals (Stewart, 2021). Recent experiences with COVID-19 have highlighted vulnerabilities in global supply chains, negatively impacting secure access to food (Suman, 2019; Beltrami, 2020; fundsforNGOs, 2024; Chandran, 2020). Therefore, to ensure future food security and sustainability, it is essential to enhance agricultural practices to provide consistent access to fresh, nutritious and local produce while reducing environmental impacts (Foley et al., 2011).

Urban agriculture has emerged as a powerful approach to address food security and sustainability challenges by tapping into unused urban spaces like rooftops and vacant lots to enhance local food production (Kortright & Wakefield, 2010). While the potential benefits of integrating urban agriculture into planning are noteworthy, its implementation faces challenges, particularly in densely populated areas where the land is scarce, the cost of maintaining green spaces is high, and surface runoff is highly polluted (Aslanoğlu et al., 2024; Oberndorfer et al., 2007).

Järfälla's development of 14,000 new residences and infrastructure developments, such as new train stations and railway lines, will cause an influx of new residents and visitors, disrupting the existing social ties between small-scale apartment buildings and larger-scale neighbourhoods.

With this population densification and urbanisation goal, more strain will be placed on providing public goods such as green spaces and recreation areas that can accommodate this growth while also providing avenues for social interactions and relationships to build. Residential homes and schools were built on former agricultural lands due to the lack of alternative land areas.

Historically, the municipality of Järfälla used to be dominated by agricultural activity; however, the Industrial Revolution altered the economic activity and land uses. Creating these areas is essential towards long-term sustainability and a safe and cohesive neighbourhood, where inequalities are not perpetuated by spaces being taken over through the chase for capital accumulation. (Egerer & Fairbairn, 2018). This awareness is vital since when cities expand, they often invade surrounding agricultural lands, leading to reductions in available local farmland and urban green spaces. The reliance on food imports, therefore, increases, which is of particular concern in Sweden where self-sufficiency is low (Stewart, 2021). Furthermore, reduces the available active green spaces for social interaction.

Moreover, with Järfälla shifting its focus back to promoting accessible and sustainable agricultural practices, outlined in the Comprehensive Plan "Option Zero" (Järfälla kommun, 2024). The municipality aims to address food security and dependence issues that come with a growing population; therefore, there is great potential for exploring the dual function of urban agriculture.

Additionally, from meetings with planners in the municipality, there is a need for creating more lively city centres that are more attractive places to live. Urban agriculture can address these issues by creating a more resilient food system and acting as a tool for strengthening community bonds.

With this in mind, we have designed our proposal as a cookbook with intervention recipes. The "cookbook" is grounded in two main concepts to achieve resilient food systems and strengthen community bonds while maintaining clear nods towards circularity: Edible Landscaping and Place attachment. Edible landscaping involves greening public spaces with edible plants that do double duty, supporting local food production and ecological health (Lee et al., 2017; Oberndorfer et al., 2007; Aslanoğlu et al., 2024). Place attachment - the sense of belonging and identity people create from a place - builds community, enhances social bonds, and strengthens our connection to the spaces we live in (Hay, 1998; Riley, 1992).

Through edible landscaping and place attachment, we offer actionable steps to create a stronger food system that is social, sustainable, and resilient. Each "recipe" guides developing more diverse and resilient green agricultural spaces that can be sustainable in an accessible, familiar format that resonates with everyone - whether you are a planner or a resident. The proposal focuses on bringing urban agriculture closer to areas with unique socio-economic characteristics.

These sites—Kallhäll, Jakobsberg Centrum, and Barkarbystaden—were selected based on a combination of factors, including average income levels, unemployment rates, foreign backgrounds, housing typologies, and proximity to agricultural land. These ideas are designed to be scalable, enabling implementation across the Järfälla municipality and within private residences.

Methods

Multi-Angled Literature Review

We began by thoroughly studying case studies and theories related to urban resilience, incorporating perspectives from sustainable development, environmental design, and social cohesion. Our literature review focuses specifically on topics such as place attachment in community gardens, food security, the integration of Järfälla's planning documents with concepts from future studies, and the potential of edible green roofs.

Municipality Documents

As a site-specific component of our methodology, we reviewed and evaluated the current municipality documents of Järfälla. This helped us better understand its urban policies and development goals, ensuring the proposal is grounded in the local context and priorities.

Site Analysis

Thirdly, we identified key *"problem areas"* and assessed the existing infrastructure. This stage involved documenting and conducting targeted observations of areas with significant challenges related to urban agriculture, social cohesion (including reflections on foreign backgrounds), and economic disparities between sites.
Interviews

Throughout the research process, we incorporated perspectives from community residents and municipal stakeholders through interviews conducted in October and November 2024, complemented by an official class-led municipal site visit on 10 September. These sessions provided valuable insights from residents and local officials, fostering trust and collaboration.

What is Circular Urban Agriculture?

Circular urban agriculture promotes sustainable food production by optimizing resource use and minimizing waste. A central component is keeping organic residues from agriculture, food processing, and urban waste within the system and making them renewable resources. These processes can decrease reliance on imported chemical fertilizers and promote a more self-sufficient and sustainable urban food system (Wageningen University & Research, n.d.; Foodloopz Sweden AB, 2023).

Healthy soil is essential for agriculture and is central to circular urban agriculture. Soil health is maintained through composted organic waste and balanced nutrient management. Additionally, including biodiversity, such as pollinator habitats and natural pest control, promotes environmental resilience. Circular agriculture therefore combines ecological preservation and sustainable food production to achieve a resilient food system (Wageningen University & Research, n.d.). In Sweden, it is essential to consider as there is low agricultural self-sufficiency and the use of peatlands in agriculture contributes to a large proportion of the country's emissions.

Key Principles of Circular Urban Farming

(Foodloopz Sweden, 2023)

- Location: Near or within a city.
- Collaboration: Partner with local waste sources.
- Sustainability: Use recycled materials and organic methods.
- Purpose: Produce food for sale, not private use.
- Public Access: Open to the community, even on rooftops.
- Size: Minimum 500 sq. m.
- Structure: Operate as a group, company, or part of an organization.
- Diversity: Grow a variety of plants, supporting pollinators and soil health.

Environmental Benefits (

Foodloopz Sweden, 2023)

- Transforming waste into resources: Organic waste and by-products become valuable inputs.
- Recycling: Encourages reuse and recycling of materials.
- Enhancing biodiversity: Supports diverse plant and animal life.
- Ecosystem services: Improves air and soil quality while supporting natural systems.
- Carbon sequestration: Helps mitigate climate change by acting as a carbon sink.

Benefits for Human

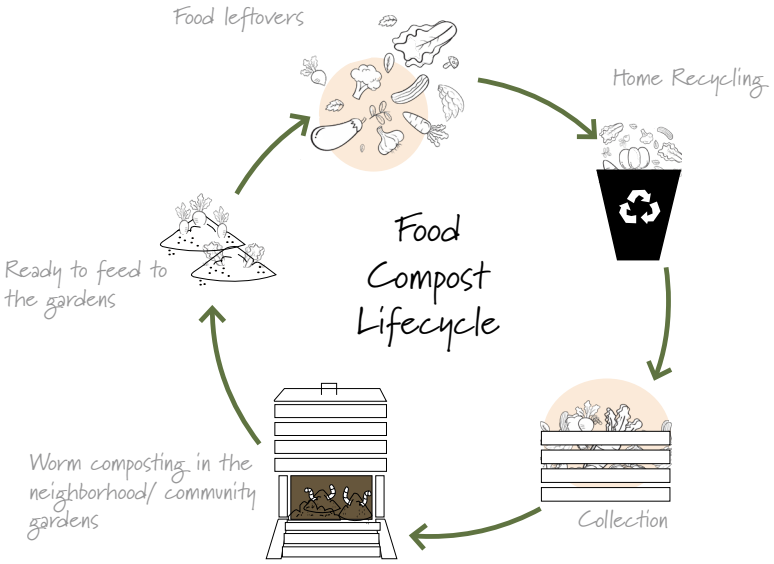
(Foodloopz Sweden, 2023)

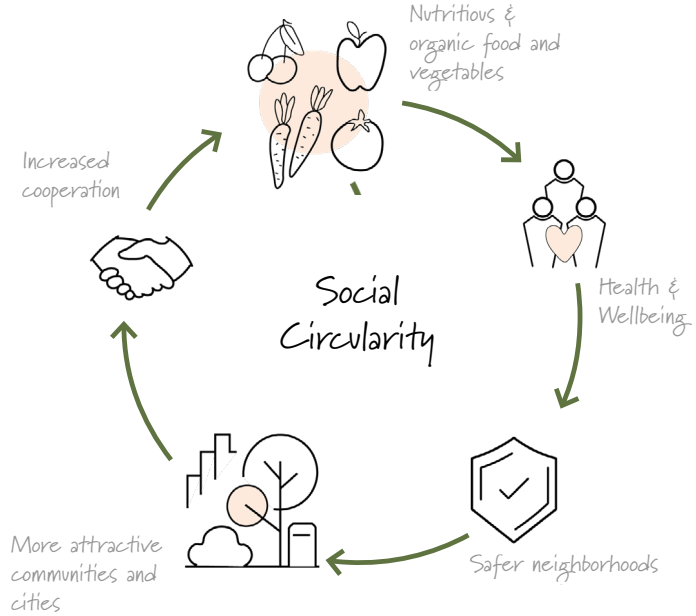
- Health and wellness: Promotes physical activity and mental well-being.
- Aesthetic appeal: Creates beautiful green spaces that enhance urban life.
- Nutritious produce: Delivers fresh, nutrient-rich vegetables.
- Stress reduction: Green environments contribute to lower stress levels.
- Learning opportunities: Facilitates knowledge exchange and education.
- Community engagement: Sparks interest and joy in sustainable living

Benefits for Community

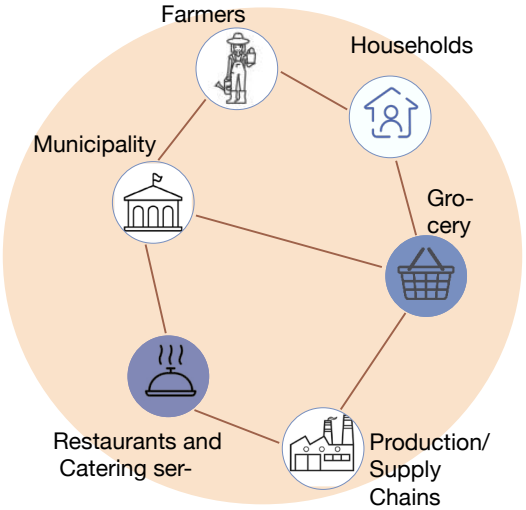
(Foodloopz Sweden, 2023)

- Stronger local ties: Fosters collaboration and shared goals.
- Efficient logistics: Shortens supply chains for food distribution.
- Enhanced urban spaces: Makes neighbourhoods greener and more appealing.
- Improved safety: Revitalized areas often feel safer and more secure.
- Economic value: Increases property values and overall neighborhood's appeal.





Composting has several benefits for gardening and agriculture by enriching the soil and promoting sustainability through the circularity of biomass nutrients. It improves soil structure, enhances fertility, and retains water, all of which improve the environment for cultivating fruits and vegetables. Compost can be created from many sources of biomass from animal waste, and kitchen waste, and can also integrate the use of autumn leaves that are available in abundance (Wageningen University & Research, n.d.).



Actors Involved

In the context of larger agricultural lands and forests, the practice of composting and mulch production can be integrated by the municipalities and farmers' facilitation. The municipality organizes the collection of leaves and wood products to then be reused in the form of mulch and compost to improve solid fertility, improve soil structure (Graff, 2020) and water retention.

An important part of circular urban agriculture that's often overlooked is social circularity—how it strengthens connections between people and communities (Foodloopz Sweden AB, 2023). In our project, we aim to not only focus on sustainable practices for the physical environment but also create a circular exchange of knowledge, collaboration, and support among residents. This approach helps build stronger local ties, makes neighbourhood's greener and more attractive, improves safety, and even boosts property values. By working together, we can create vibrant, sustainable spaces that benefit everyone.

Taking a look at Järfälla's Fridge & Pantry

According to the Hållbarhets Konsekvens-beskrivning report from 2023, 33% of Järfälla's land is protected; however, Järfälla has 476 hectares of agricultural land, corresponding to 7.5% of the municipality's area. However, there is a potential for improving agriculture, as a municipal goal is to increase protected land by at least 75 hectares by 2025 to help support biodiversity and sustain rich natural experiences for residents (Ekologigruppen, 2018).

Järfälla's Mouldy Problems

Mouldy problems refer to the identified problems that Järfalla is currently facing, and the sections below describe them. The sections provide supporting information for the significance and links to the benefits of urban agriculture in solving or mitigating these issues.

Income, Safety Issues and Foreign Backgrounds

Certain areas within Järfälla are notable for their distinct social challenges. For instance, in Kallhäll, 47% of the female population have reported experiencing safety concerns (Baczyk et al., 2023). Unemployment levels also vary significantly across the municipality, with particularly high rates in Jakobsberg Centrum, ranging from 25% to 45%. While having a foreign background is not inherently problematic, it can contribute to ethnic tensions, and a lack of community cohesion. When combined with other social and environmental factors, these dynamics can highlight underlying social disparities and inequities.

Densification and land scarcity

In addition to its limited size, the available cultivated land struggles with high dispersion as it is smaller and isolated, leading to further reduced efficiency. Barkarbystaden holds the largest share and value of the municipalities' available agricultural area. However, it is also under the highest pressure from housing development driven by the metro line's construction (Järfälla kommun, 2023).

Soil Contamination

There is a need to improve soil quality, combined with goals for organically cultivated land and planting specific vegetation for pollution absorption under the SVIKT project (Barkarby Science, 2022). The plans for Järfälla are outlined in the Comprehensive Plan and Analysis of Agricultural Land, where scenarios were presented for future planning, and the "Option Zero" alternative was adopted. Option Zero entails protecting agricultural land and pastures but has the downside of limiting the urban development of new residential areas. Agricultural land is only claimed if the area already has legally binding plans (Järfälla kommun, 2024).

Flooding and surface runoff

As cities grow denser, urban challenges like increased runoff pollution, flood risks, and heatwave health hazards intensify due to more paved surfaces and shrinking green spaces. City planners must integrate green and blue spaces to sustain essential ecosystem services. Järfälla Municipality faces these issues, particularly in Barkarbystaden, aiming to balance economic, social, and environmental sustainability (Järfälla kommun, 2020).

Green spaces provide additional benefits, like slowing and filtering runoff and helping to regulate temperatures (Swedish Portal for Climate Change Adaptation, 2018). In the face of a 100-year rain, Järfälla will experience severe flooding, especially in low-lying areas along the town's waterways. Overall, it will impact over 6,265 homes, including 824 apartments, in Veddesta, Jakobsberg, Barkaby, Kallhäll and Stäket.

Despite efforts to reduce flood risks, Aphram Melki (C), head of Järfälla's environmental and social sustainability committee, highlights that new developments like Barkarbystaden can increase flooding vulnerability by reducing green areas that naturally manage water (Hedström, 2019).

To enhance resilience, Järfälla has proposed measures such as green roofs, vegetated biofilters, and water storage facilities (Järfälla kommun, 2020).

The Connection between Nature and Social Cohesion

In Järfälla, urban parks and green spaces could play a key role in promoting social cohesion. Just as Kuo and Sullivan's (2001) study in Chicago showed that green residential neighbourhoods strengthen social relationships, this municipality's green urban agriculture spaces could serve as social hubs where neighbours meet, build mutual trust, and develop connections.

However, how these green spaces are designed largely determines how residents experience them. Gustavsson (1982) highlights the impact of design on residents' feelings toward their environment, while Mack (2021) adds that residents often develop a nostalgic attachment to their outdoor spaces, regardless of their current condition. These outdoor spaces are seen as homes with their history, further reinforcing the significance of these places to the community. If properly designed and tailored to the local community's needs, urban nature can promote social cohesion and create close-knit communities. The combination of nature, design and community spirit provides a sustainable basis for well-being and collective and individual identity.

The Role of Green Spaces in Järfälla

The landscape of Järfälla has been significantly transformed over the years, shifting away from its agricultural history, increasing densification and loss of variety of green spaces. What is perceived as natural today is often the result of long-term technical and human interventions. Recognising this is essential to redefine contemporary architecture and urbanism as processes that separate natural and urban areas and integrate them into human-controlled environments through methods such as urban agriculture (Carbonell, 2022).

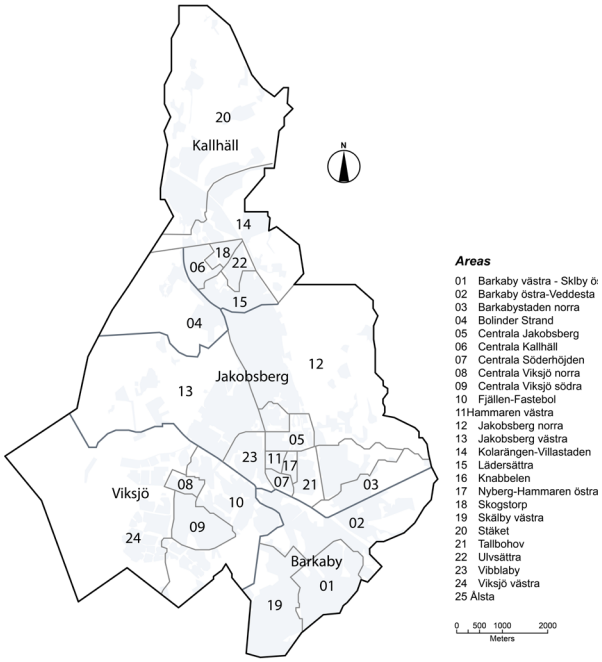
Green areas in Järfälla serve as residential meeting places, promoting social interaction and contributing to a more cohesive community (Carbonell, 2022). The "well-being landscape" created here goes beyond merely providing green recreation spaces. It is part of a broader vision in which nature, transportation infrastructure and sub-urban residential neighbourhoods coexist harmoniously and in which the experience of nature is directly linked to community well-being.

The accessibility of these green spaces is invaluable to human well-being and contributes to the balance between urban development and ecological preservation (Pries & Qviström, 2021). Urban parks in Järfälla are essential refuges for various species of flora and fauna. Native trees like birch (Betula), oak (Quercus), and pine (Pinus) create vital habitats, while wildflowers such as cow parsley (Anthriscus sylvestris) and buttercups (Ranunculus) support pollinators like the European honeybee (Apis mellifera). These parks also host wildlife, including common blackbirds (Turdus merula), red squirrels (Sciurus vulgaris), and European hedgehogs (Erinaceus europaeus), contributing to urban biodiversity (De Burca, 2024).

Currently, Järfälla municipality lacks a strategy for urban agriculture, and its comprehensive plan does not address food security. However, in our second meeting with the municipality on October 22, 2024, officials expressed a clear interest in integrating agriculture into Järfälla's current urban landscape. They showed openness to exploring various methods, including green roofs, community gardens, and agroforestry in public green spaces. Additionally, municipal members noted that the seasonal rentable gardening boxes are consistently fully booked, with long waiting lists—indicating solid local interest in recreational gardening during the summer.

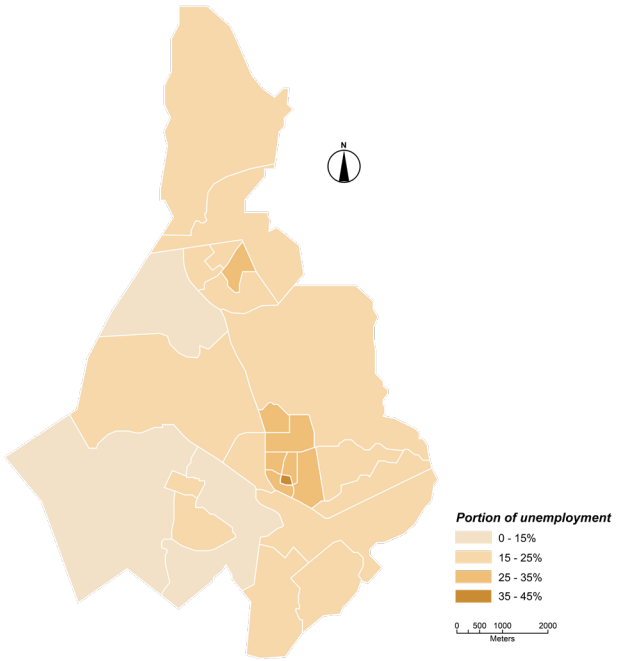
While the importance of biodiversity conservation is widely recognised, along with public willingness to incorporate urban agriculture into green spaces, it is crucial to emphasise the role of both natural and human-managed areas in supporting biodiversity. This balance is essential for maintaining an urban agricultural system with sufficient green stepping stones to support pollinators and nutrient flows.

Site Analysis



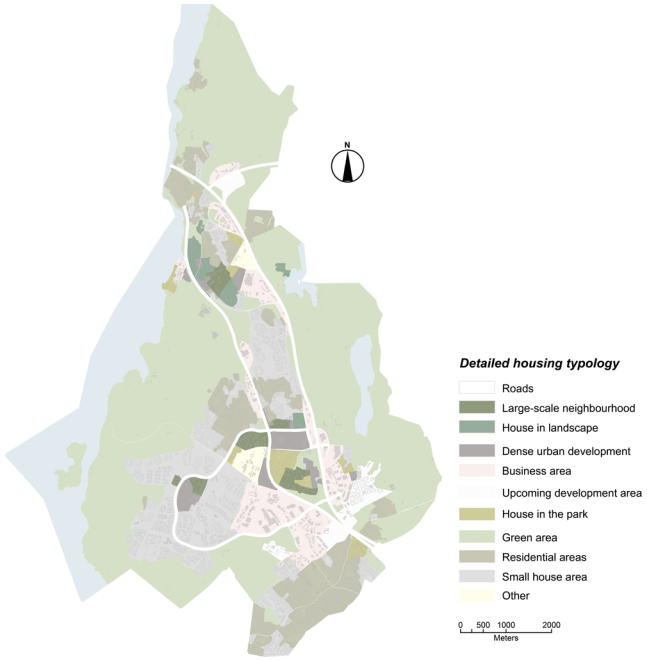
Neighbourhoods within Järfälla

Source: Baczyk, et al., (2023).
Adequate housing for Järfälla. KTH.



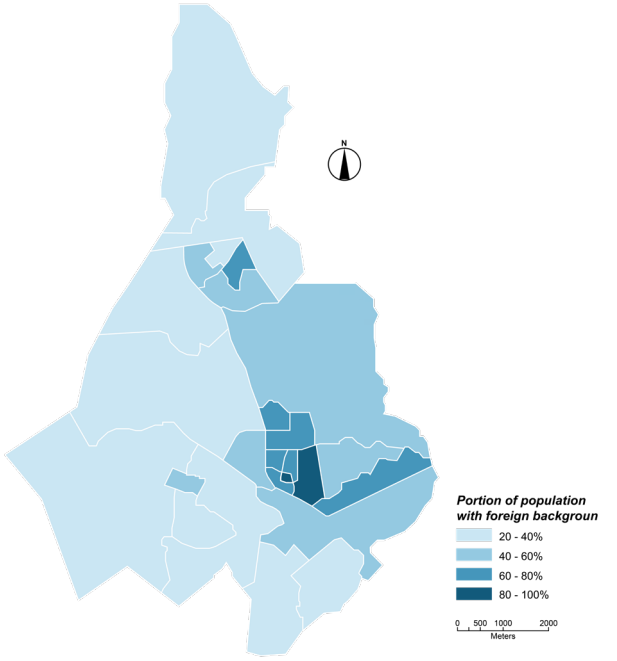
Unemployment Rate where Jakobsberg Centre and Kallhäll stand out.

Source: Redrawn by authors based on SCB.



The Detailed Husing Typology Map shows the dense urban development areas and the areas that will be further densified/used for future development. These areas provide the potential to integrate urban agricultural methods into the design plans before the construction is complete and highlight where most residents in Järfälla live. It also emphasises the lack of green spaces within the built-up environment.

Source: Drawn by authors based on Google Maps.

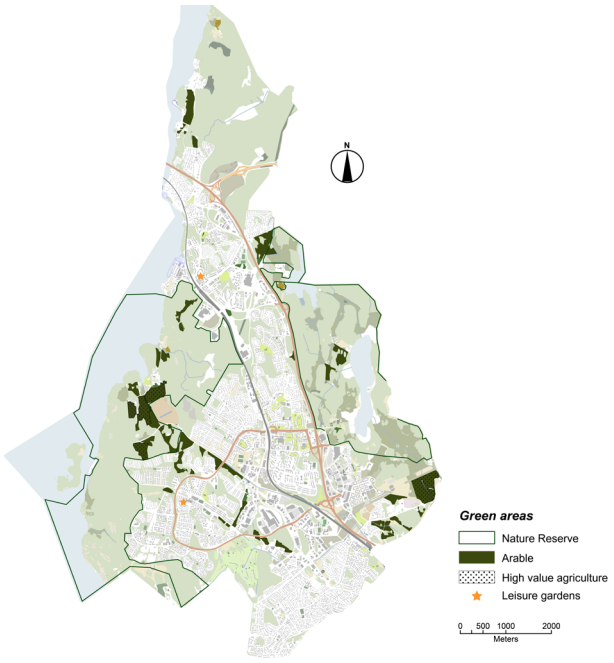


Portion of Järfälla Population with a Foreign Background. Central Söderhöjden in Jakobsberg Centre, Northern part of Central Viksjö and Ulvsättra in Kallhäll stand out. This analysis is important to include because of the ethnic tensions that can often arise in communal settings when different cultures, values and opinions come together. Since the expected population of Järfälla is also expanding, the influx of new residents might further emphasise these tensions.

Source: Redrawn by the authors based on SCB.

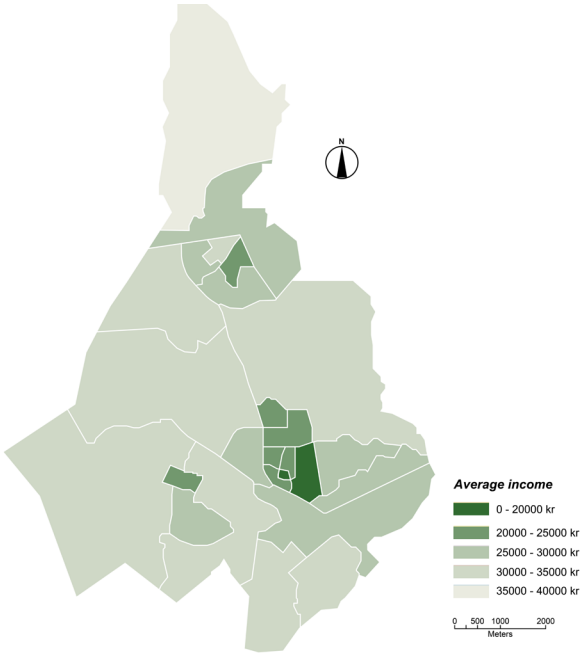
Schools (Important for youth community gardens).

Source: Redrawn by authors based on Openstreetmap



Green Areas and Agircultural Lands

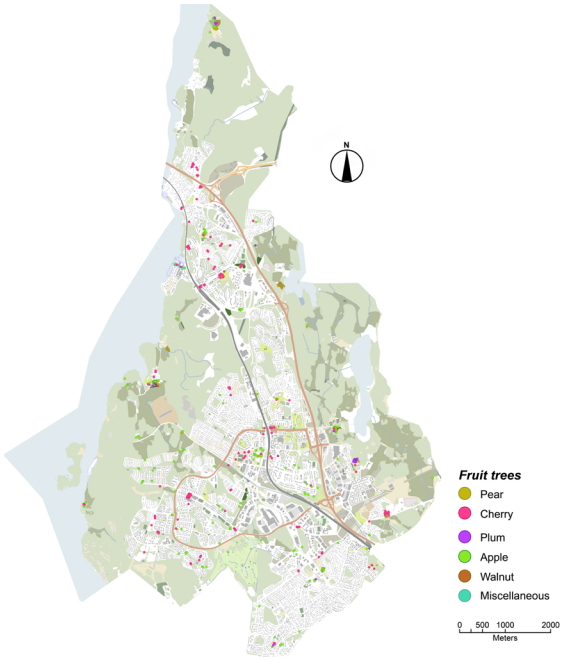
Source: Redrawn by authors based on Openstreetmap



Average Income Rate

Central Söderhöjden in Jakobsberg Centre, Northern part of Central Viksjö and Ulvsättra in Kallhäll stand out as lowest income rates. This is an important consideration in terms of site selections because of urban agriculture's potential to aid with food security.

Source: Redrawn by the authors based on SCB.



Existing Fruit Trees

(Important for permaculture guilds).

The existing fruit trees show the potential for edible landscaping and urban agriculture in Järfälla. They show that it is not an entirely new concept and create an avenue for intervention recipes to work with these existing plants.

Source: Redrawn by authors based on Järfälla Municipality, 2023. (EIA report for Overview Plan 2050).

Interviews

Jane, 45 years old

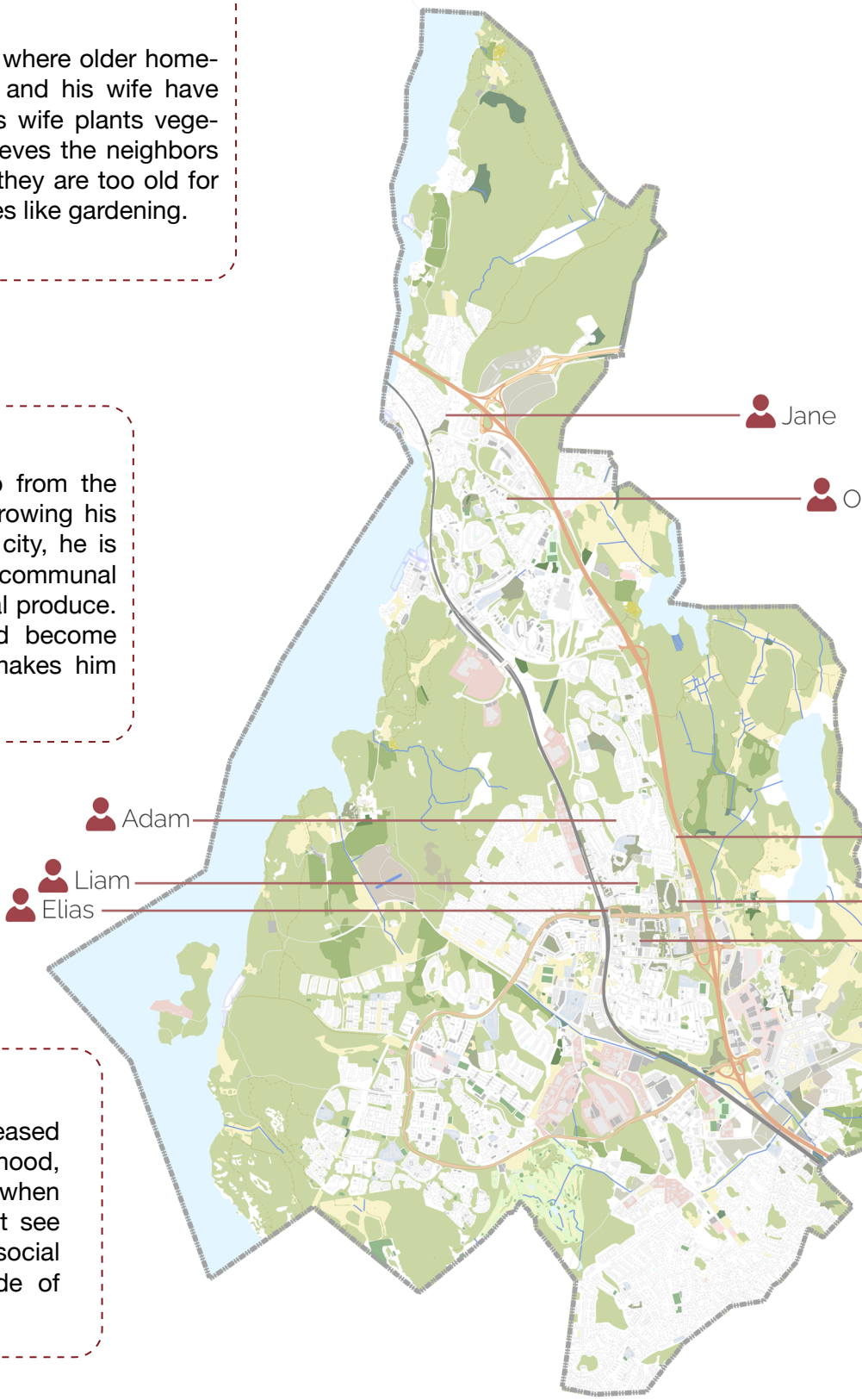
Elin lives in an apartment building in Lövsangaren that already has community gardens. Not only is she on the building board for the community garden, but she also mentioned that the community garden is a success within residents of the building and has helped build trust between residents.

Adam, 37 years old

Adam lives in Jakobsberg, where older home-owners surround him. He and his wife have a private garden where his wife plants vege-tables as a hobby. He believes the neighbors don't share this hobby as they are too old for physically intensive activities like gardening.

Liam, 38 years old

Moved to Jakobsberg years ago from the countryside, where he enjoyed growing his fruits and vegetables. In the big city, he is less trusting of his neighbours in communal spaces where they can share local produce. He has seen the neighbourhood become less safe and more vandalism makes him hesitant.



Elias, 15 years old

Elias experienced increased criminality in his neighbourhood, which he felt much safer in when he was younger. He doesn't see many opportunities for social interaction in Järfälla outside of his school.

Source: Edited by authors based on Openstreetmap.

Oscar, 60 years old

Oscar is now retired and lives in Kallhäll. He enjoys foraging for blueberries during their season. He would enjoy gardening, though, but he doesn't see the space for it and feels that he doesn't have enough time for it.

Ines, 38 years old

She lives outside of Järfälla, though she is often near to visit friends and shop. Astrid is passionate about building her community and enjoys gardening, so she would be excited to participate in communal gardening.

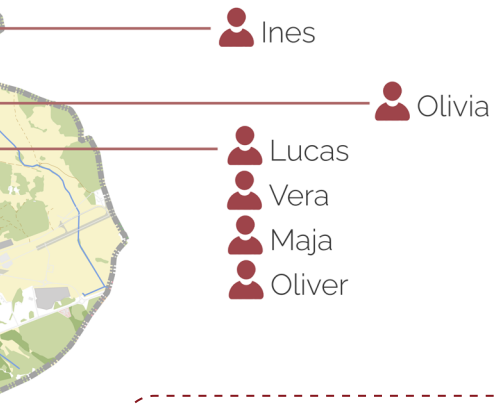
Olivia, 83 years old

Olivia lives in the new apartment block in Jakobsberg on one of the higher floors. She knows some of her neighbours, but there is not much social interaction. She feels a bit isolated from nature and doesn't have the energy for gardening, but she would be happy to have social activities with her neighbours.

scar

Lucas, 31 years old

He appreciates fresh produce and green spaces. Lucas takes care of the garden of flowers shared with neighbours and enjoyed gardening vegetables before but feels there is no space for this in Jakobsberg.



Vera and daughter Maja, 61 and 32 years old

The mother and daughter live in central Jakobsberg. They live in a building with older neighbours who need more energy to participate in the community. They enjoy green spaces and would happily garden with their neighbours. However, they see that the economic situation has made making environmentally friendly choices, such as buying local produce, difficult.

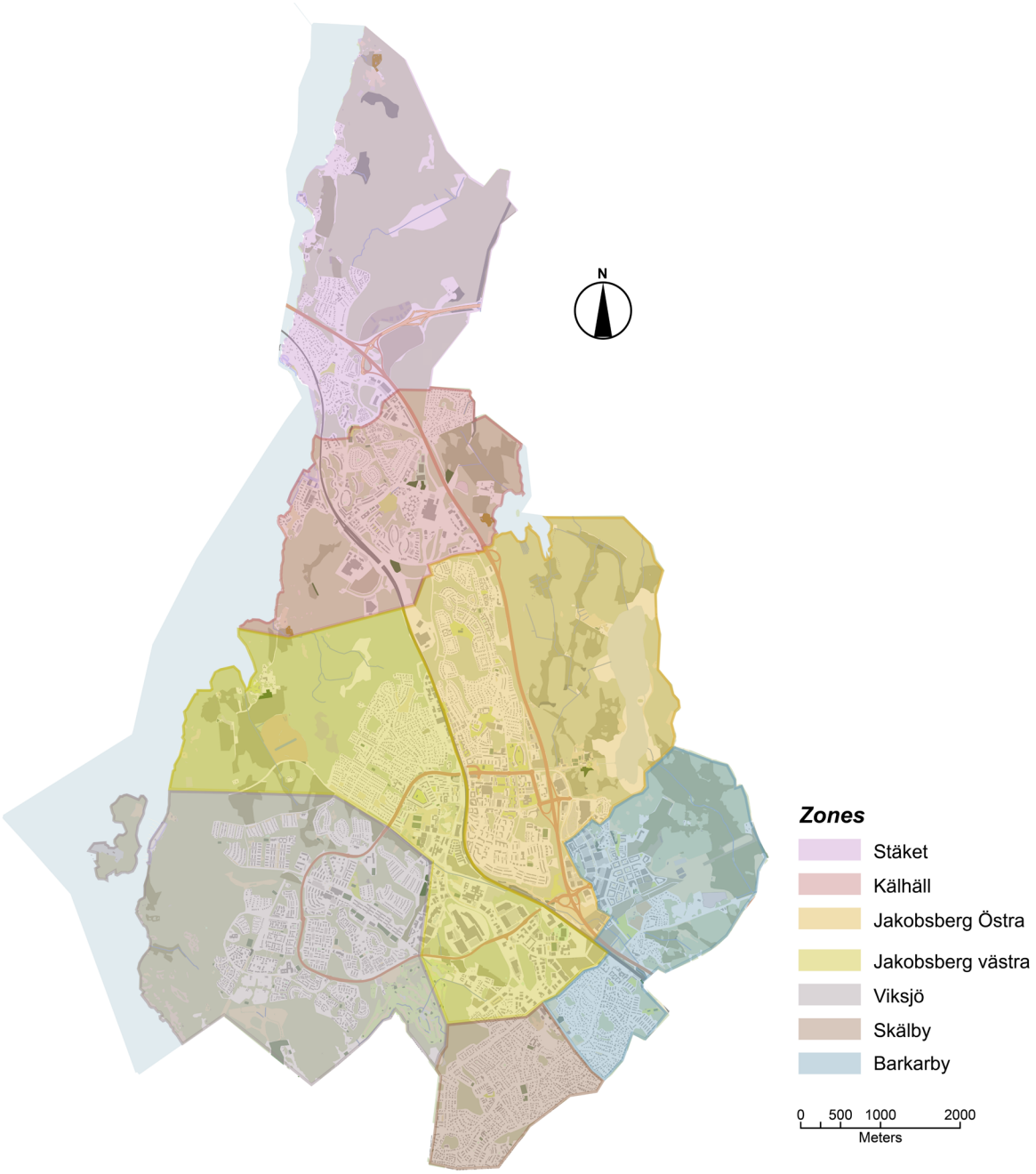
Oliver, 80 years old

He used to garden and enjoyed the activity however now space is limited, and he has less energy for physical activity. Oliver keeps an active life with his neighbours, they gather every couple of days for tea and to play music. He saw the neighbourhood changed a lot and there are many internationals moving into the area and many more residents than before.

The Chosen Dinner Plates

(Selected Neighbourhood profiles)

To situate the recipes within Järfälla, a profile for each of the selected neighbourhoods was created that shows infrastructure and amenities that can influence their placement. This profile also serves as a step towards understanding the extent to which different interventions can have benefits in specific areas.



Neighbourhoods of Järfälla
Source: Redrawn by authors based on Google Maps

Kallhäll

Inhabitants: 15,000
Surface area of land: 5.2 km²
Surface area water: 1.2 km²

Housing types

A former industrial suburb that has transformed into:

Apartment complexes

- Modern developments
- Urban living combined with green spaces
- Terraces, wooden decks, communal courtyards that connect to surrounding nature, focus on eco-friendly and family-oriented living
- Singles and families

Row houses (Radhus)

- Built in 1940
- Two floors plus a basement, with layouts that include multiple bedrooms and private gardens
- Families

Stand-alone log houses

- Less frequent
- Large

Most of the houses date from 1950–1970 In the 1960s, the area was included in the Miljonprogrammet, which now makes up a large percentage of housing types

Social structure

- Mixed: young and old families
- Multicultural community
- Strong social cohesion
- Various initiatives focused on neighbourhood involvement and community activities

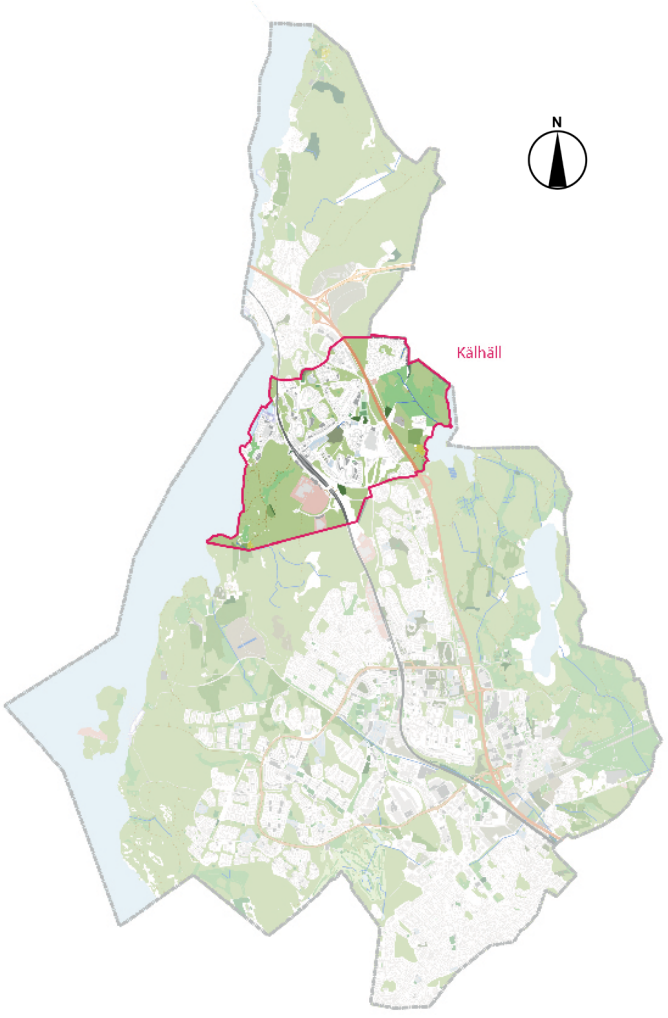
Amenities

- Well-developed centre with supermarkets, pharmacies, cafes and multiple stores
- Education
- Health care
- Recreational areas: Görväln nature reserve, swimming beaches along Lake Mälaren

Transportation

- The train station gets you to Stockholm in 25 minutes by commuter train
- Buses

Our analysis concluded that Kallhäll is one of the areas of Järfälla where we identified social and ecological aspects that indicate a plausible site for edible landscaping and place attachment initiatives. Social aspects that indicate a need for such practices are lower income, higher unemployment and a higher proportion of the population from foreign backgrounds. Areas with such characteristics can be more prone to food insecurity devaluation of green areas and require more facilitated areas for interaction to contribute to a cohesive neighbourhood. Ecological aspects of the area supported urban gardening initiatives as the site analysis revealed a higher number of existing fruit trees, arable land in the peripheries and existing allotment gardens in the neighbourhood. The existing natural aspects can help integrate and facilitate circular urban agricultural practices and improve social cohesion.



Kallhälll, Järfälla
Source: Redrawn by authors based on Google Maps

Jakobsberg (Jakobsberg Centrum)

Inhabitants: 32,600
Surface area of land: 12.54 km²
Surface area water: 9.34 km²

Housing types

Apartments in blocks around Jakobsberg centre
- 1940-1950
- 2-3 room flats
- Young families and singles

Single-family houses in the suburbs of Jakobsberg
- Families
- Access to green areas

Row houses and townhouses
- Recently built
- Newer residential areas

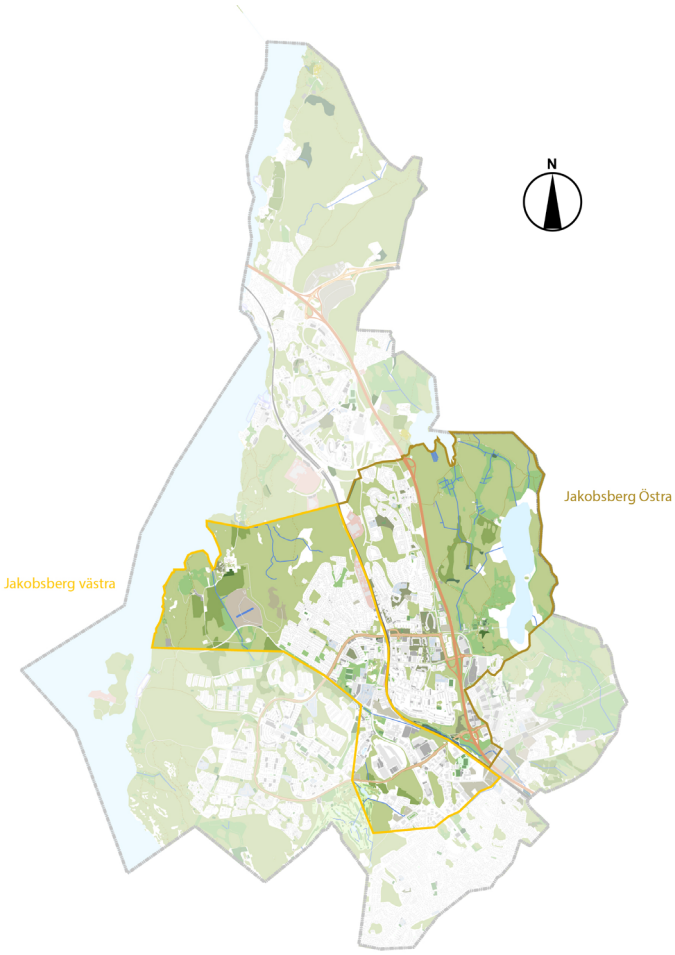
New construction projects
- Sustainable and energy-efficient housing complexes
- Young professionals
- Families

Social structure
- Swedish population
- International Population
- Diverse income levels and cultural backgrounds

Amenities
- Commercial and administrative centre
- Stores
- Restaurants
- Cinemas
- Libraries
- Schools
- Health centers
- Recreational facilities

Transportation
- Commuter train station
- Bus connections
- Major hub to Stockholm

In Jakobsberg, we have observed that income and unemployment issues are further exacerbated compared to Kallhäll. The highest proportion of the population with a foreign background can be found here, as well as the most safety concerns highlighted in the interviews. The E18 road and commuter railway line separate the neighbourhood from green areas. It is a densely built area lacking edible landscaping elements such as fruit trees. Jakobsberg Centre is the municipality's urban centre, meaning many schools and other institutions are located there. Institutions are essential in facilitating urban agricultural practices' integration into the neighbourhood by providing space and funding.



Jakobsberg, Järfälla
Source: Redrawn by authors based on Google Maps

Barkarby (Barkarbystaden)

Inhabitants: 40,000
Surface area of land: 2.4 km²

Housing types

Traditional apartments
- Different housing needs: affordable housing and higher incomes

Modern apartments
- High-tech, energy-efficient housing

Student apartments

Row houses
- Families

Single-family homes
- Families

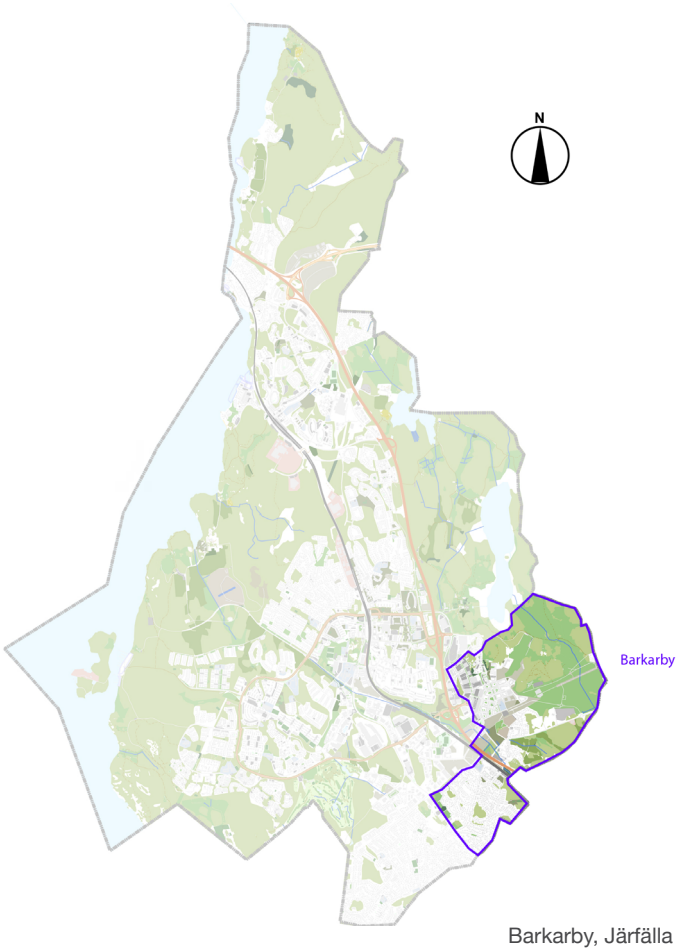
Social structure
- Swedish population
- International Population
- Diverse income levels and cultural backgrounds

Amenities
- Office buildings
- Stores
- Cafés
- Culture
- Schools
- Healthcare
- Shopping malls
- Public parks

Transportation
- Commuter train station
- Bus connections
- Major hub to Stockholm
- Metro blue line

A rapidly developing area with new apartment buildings where a new metro station of metro line 11 is under construction. The municipality plans in the area highlighted a conflict of densification with the preservation of natural and arable areas, making the neighbourhood a significant focus area for urban agricultural practices. Working around the conflict of densification is difficult due to conflicting interests; therefore, alternative measures are required to enable both the building of more housing and preserving green areas.

Previously, the area was primarily dominated by industrial and military activity that resulted in the accumulation of pollutants in the soil, which now poses a challenge and barrier to agricultural practices. Furthermore, the densely built area leads to reduced porous surfaces, which increases the risk of flooding. Implementing greenery in edible landscaping can provide the synergistic benefit of combating future water management issues.



Barkarby, Järfälla
Source: Redrawn by authors based on Google Maps

Recipes

The suggested interventions for our focus areas within Järfälla are presented in the form of recipes in a cookbook to which the result is the circular urban agriculture final meal. Following the recipe layout, the ingredients in the form of cooks as facilitators, guests as the benefiting parties and the steps to achieve it are presented. To facilitate the success of the recipes, each stage is outlined including the initiation, organization and maintenance. For transparency, the challenges to each recipe are included which allows for the facilitators, the cooks, of each recipe to make informed decisions and precautions.

Common ingredient: Spices

- Edible Landscaping
- Place Attachment

Appetiser:
Community Garden Brioche

Main Dish:
Rooftop Garden Lasagna

Dessert:
Agroforestry

-Permaculture Guilds

-Intercropping _ Toppings: (Row/Strip/Relay)

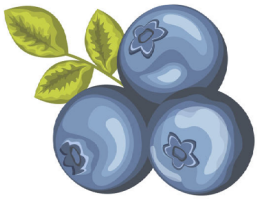
Spices

(Concepts)

Edible Landscaping

Place Attachment

Source: AI-generated image created using
Adobe Photoshop based on detailed prompt provided by authors.



Edible Landscaping

With the increasing trend of population density in urban areas, the distance between consumers and food prosecution sites has increased (Zheng & Chou, 2023). Edible landscaping, a term first coined in 1980 by the American landscape architect Robert Kourik, is a tool used to combat this challenge and combine aesthetic landscape design with crop production (Zheng & Chou, 2024). While a newly coined term, its main ideas have already had a rich and long cultural history, with historical accounts mentioning notions of edible landscaping during the Zhou Dynasty in China between 1046 BC and 771 BC, where edible crops such as peaches, papayas and plums were included in the garden designs (Zheng & Chou, 2023).

One of the primary impacts that edible landscaping can have on the urban fabric is its potential to protect and promote native edible plants and improve food security by ensuring equal access and utilisation (Zheng & Chou, 2023). While the term does not have criteria for what it looks like (e.g. community garden, individual plots, street orchards, etc.), one of the primary characteristics is that the produce is not created to sell (Çelik, 2017).

As a subset of urban agriculture, edible landscaping has a unique potential to bridge the food access divide in cities, offering localised food production and supporting the key principles of food security:

Availability: Edible landscaping enhances access by introducing edible plants into urban green spaces, making fresh food readily available within the community and potentially filling supply gaps (Kortright & Wakefield, 2010).

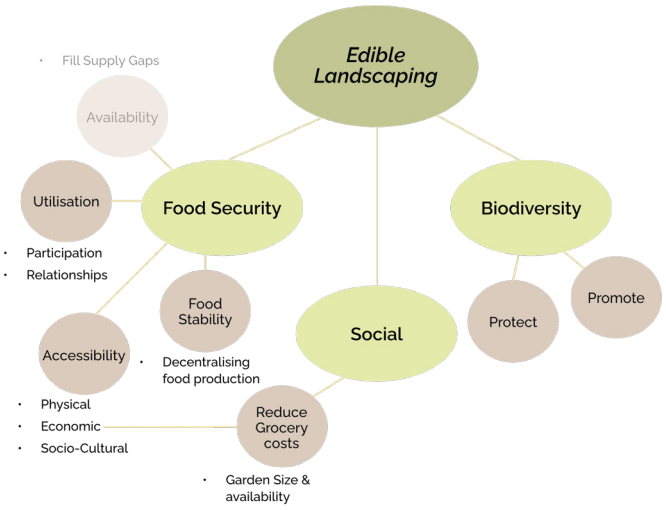
Accessibility: Three dimensions of accessibility ensure food security: Physical, economic, and

By growing food close to residents, edible landscapes reduce the need to rely on distant suppliers, cut grocery costs, and provide healthier, affordable options for diverse socio-economic groups (Russo et al., 2017).

Utilisation: These landscapes encourage nutritious diets and offer culturally relevant food choices, fostering connection through self-expression and builds relationships to food through direct participation (KARACA, 2019).

Food stability: By decentralising food production, edible landscaping creates a resilient food source less dependent on global supply chains, which helps communities withstand food crises (Ashby et al., 2016).

These food security principles benefit the economy of the private individual (individual, family, partners) and spur various urban agricultural businesses that can boost the local economy and create a more entrepreneurial agricultural spirit, attracting new young professionals (Urban Growth Learning Gardens, 2024).



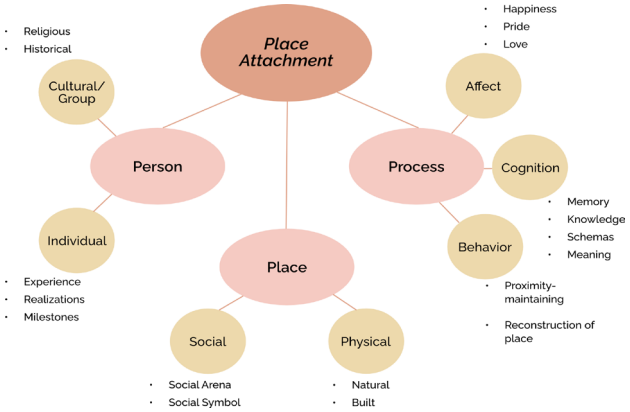
Framework illustratung the proces of edible landscaping
Source: Created by authors.

Place Attachment

"I may not know who I am, but I know where I am from" (Riley, 1992).

While we have previously introduced the notion of social cohesion, social cohesion is a broad concept, it can be meaningfully explored through place attachment. Manzo and Perkins (2006) emphasize that greater attachment to neighborhoods fosters increased interaction among residents and vigilance over communities, thereby promoting social cohesion even in diverse populations. Place attachment provides a sense of identity and reinforces individuals' and communities' sense of belonging. It is a multi-dimensional concept with temporal depth, as longer associations with a place often strengthen attachment, though these bonds may evolve over time (Brown et al., 2012). Unlike related concepts, place identity links place to self-identity, place dependence concerns functional needs met by specific locations, and human territoriality focuses on perceived ownership rather than emotional or social bonds (Brown et al., 2012).

Places gain meaning through personal, collective, or cultural processes, where physical spaces and the relationships nurtured within them play crucial roles in fostering positive place bonds (Riley, 1992). These bonds deepen when individuals actively shape their environments, enhancing well-being and quality of life (Riley, 1992; Scannell & Gifford, 2017). For instance, public gardens encourage attachment through activities like decorating pathways, planting seeds, and hosting gatherings, which reflect personal values and strengthen the connection to the place.

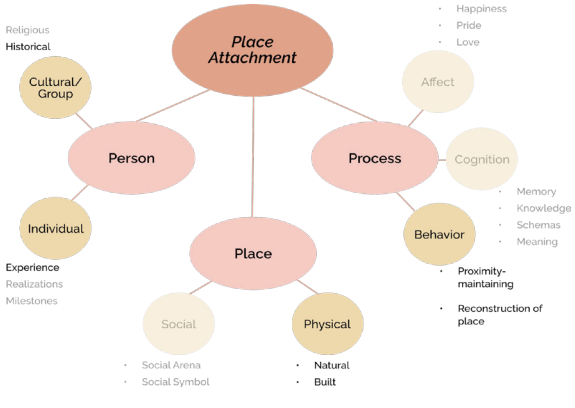


Scannell and Gifford's (2010) framework illustrates the process of place attachment

Factors such as movement, shared identity, social ties, and residence length facilitate place attachment. Locations aligned with individual or group values and offering opportunities for personal expression are more likely to foster strong attachment (Scannell & Gifford, 2010; Shaykh-Baygloo, 2020).

These spaces foster individual agency and identity while encouraging relationships between humans and non-human species, offering activities outside the neoliberal focus on consumption (Del Monte & Sachsé, 2018; Hammar, 2022; He et al., 2024).
As forms of urban agriculture, community gardens can challenge the racialized or classist dynamics often associated with green spaces, redefining belonging through shared experiences rather than exclusionary boundaries (Ghose & Pettygrove, 2014; McClintock, 2013).

Artmann et al.'s (2020) case study on Andernach, Germany, highlights how the edible city concept enhances place attachment by increasing the city's attractiveness and fostering social bonds and place identity. This nature-based solution provides free food in public spaces, strengthens human-food connections, and promotes social cohesion (Artmann et al., 2020).
Place bonds are inherently fragile, and abrupt disruptions due to urbanization can lead to alienation, anxiety, and disorientation (Brown & Perkins, 1992; Fullilove, 1996; Hornsey & Gallois, 1998).



Processes of place attachment. Redrawn by authors base on Scannell and Gifford (2010)

Recipe 1: Appetiser

Community Garden Brioche

Community gardens are a form of urban gardening that focuses on collective and shared space to produce food (Glover, 2003). Unlike allotment gardens, where each family or individual has a specified plot, in community gardens, the entirety of the space is cultivated collectively, and produce is shared.

Community gardens are, therefore, social spaces that can contribute to place attachment through the shared social activity of gardening. Simultaneously, they involve circular practices for soil regeneration through composting and water management by providing permeable surfaces for infiltration.

Factors such as movement, shared identity, social ties, and residence length facilitate place attachment. Locations aligned with individual or group values and offering opportunities for personal expression are more likely to foster strong attachment (Scannell & Gifford, 2010; Shaykh-Baygloo, 2020).

These spaces foster individual agency and identity while encouraging relationships between humans and non-human species, offering activities outside the neoliberal focus on consumption (Del Monte & Sachsé, 2018; Hammar, 2022; He et al., 2024).

As forms of urban agriculture, community gardens can challenge the racialized or classist dynamics often associated with green spaces, redefining belonging through shared experiences rather than exclusionary boundaries (Ghose & Pettygrove, 2014; McClintock, 2013).

Artmann et al.'s (2020) case study on Andernach, Germany, highlights how the edible city concept enhances place attachment by increasing the city's attractiveness and fostering social bonds and place identity.

This nature-based solution provides free food in public spaces, strengthens human-food connections, and promotes social cohesion (Artmann et al., 2020).

Place bonds are inherently fragile, and abrupt disruptions due to urbanization can lead to alienation, anxiety, and disorientation (Brown & Perkins, 1992; Fullilove, 1996; Hornsey & Gallois, 1998).

Stockholm Communal Garden (Trädgård på spåret).
Source: Trädgård på Spåret facebook

Source: The Victorian Schools Garden Program (VSGP), (n.d.).

Objectives:

Social cohesion, provision of food, education, regeneration of the area and promoting biodiversity (INJ, 2023).

Chef

- Municipality

Urban Planning Departments: Zoning, pilot programs.
Policy Makers: Supportive policies, incentives.
Environmental Consulting Agencies: Conduct ecological assessments, monitor biodiversity impacts, and ensure alignment with sustainability standards (e.g., Sweco).

- Schools
- Housing cooperatives,
- Social Service,
- Local Residents.

Guests

- Students
- Residents

Location

Jakobsberg
Barkarbystaden
Kallhäll

Difficulty (Challenges)

- Conflicts between community members
- Unsure level of residents' involvement
- Cost, maintenance, scalability, weather
- Awareness of Soil conditions
- Long-term management
- Theft

Ingredients:

- Available land
- Accessible water resource
- Uncontaminated soil
- Public willingness
- Gardening tools
- Tool Storage
- Raised garden beds
- Seeds
- Compost bins
- Community workshops
- Facilitator: elected by the community
- Community board

Optional ingredient/optional:

- Cooking workshops,
- Food culture days.

Source: AI-generated image created using Adobe Photoshop based on detailed prompt provided by authors.

Selected Types

Cooperative: For Local Residents
community members all work on managing the same plot as one giant garden. These gardens are often affiliated with religious communities, civic groups, or service organisations that donate part or all the products to charitable organisations like food banks and soup kitchens.

Youth-Garden: For Schools
These are specific to educational institutions, where children learn skills in planting, cultivating, harvesting, teamwork, and healthy lifestyles.

Benefits

• Increase trust in one's gardening ability, trust between people, and transparency in food production processes.
• Community cohesion: unite people on a smaller scale to share gardening accomplishments and localised events.
• Restore vacant spaces
• Space to produce local and organic food
• Increase soil health.
• The microbial basal respiration rate in community gardens is higher than in allotment gardens, indicating nutrient turnover and soil fertility,
• Falling tree leaves are used during autumn to create compost and eventually soil fertiliser.
• Increase biodiversity & Ecosystem services:
• Supporting: habitat provision, nutrient cycling
• Provisioning: food
• Regulating: climate and water
• Higher permeability of surfaces for water retention and infiltration than in allotment gardens
• It can integrate other sustainability measures, such as collecting rainwater for watering, composting, and using natural fertiliser instead of chemicals.

HOW TO DO:

Step 1,2,3: Assessment and Preparation

1. Identifying organisations to sponsor the garden: municipality, schools, retirement homes, churches, housing and social service authorities.
2. Conduct surveys and interviews about public willingness for gardening and food production and their preferences for the type of activity
3. Find and evaluate potential garden sites. To consider in this process (McKelvey, n.d.):
-Does the site get sunlight?
-Is there an access to water?
-Is the site relatively flat?
-Is the plot in the vicinity of the potential users?
-Consider inquiring about organisations willing to participate to provide the land for gardening.
-Test for soil contamination (check previous land-use).
Note: For an organic and healthy food production it is important the soil is uncontaminated.

Step 4: Tools and Practicality

• Provide gardening tools,
• Tool Storage,
• Seeds,
• Raised garden beds: Raised garden beds benefit the elderly who struggle with physical activity and want to participate in gardening practices. They can be implemented in areas where the soil is inadequate (due to contamination or soil depth) (SSSA, 2013).

• Include water management strategies:
Rain barrels are water tanks used to collect and store rainwater. Using them reduces the garden's reliability on tap water, which may be costly, especially in drought-prone seasons. For more efficient rainwater collection, the garden can use gutters and downspouts from roofs, which act as catchment areas, and divert them into the barrels for collection (Charland, 2017).

• **Mulch:** Evaporation on a hot day can be quite high, increasing the water demand of the plants in the garden. However, the evaporation can be reduced significantly using mulch, an organic layer of grass clippings or straw.

In addition, the mulch also suppresses weeds that compete for soil moisture with the cultivated plants in the garden. It is essential to place larger mulch, such as bark chips, to allow the rainwater to infiltrate the soil while preventing evaporation (Charland, 2017).

• **Drip irrigation** is important to conserving and efficiently using collected and stored water. In this process, water is applied at the base of the plants to allow for better absorption (Jenny, 2019).

Circular Practices in the community gardens:
• Provide Compost bins,
• Avoid organising as allotments and rather cooperative gardens to facilitate shared resources and produce.
• Use water retention and conservation methods such as rain barrels, mulch and drip irrigation.
• Work with organic and natural principles without artificial fertilisers
• Strive for a diversity of vegetables, spices, and flowers, not a monoculture
• Benefit pollinators and micro-life in the soil
• Establish criteria for garden membership: residence in a specific geographic region, payment of dues, agreement with rules, and participation in the upkeep of common areas (Bradley, 2019).

Step 5: Community Workshops

To make sure that people get the right information about how to use the tools, how to and what to plant and how to maintain the tools, space but also social connections,

Step 6:

Volunteer/Encourage people to volunteer to be in the community board.
Community board choses a facilitator for a period and others can also take the role.

Step 7: Maintenance

Hold monthly workdays to clean and tidy the garden
• Maintain clean pathways
• Make sure labels are clear & easy to read
• Removing weeds & disease control
• Check on the availability of tools
• Free Composting system of pests & odours
• Make sure to check structures safety
• Good communication
• Hold regular workshops
• Establish Gardener guidelines; this may include (McKelvey, n.d.):
-Will there be an application fee?
-What standards should plot maintenance uphold? What happens if this is not met?
-Are there restrictions on the type of plants that can be grown?
-What materials can be composted? If there is a compost bin.
-How should theft be handled?

Optional Ingredients

If you choose to use the optional ingredients, make sure to provide enough and clear information about the workshops and **food culture days**.

These events can take place within the community gardens, and is organized by the community board, and can be initiated by any community member.

Fruits and Vegetables that can be cultivated in gardens in the Swedish climate:

Example of Uppsala University's campus garden (Uppsala University, 2021).
Produce being cultivated: onions, carrots, peas, pumpkins, potatoes, cabbage, beans, and corn. For perennial crops (plants that regenerate after autumn and winter), there are, for example, currant bushes, raspberries, cherries, medlar, and chervil. Mushrooms are also a possibility.

Järfälla is in cultivation zone 2, according to Riksförbundet Svensk Trädgård. This scale is from 1-8, with 2 being a relatively moderate environment for cultivation. This association provides advice, access to a lot of information and support to develop garden skills (Riksförbundet Svensk Trädgård, 2022).

Fruits: apples, pears, plums and cherries.
Vegetables: onions, carrots, beets, kale, parsnip, lettuce, pumpkin, broccoli, cauliflower, celery stalks, parsley, dill, chives, green onions, beans (Lantbrukarnas Riksförbund, 2024).

Recipe 2: Main Dish
Green Rooftop Lasagna

Other forms of green infrastructure, such as domestic gardens and edible green rooftops, have gained attention in recent years as a solution due to their potential for local food production, but also offering critical ecosystem services such as temperature and stormwater regulation, air purification, and delivering health-supporting ecosystem services while using less of the city's limited land resources (Cameron et al., 2012; Coutts & Hahn, 2015), as well as ensuring healthy products by using uncontaminated sources of soil. However, high maintenance costs and limited awareness still pose challenges, as well as the need for community engagement, particularly when compared to on-ground gardens (Oberndorfer et al., 2007).

Green roofs offer an alternative to urban agriculture in land-scarce cities, contributing to food security by creating space for crop cultivation without occupying valuable lots (Walters & Midden, 2018). These spaces can be implemented on private or public properties such as hospitals, prisons, and schools. However, high costs, structural requirements, and environmental challenges limit their widespread adoption (Hui, 2011; Walters & Midden, 2018).

According to Baldwin (2022), green roofs are categorised into three main types: extensive, semi-intensive, and intensive, each with distinct characteristics and uses. This nature-based solution provides free food in public spaces, strengthens human-food connections, and promotes social cohesion (Artmann et al., 2020).

Extensive green roofs are typically installed in inaccessible areas not designated for other purposes. They are low-maintenance and self-sufficient, with vegetation miming natural ecosystems.

Extensive roofs are simple, lightweight, cost-The plants are generally resilient to drought, frost, occasional overwatering and nutrient deficiencies, with a thin substrate layer and minimal nutrient requirements. effective, and suitable for flat or pitched roofs.

Semi-intensive green roofs blend characteristics of extensive and intensive systems, including plant-type mixes that require occasional maintenance, balancing functionality and upkeep.

Intensive green roofs, often called rooftop gardens, provide more plant selection and design possibilities. This also means they require regular maintenance and are only suitable for flat surfaces, supporting heavier loads and more complex landscaping. They are typically integrated into the building's design and intended as usable, accessible spaces for various activities.
By offering flexibility in design and maintenance, green roofs contribute to sustainable urban planning, enhance biodiversity, improve insulation, and maximise underutilised spaces. In our recipes, we look at the following immediate forms: Sedum roofs, Edible Nature Roofs and Rooftop Gardens.

Intermediate Forms
Sedum Roof (VIBE, 2020)

Source: Petterson Skog et al,. (2021)

Better appearance, some water storage and evaporation, cleverly combined with solar panels
Substrate layer: 40-80 mm
Otherwise, there is a risk of the plants drying out and the entire vegetation layer being displaced by wind.
Plants: succulents, drought-loving herbs, grasses and perennials
Weight: 40-80 kg per m²
Maintenance: 1-2 times a year
Water retention: 15-24 l/m²
Water evaporation: 45%
Cost: € 35,- to € 80,- per m²

Edible Nature Roof (VIBE, 2020)

Maintain, enhance and expand local biodiversity
Substrate layer: 80 - 200 mm, varying in height and composition
Plants: trees, shrubs, herbs, grasses and perennials (preferably Indigenous)
Weight: 100 - 300 kg per m²
Maintenance: 1 - 3 times a year
Water retention: 20 - 50 l/m²
Water evaporation: 50 - 60%
Cost: € 50,- to € 100,- per m²

Rooftop Garden (VIBE, 2020)

Source: Petterson Skog et al,. (2021)

Stay, play and meet
Substrate layer: 150 - 400 mm
Plants: Lawn, perennials, shrubs, trees, herbs, vegetables, small fruit, fruit
Weight: 200 - 600 kg per m²
Maintenance: 4 - 10 times a year
Water retention: 30 - 90 l/m²
Water evaporation: 55 - 65%
Cost: € 80,- to € 250,- per m²

The Table below shows the minimum depth for different crops in urban farming on raised beds (Petterson Skog et al., 2021).

70 mm	100mm	150mm	200mm	250mm	300mm
Basil, Cilantro	Winter Leek, Chives, Chervil, Marjoram, Chives, Lamb's Lettuce, Arugula, Various Types of Lettuce	Bush Beans, Garlic, Kohlrabi, Yellow Onion, Shallots, Peas, Spring Onion, Mint, Savory, Thyme, Asian Leafy Greens, Strawberries	Green Beans, Eggplant, Kidney Beans, Fava Beans, Cabbage, Small Carrots, Cucumbers, Endive, Chicory, Leek, Parsnips (small varieties), Bell Peppers & Chili, Tomatoes, Turnips, Dwarf Corn, Daylilies, Dwarf Citrus, Melons, Borage, Lavender, Lemon Balm, Parsley, Rosemary, Sage	Beets, Broccoli, Cauliflower, Squash, Okra, Dill, Fennel, Lemongrass, Lovage, Tarragon	Regular Corn, Potatoes, Rhubarb, Currants, Gooseberries, Autumn Raspberries, Bay Leaves

Green/Blue Roof (VIBE, 2020)

Water management for additional water storage,- buffering, -delay, evaporation, cooling and water reuse
Building Height: 30 - 100 mm extra
Plants: Water layer, to be combined with sedum, nature or garden roof
Weight: 25 - 100 kg per m²
Additional Maintenance: 3 times a year (rainwater drains)
Water retention: 60 - 150 l/m²
Water evaporation: 70%
Extra Cost: € 15,- to € 60,- per m² (extra)

Objectives:

Provision of food, Alternative to on ground gardens for densely built-up Areas, Biodiveristy.

Chef

Design and Installation:
Architects, Landscape architects, Horticulturists, Gardeners, Structural engineers, Property managers, Construction sector with expertise in green buildings.

Support and Partnership:
- Järfälla Municipality promoting urban sustainability (e.g., through zoning incentives or grants)
- University & research institutions conducting studies on rooftop farming viability
- Green roof institutes (e.g., Scandinavian Green Roof Institute).
- Local businesses like Arla

Guests

- Pollinators
- Residents
- Schools
- Local business employees

Location

Barkarbystaden

Difficulty (Challenges)

- Limited Scientific Data on the environmental and economic performance
- Relatively low yield compared to conventional agriculture
- High construction costs
- Uncertain economic and environmental returns.(Harada & Whitlow, 2020).

Ingredients:

- Vacant flat rooftops
- Slanted roofs (sedum)
- Water resource: Rainwater collection
- Uncontaminated soil
- Public willingness
- Gardening tools
- Tool Storage
- Raised garden beds
- Green houses
- Seeds
- Compost bins

Optional ingredients:
- Facilitator

Source: AI-generated image created using Adobe Photoshop based on detailed prompt provided by authors.

Selected Types

Extensive Green Roofs: Lightweight, low-maintenance, drought-tolerant plants like sedums and grasses.
Garden Roofs: for more intensive spaces with a higher plant load, including herbs, vegetables, and small fruit trees.
Nature Roofs: Support biodiversity and pollinators.

Benefits (Harada & Whitlow, 2020)

Addressing Urban Sustainability Goals:
Rooftop agriculture can help cities address various sustainability goals, including:
• Food security
• Food Equity
• Efficient food supply chains
-Lower transportation costs and produce is produced locally.
• Stormwater management
• Mitigation of urban heat island effects
• Waste management using compostable waste

Utilising Underutilised Space: Cities have a lot of unused rooftop space that could be repurposed for rooftop farms. For example, New York City has 15,482 hectares of rooftop surface, which is 445 times larger than the area of existing community gardens.
• Efficient use of space allows for the expanded development of the area while simultaneously providing functional green spaces.
• Enhance the aesthetic appeal of urban areas (Elstein et al., 2008).

Biodiversity Conservation: Rooftop farms, particularly those using organic practices, can enhance biodiversity by:
• Providing habitat for plants, insects, and birds
• Supporting pollinators like bees (Packer et al., 2009)
• Contributing to urban corridor network.

Combining Public and Private Investments: Rooftop farming can attract funding from private investors and public sources, such as green building and infrastructure initiatives.

Enhanced Stormwater Management:
• Rooftop farms can help manage stormwater by retaining rainfall and reducing runoff by 60% to 100%. By increasing substrate water-holding capacity and implementing recirculating drainage systems, rooftop farms could eliminate stormwater discharge and minimise irrigation needs (VanWoert et al., 2005).
• Minimise the cost of food transportation (Whittinghill & Rowe, 2012)

Less energy consumption:
• Control the cooling and heating of the building (Niachou et al., 2001; Castleton et al., 2010).
• Acts as a heat shield during summer and a cold shield during winter
• The amenities of the rooftop gardens are more private; therefore, security concerns are lower.

Rooftop Greenhouses Feasibility in Stockholm Case Study

(Roca et al., 2023)

Climate Considerations
• **Sunlight and Temperature:** Stockholm's high latitude means limited sunlight and cold temperatures during winter. Artificial lighting and heating are necessary for year-round production, significantly impacting energy consumption. Studies indicate that replacing 50% of lettuce imports with local hydroponic systems could increase annual electricity consumption by 10%.
• **Energy Mix:** Sweden's reliance on renewable energy sources offers an advantage. Utilising district heating and a sustainable energy mix can significantly lower the carbon footprint of rooftop greenhouses compared to regions dependent on fossil fuels.

Infrastructure Considerations:
• **Rooftop Suitability:** Many Stockholm buildings have sloped rooftops, limiting the available area for greenhouses. Industrial buildings with more extensive, flatter rooftops offer better suitability.
• **Building Capacity:** Assessing the load-bearing capacity of existing buildings is crucial. Older buildings might have better capacity, while newer ones may require structural reinforcements, increasing costs.

• **Accessibility and Logistics:** Easy transportation, maintenance, and distribution access is essential. Proximity to consumers reduces transportation needs and aligns with the goal of localised food systems.

Economic and Social Aspects:

• **Cost-Effectiveness:** High initial investment costs for infrastructure, technology (hydroponics, lighting, heating), and potential building modifications must be balanced against the long-term benefits.

• **Social Acceptance:** Promoting the understanding and acceptance of soilless cultivation techniques like hydroponics among consumers is essential.

• **Food Security and Sustainability Goals:** Rooftop greenhouses align with Stockholm's goal of increasing local food production and reducing reliance on imports. They contribute to sustainability by utilising unused urban spaces and potentially incorporating waste management and water recycling systems.

Overall Feasibility:

• **Favourable factors:** Sweden's commitment to sustainability, the potential for utilising renewable energy, and the need to enhance local food security support the feasibility of rooftop greenhouses.

• **Challenges:** The climate necessitates energy-intensive solutions, and the existing building infrastructure may require modifications. Careful site selection, efficient design, and technological advancements are critical to optimising resource use and cost-effectiveness.

Water management:

• Integrating blue roof solutions into green rooftops can help sustain them by conserving water and creating a consistent water supply even in dry seasons.

• The solution involves creating a water reservoir under the soil layer, allowing water to infiltrate the reservoir for conservation. In drier periods, the water needs to diffuse towards the soil and vegetation, facilitated by a wicking layer, a fibrous material connecting the water retention layer to the drainage layer (Mai, 2022).

• Less infrastructure-intensive methods to retain water can be utilised through reducing transpiration rates. Methods to achieve this include mulching the soil, which is the application of larger pieces of organic matter layered over the soil, consisting of grass clippings or straw (Charland, 2017). Including larger vegetation to provide shading to the soil can also significantly reduce evapotranspiration (Mai, 2022).

Circular practices:

• Water retention and conservation practices through blue roof solutions, including water reservoir layer under the soil and reducing transpiration by mulching and planting larger vegetation for shading.

• Green roofs can lower the energy demand of buildings by insulating their surfaces during both warm and cold seasons.

• Contribute to biodiversity by providing habitats and supporting pollinators and can be parts of urban green corridor networks.

• Composting sites placed within rooftop gardens ensure the nutrients are cycled and can be reused within that same garden until all nutrients have been depleted.

HOW TO DO:

Step 1: Preliminary Planning and Research

Objective: Evaluate the feasibility of rooftop gardens.

• Survey industrial and public buildings with large flat or sloped roofs for green roofs.

-So that the different types of green roofs can be correctly allocated.

• Work with engineers to assess load capacity.

• Use climate data to choose energy-efficient materials and technologies.

• Identify buildings with easy access for maintenance and transport.

• Consider using renewable energy for heating and lighting, leveraging Swedish sustainable energy mix.

Step 2: Policy and Regulatory Framework

Objective: Develop supportive policies and regulations.

• Create zoning regulations that support rooftop agriculture, including tax incentives, grants, and simplified permits.
• Seek funding and education from national and municipal programs, green building initiatives, and private investors.
Examples: Scandinavian Green Roof Institute (Education), Vinnova (has funded similar initiatives on green waterproof roof gardens) (Towards the Human City, n.d.; Vinnova, 2021).
• Build partnerships with businesses and universities like the Swedish University of Agricultural Sciences.
• Ensure compliance with environmental and safety standards for water management, stormwater retention, and energy efficiency.

Step 3: Design and Implementation

Objective: Choose farming systems that align with sustainability and space efficiency goals.
• Choose green roofs based on purpose
-Prioritise buildings with flat rooftops and larger surface areas like commercial, municipal, and industrial structures.
-Choose lightweight and low-maintenance technologies like sedum or garden roofs for buildings with lighter load requirements.
-Include mixed-use residential buildings where feasible, offering private rooftop spaces for sedum gardens. Provide incentives for private homeowners
• Add sedum gardens to mixed-use residential rooftops with incentives.
• Add composting facilities for organic waste.
• Combine sedum roofs with solar panels for efficiency.
• Include rooftop greenhouses for hydroponics or aquaponics if feasible.

Step 4: Community Engagement and Education

Objective: Ensure community involvement and support.
• Conduct workshops and campaigns on rooftop garden benefits for residents, businesses, and schools.
• Train locals in rooftop gardening maintenance and techniques like hydroponics and aquaponics.
• Create educational materials highlighting rooftop agriculture's role in food security, stormwater management, and urban cooling.

Step 5: Economic and Environmental Assessment

Objective: Evaluate the performance of rooftop gardens.
• Track yields, resource use, and environmental impact (e.g., water retention, energy consumption, stormwater reduction).
• Conduct a cost-benefit analysis to measure economic viability, long-term savings, and environmental benefits compared to conventional agriculture. Consider using public-private partnerships
to offset costs and provide long-term funding support.

Step 6: Long-Term Maintenance and Scaling

Objective: Ensure the ongoing success of rooftop gardens.
• Develop a maintenance plan to regularly monitor garden health, irrigation systems, and structural components.
• Set up community-based maintenance teams or partnerships with local businesses to manage the gardens.
• Use successful pilot projects to demonstrate the feasibility, attract further investment, and scale to other rooftops.

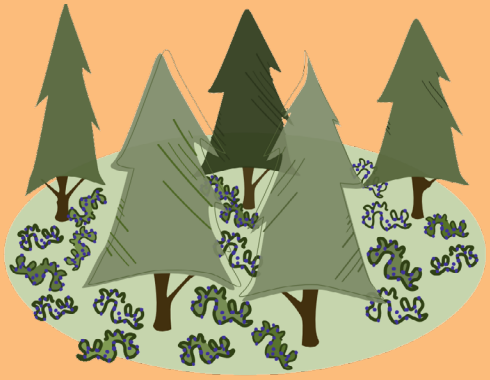
Step 7: Policy and Infrastructure Support

Objective: Integrate rooftop farming into broader urban planning.
• Integrate green rooftops into the immediate design plans to include rooftop gardens in new urban developments —not just sedum roofs but roofs where agriculture and social interaction can happen.
• Adapt zoning and infrastructure plans to support rooftop agriculture across the municipality.

Step 8: Final Assessment and Feedback

Objective: Ensure continuous improvement to the green roof System promoting roof agriculture.
• Collect feedback from residents, businesses, and other stakeholders to assess the outcomes and effectiveness of rooftop gardens.
• Review and adjust strategies based on feedback and results to optimise efficiency, cost-effectiveness, and environmental benefits.
• Conduct periodic evaluations to assess progress and make necessary improvements.

Recipe3: Dessert
Agroforestry



Agroforestry is the production of trees and non-tree crops on the same land, integrating animals, plants, and trees into a long-term conservative and productive System. Trees can be planted in rows, groups, or individually and must be planted to produce food, feed, or other ecosystem services. The areas—usually existing agricultural land—must be managed so that they do not become overgrown, and the areas not occupied by trees should maintain cultivation functionally using standard agricultural practices and machinery. Harvesting the annual or perennial crop between the trees still needs to be possible, and the tillable area should cover at least 50% of the entire plot/area (Agroforestry Sweden, 2024).

Key Facts:

Sweden has a longstanding tradition of integrating trees into agricultural landscapes. It commonly practices agroforestry methods such as alley cropping (silvoarable systems), silvopastoral systems, hedgerows, riparian buffer strips, and forest farming (Pasquier, 2020).
Forestry is the predominant land use in Sweden, with data from SBC (2019) indicating that forested areas accounted for 69% of the country's landmass in 2015. In contrast, agricultural and pasture lands combined covered only 16% (Statistikmyndigheten, 2019)
Approximately half of Sweden's agricultural area is constrained by natural or other area-specific constraints (European Commission, n.d.).
1.1% of Swedish land is devoted to agroforestry practices (Schaffer et al., 2019). Agroforestry, however, can take many different tyoes and methods.

Selected Types:

Permaculture Guilds
Intercropping : Row, Strip, and Relay

Permaculture Guilds

Permaculture guilds will be introduced to help mitigate the more labour-intensive process of organic agriculture. A permaculture design system aims to integrate a beneficial grouping of plants that can support each other through their various functions (Weiseman et al., 2014).

For example, a permaculture guild is built around an anchor plant - usually a fruit tree -, then various companion plants that support the main plant through various roles like nitrogen fixers (clover or lupine), dynamic accumulators (deep-rooted plants like comfrey, potatoes and carrots), pest repellents (e.g. aromatic garlic and marigolds) (Weiseman et al., 2014). Within the Guild system, it is also essential to include pollinator-attracting flowering plants like lavender and ground covers like strawberries or creeping thyme to suppress weed growth and retain soil moisture (Weiseman et al., 2014).

Lastly, you must include mulch providers like nasturtiums or comfrey's that do not need to be cut and can decompose, returning nutrients to the soil and vining plants like beans and peas to utilise the vertical space.

Row, Strip, and Relay Intercropping

(Maitra et al., 2021)

Row intercropping involves cultivating one or more crops in distinct rows, with intercrops grown simultaneously in rows or without a defined row pattern. This practice is commonly employed to maximise resource efficiency and enhance overall productivity.

Mixed intercropping involves growing two or more crops together without a specific row arrangement. In pasture-based systems, grass-legume intercropping is a prime example of this practice. Mixed intercropping is frequently adopted to meet food and forage needs, particularly when land resources are limited, however since it is pasture based, it will not be used in our recipes.

Strip intercropping involves growing two or more crops in alternating strips, particularly on sloped terrain. This method is recognised for improving efficiency on marginal and less fertile lands. Typically, soil-conserving crops are alternated with soil-depleting crops in strips perpendicular to the land's slope or the prevailing wind direction. The primary goals of strip intercropping are to minimise soil erosion and optimise yield from degraded or low-quality lands.

Relay intercropping involves cultivating two or more crops simultaneously during part of their growth periods. In this system, the second crop is planted once the first crop has completed most of its growth and is near the reproductive or maturity stage, but before it is harvested. This approach is particularly suitable for areas with constraints in time or soil moisture. The second crop is sown before the first crop is harvested, allowing both to overlap in the field for a portion of their cycles. However, the yield of the second crop is often lower than with conventional sequential cropping, and a higher seed rate is typically required to achieve a satisfactory stand.

Benefits (Agroforestry Sweden, 2024)

Below Ground:

• Increased diversity of micro-life in the soils provides a better foundation for the decomposition of organic material and better soil structure.
• Increased micro-life improves soil structure, decomposes organic material, and builds topsoil.
- Topsoil (5-20 cm deep) is nutrient-rich and enhances fertility.
• Micro-life and plant roots increase climate resilience and nutrient efficiency.
• Mycorrhizal networks form over large areas, requiring perennial, undisturbed soil.
• Carbon is better stored in the root system, trunk, branches, and soil.
• Nitrogen needs are reduced with nitrogen fixers.
• -Examples of nitrogen fixers are Grey alder (Alnus incana), Lupine (Lupinus), Red Clover (Trifolium pratense), Timothy Grasses (Phleum pratense), and Meadow Fescue (Lolium pratense) (Swedish University of Agricultural Sciences, 1988; Huss-Danell et al., 2008). These examples and their benefits have already been researched within Sweden's geographical climate.
• Proper species selection improves water management and prevents soil erosion. They can help drain water during heavy rain or draw water from the deeper soil layers during drier periods.
• Perennials and living soil enhance water quality by capturing pollutants.

Above Ground:

• Higher photosynthesis and biomass production.
• Improved microclimate with wind protection and frost tolerance. Creating scenes for frost-sensitive plants and providing wind protection (which also reduces erosion).
• In many cases, well-established perennials tolerate drought better than annual plants.
• Reduces disease and pest attacks.
• Increases biodiversity, benefiting pollinators and animals.
• Acts as biotopes or corridors for wildlife.
• Increased animal welfare as trees and bushes provides shade, shelter, and more natural living conditions than completely monoculture agriculture.

For Farmers:

• Based on the Land Equivalent Ratio (LER), intercropping is a strategy that can increase agricultural productivity per unit of land. It is based on ecological mechanisms for improved resource capture (Yu et al., 2015).
• It also diversifies the types of products the farmer can create, such as timber, bioenergy, medicinal plants, animal feed, or other special products like Christmas trees, while continuing with regular crop production. This can also increase self-sufficiency.
• Since you do not depend on one crop, your food and income security also become more stable (depending on what other plants you decide to grow) (Maitra et al., 2021). Intercropping makes it possible to manage varying weather and fluctuating prices better.
• Extended harvest seasons, from early spring to late fall, with perennials. The harvest can be spread out so that different crops are harvested separately.
• Needs less spraying and fertiliser, even in conventional cultivation.

Challenges

• If crops aren't correctly chosen, it can lead to further soil depletion and competition over nutrients (Maitra et al., 2021).
- Allelopathic effects - where one plant releases chemicals that harm another, can be detrimental.
• Agroforestry systems demand higher labour input because of their complex nature.
• They involve increased investment, maintenance, and administration costs due to the need for holistic management approaches.
• Public policies, such as the Common Agricultural Policy (CAP), often fail to recognise the multifunctional benefits of agroforestry landscapes.
- These policies are frequently viewed as unfavourable or unsupportive of agroforestry practices (Schaffer et al., 2024).
• A lack of value chains for agroforestry products makes it challenging to sell agroforestry effectively.
• The sectoral dualism of the Swedish governmental sectors—forestry and agriculture—poses a challenge as agroforestry belongs to both (or neither). This can lead to coordination gaps between sectors, which can slow down and accelerate development.
• Many farmers need more training and awareness to adopt agroforestry practices.
• Inadequate policies and regulations.
• Limited resource access (capital, technical, knowledge and planting materials) (Lars, 2024).
• Unclear land tenure and ownership rights can discourage farmers from investing in long-term agroforestry systems.

- Options for improving land tenure (FOA & ICRAF, 2019).
1. Land Formalisation
2. Conditional and long-term leases
3. Community-based land management

Water Management

• Drip irrigation is an efficient method that delivers water directly to the plant roots, minimising water loss through evaporation. In agroforestry systems, drip irrigation can be used to provide water to individual trees, ensuring their optimal growth and productivity while minimising water usage (FasterCapital, 2024).
• Mulching is another strategy for efficient irrigation which involves covering the soil surface with organic materials like straw or wood chips. Mulching contributes to soil moisture retention, reduces evaporation, and suppresses weed growth, therefore helping in the conservation of water (FasterCapital, 2024).

Circular practices for Agroforestry

• Aim for seasonal cultivation, which is suitable for the Swedish climate and therefore promotes local produce.
• Mulch and compost can contribute to sustainability and circularity by providing natural fertiliser for agricultural lands and permaculture guilds (if they do not completely' self-fertilise' through the mulch-producing plants). Adding mulch and compost to agricultural sites can also promote water retention in the soil and reduce the demand for irrigation.
• Located in or close to a city or larger community
• Have several local waste collaborations with different actors - that's the key.
• Primarily choose recycled and reused material, inputs and fertiliser
• Not for private/individual use. Vegetables must be sold or end up in a larger context.

Permaculture Guilds

"Their layered spacing uses the light, a gift from the sun, efficiently, with no waste. The organic symmetry of forms belong together; the placement of every leaf and the harmony of shapes speak their message. Respect one another, support one another, bring your gift to the world and receive the gifts of others, and there will be enough for all."
(Kimmerer, 2013)

Chef

- Residents, including individuals, neighbourhood groups, and community organisations, would actively participate in creating permaculture guilds.
- Municipal urban planners, facilitate site selection, workshops, and pilot projects, providing expertise and resources.
- NGOs and local environmental groups, could contribute with funding and technical support.

E.g. educational collaborations with Ultuna Permakultur, a flourishing permaculture garden in Uppsala (Salmelin, 2023). (Uppsala generally already has a robust urban farming culture)
E.g. Abundant Earth Foundation (Abundant Earth Foundation, 2024) (mainly supports grassroots initiatives, though)
E.g. Nordic Permaculture (Jais, 2024) (also more for education).

Guests

- Pollinators
- Environment
- Residents would benefit from increased food security, biodiversity, and greener urban spaces
- Schools, community centres, and housing areas could adopt guild systems for educational purposes, improving community cohesion and engagement.

Location

Barkarbystaden
Jakobsberg
Kallhäll

Ingredients:

- Green areas
- Exiting anchor plants (Fruit tree)
- Supporting plants:
- Nitrogen fixers (Gray Alder, Lupine, Red Clover, Timothy Grasses
- Dynamic accumulators (Potatoes, Carrots)
- Pest Repellents (Aromatic Garlic, Marigolds)
- Native Pollinator attracting flowers
- Ground Covers (Lingon berries, Wild strawberries, Creeping thyme)
- Mulch providers (comfrey, nasturtiums).

Source: AI-generated image created using Adobe Photoshop based on detailed prompt provided by authors.

Permaculture guide app:
https://www.permaculturegardens.org/sage-app

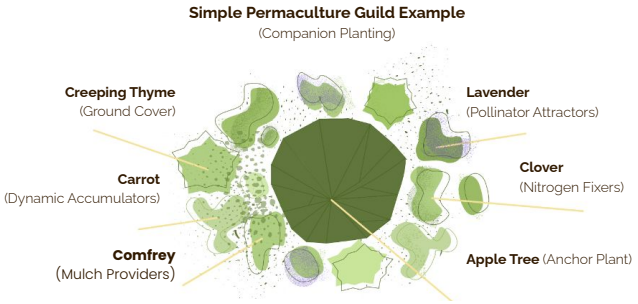
HOW TO DO:

Step 1: Site Selection

Identify suitable existing fruit trees (anchor plants) in Järfälla, so that permaculture guilds can be built around these.

Step 2: Pilot Projects

Establish using companion plants (See diagram below)



Source: Redrawn by authors based on Weiseman et al., 2014)

This would educate the community on how to build their own permaculture guilds and test out what plant combinations work in Järfälla's soil. Also accounting for plants that can help mitigate Järfälla's soil toxicity.

Consider the niches in *time (seasonality)*, *space (vertical and horizontal spacing)* and *functionality (beneficial relationships)* (Permaculture Garden, 2023).
Time: Summer - tomatoes, peppers, squashes, cucumbers; Cooler seasons - winter radish, lettuce and kale. In-between seasons - peas, yarrow and chamomile
Seven layers: overstory layer, vining layer, ground cover, understory layer, shrub layer, herbaceous layer, root crop layer
The more diverse your garden, the more stable it becomes.

Step 2a: designate a space
Step 2b: Choose a 'star player' (Anchor Plant)
Step 2c: Choose the 'Supporting players' based on their function
Step 2d: Fill in the seven layers of the food forest

Step 3: Community Involvement

a. Residential workshops and education about managing guild systems.
b. Provide Information on the trees and the companion plants to increase communal trust in picking them.

Step 4: Maintenance

Step 3b helps for maintenance.
Conditional: Use of mulch collected from forest and parks.

Step 5: Monitoring and Scaling

Evaluate scalability to public and private housing areas.

Step 6: Policy Support

Develop municipal policies to encourage and subsidise guild implementation in private yards and commercial developments, necessary so that green spaces in private properties are also utilised for food security and plant biodiversity

- These subsidies could only be an initial starting point, and once traction among residents has been gained, they could be removed again.

Common Steps with Intercropping:

Step X: Community Engagement & Education

• Organise events to demonstrate the practices to residents and local farmers.
• Partner with schools and universities to incorporate permaculture and agroforestry into curriculum and research projects.
• Introduce reward systems (e.g., tax benefits or grants).

Step Y: Infrastructure & Policy Support

• Resource Hubs: Establish community resource hubs that offer tools, seeds, and educational materials for implementing these systems (FOA & ICRAF, 2019)
• Municipal Policies: Develop policies supporting agroforestry, and permaculture practices, including zoning regulations and financial incentives (FOA & ICRAF, 2019).
- Make agroforestry actions visible in the municipal 'green' plan, mitigation and reforestation programs (which it currently isn't in Järfälla)
- Ensure that securing tenure for agroforestry is inclusive and involves all stakeholders, including women and landless individuals, who may be granted rights to trees and tree products when securing land rights is challenging.
• Monitoring and Feedback: Create a system to monitor these interventions' environmental and social impacts and gather community feedback for continuous improvement.

Step Z: Long-term Integration

• Incorporate permaculture and agroforestry into urban design frameworks, creating green corridors, edible landscapes, and sustainable drainage systems.
• Climate Adaptation Strategies
• Scalability

Intercropping

Chef

- Local farmers,
- Universities and
- Research Institutes,
- Agricultural cooperatives e.g.
- Stiftelsen Lantbruksforskning,
- Governmental organizations e.g.
- IFAD,
- NGOs,
- Interorganizational organizations

e.g. European Union.

Guests

- Pollinators
- Environment
- Local farmers (both large-scale extending beyond Järfälla's borders and small-scale) would see increased land productivity, reduced input costs (e.g., for fertilisers and pesticides), and more resilient agricultural systems that can adapt to the changing climate conditions.
- Residents would benefit from local, sustainably produced food and improved environmental quality through reduced soil erosion and water conservation.

Location

Barkarbystaden
Jakobsberg
Kallhäll

Ingredients:

Trees
Active arable agricultural lands
Variety of ecologically balancing plants e.g.
Sweet clover, Rye, Alfalfa and Winter wheat.

HOW TO DO:

1. Row Intercropping

• Promote planting complementary crops in rows to optimise resource use and productivity in peri-urban agricultural lands.

• Assess the economic and ecological benefits of row intercropping for local farmers & further incentivise them.

2. Strip Intercropping

• Implement strip intercropping on sloped lands to prevent soil erosion & improve land productivity.

• Maintain ecological balance; combine soil-conserving (e.g., sweet clover, rye, alfalfa, and winter wheat) and soil-depleting crops in strategic patterns.

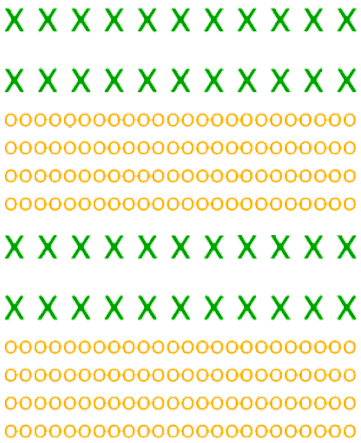
3.Relay Intercropping

• Promote relay intercropping in areas where time and soil moisture are constraints. This will allow two crops to coexist briefly & optimise land use.

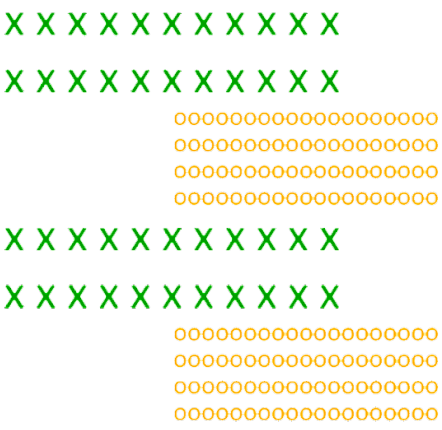
• Guide seed rates and crop combinations to improve yields & adaptability.

Intercropping has Common Steps with Permaculture Guilds- Refer to page.36 of the cookbook.

1. Alternate-row intercropping.



2. Strip intercropping, with both species grown simultaneously.



3. Relay strip intercropping, with one species sown and harvested later than the other.

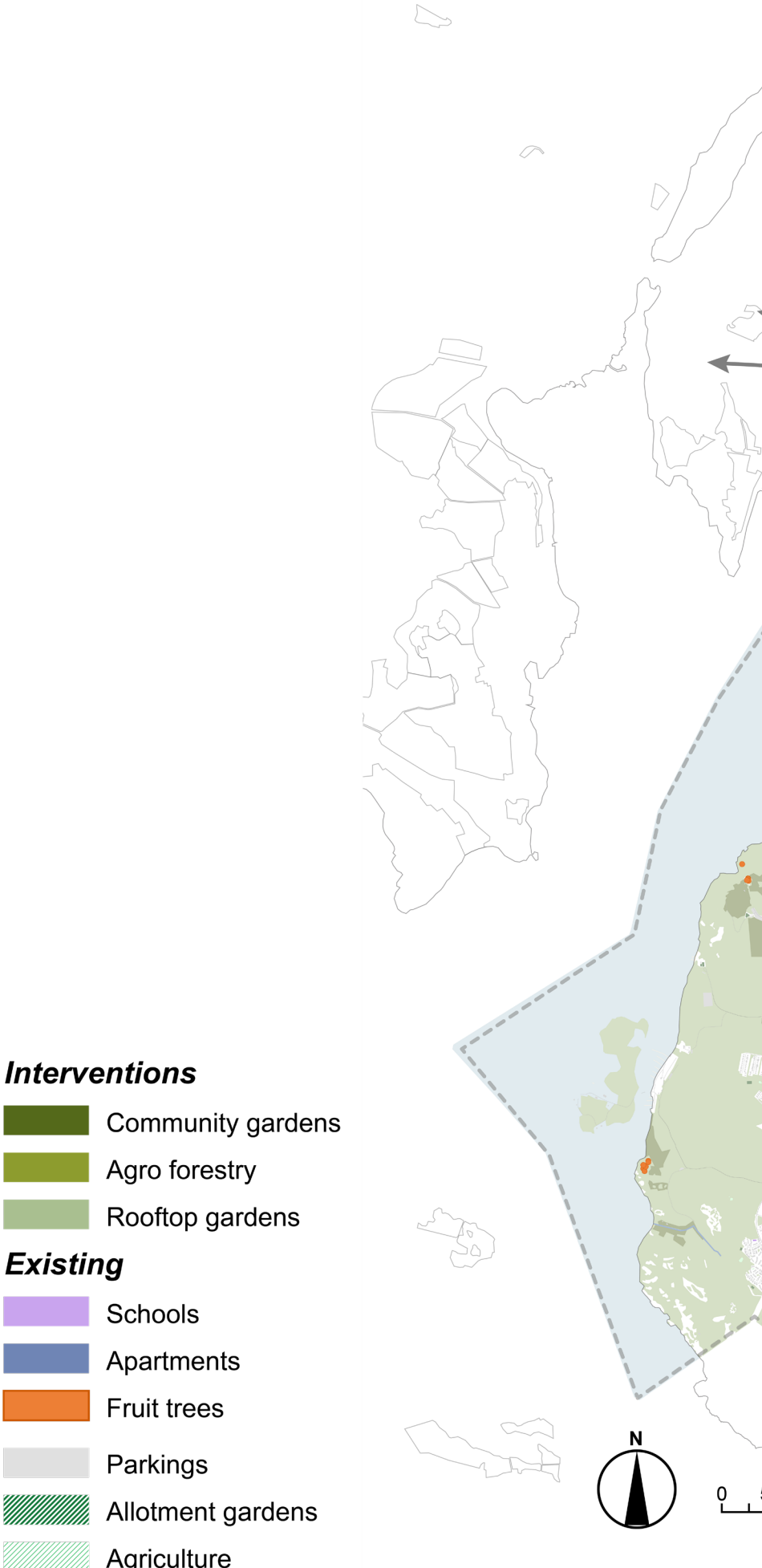
The Last Supper

In this project we propose the interventions to be applied into three zones in Kallhäll, Central Jakobsberg, and Barkarbystaden, these interventions can be implemented strategically in areas of need with careful consideration and comprehensive analysis of various factors.

For example, in Barkarbystaden, local conditions are well-suited for these practices. Schools in these neighbourhoods can serve as hubs for community gardens, promoting education and community engagement.

New construction projects in Barkarbystaden show ideal opportunities for the integration of green rooftops, while existing green spaces across the municipality can be revitalized through agroforestry initiatives.

By combining these strategies and prioritizing more circular and sustainable practices, Järfälla can enhance both its ecological sustainability and social well-being, creating a more resilient and connected community.



Source: Redrawn by authors based on Google Maps

20.000 - 35.000 kr average income
15 -35% unemployment
20 - 80% foreign background
Safety issues - 47% female

0 - 25.000 kr average income
25 - 45% unemployment
60 - 100% foreign background
Safety issues - 35% population
300 new apartements - public space

25.000 - 30.000 kr average income
15 - 25% unemployment
40 - 80% foreign background
4.100 - 4.400 new apartments

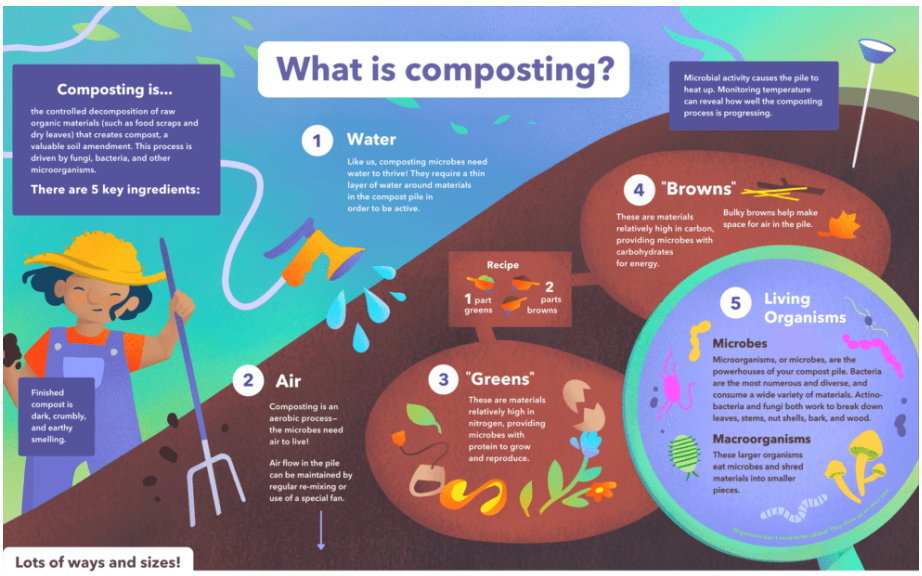
Some Inspiration from International Initiatives Proposed by Various Actors!

Objective: Learning from Others

Education, Awareness and Community Engagement Campaigns aorund Urban Agriculture & Food Composting!

Alabama Extension, 2024

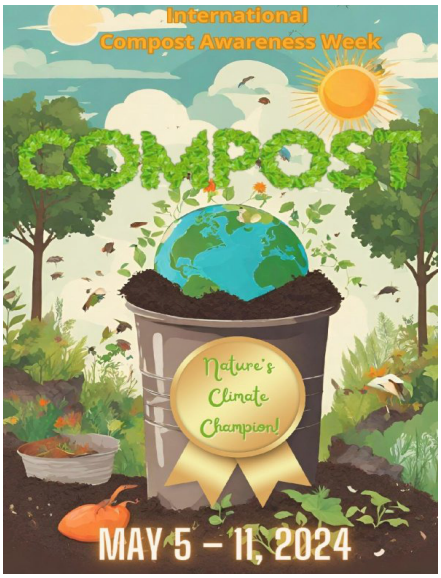
La Crosse Climate Action Plan, 2024



ILSR (Institute for Local Self-Resilience

Vision Greens, a vertical farming company from Welland, Ontario.
Kalin Ned — October 29, 2024

Direct Dialogue Initiatives India

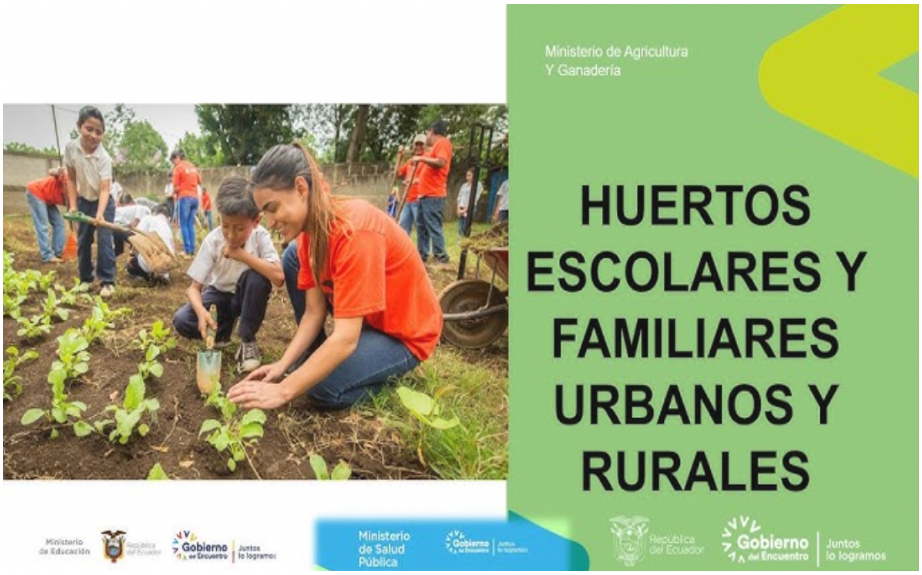


UCRRA Director of Sustainability, 2023

[Awareness poster issued for the 2019 French national waste composting awareness week]

[Composter at the foot of an apartment building]
©City of Nantes

A guide to create an organic gardens at home! [Municipality of Lima]



A youtube guide to Urban and rural school and family gardens. Ministry of Agriculture, Granada.

[Metropolitan Municipality of Lima, 2021]

Municiplaity of Madrid, 2023. A [guide to implementing a school biogarden in arid areas.]

DISCUSSION

The project aims to reconnect Järfälla's agriculture and integrate it into the urban environment to achieve the beginning of circularity and improve social cohesion. Several ecological and social challenges, such as high levels of unemployment and income distribution, have been identified through the analysis, and our proposal suggests that urban agricultural initiatives, specifically community gardens, green roofs, and agroforestry, can contribute to their improvement.

Järfälla's need for densification, which is increasingly threatening green areas, such as the existing agricultural land, and the increasing population have created the need to facilitate interactive platforms for social cohesion. As mentioned during the introduction of place attachment, social cohesion can be fostered through the theoretical notion of place attachment as the first stepping stone. This is why our recipes always strongly focus on community engagement, which helps residents gain personal and group bonds to spaces within Järfälla. Furthermore, soil contamination in Barkarbystaden and related issues increase the need for strategic interventions as well as can challenge their implementation.

The project aims to address social and ecological issues with highly complex systems that the scope of the project could not entirely address or guarantee that they would end up working. As with every social matter, experiencing a place can be a deeply individual act, and how the individual engages with and interprets our proposed interventions is not given. Additionally, the seasonality of the interventions is an aspect that can be further analysed to identify suitable vegetation for each season throughout the implementation of the recipes.

While we have included some planting suggestions, we could not perform more in-depth research on different types and their functionality under different urban stresses, such as flood, heatwaves and air pollution due complexity of each of these subjects and due to time constraints.

This is an essential aspect to consider for the long-term success of local and organic urban agriculture, as well as ensuring that the maintenance levels are not 'more/less than necessary'.

One of Järfälla's current objectives is water management due to the increasing local risks of flooding, which the recipes somewhat address regarding efficiently utilising water and providing diverse green spaces that can absorb more water than monocultures. However, more research can be conducted about how the different green spaces can mitigate flooding issues in the site-specific location of Järfälla to adequately predict the impact of the recipes on water management and flooding mitigation.

Furthermore, Järfälla is also focused on climate adaptation, to which edible green spaces contribute by reducing temperatures and flooding instances, though more can be done to highlight their synergies. Showing the broad benefits of urban agricultural practices on both social and ecological aspects of Järfälla can both help in upscaling and allow for successful functioning.

Lastly, a limitation faced in the project was the lack of spatial data available for analysis using Geographic Information Systems (GIS). Publicly available data on factors such as water management and mapping of social aspects could enable a precise and strategic selection of the exact location of the interventions.

CONCLUSION

As Järfälla continues to densify and adapt to its growing population, encouraging sustainable development and a cohesive community depends on its ability to utilise methods of urban agriculture. This cookbook proposes actionable recipes that address challenges such as social fragmentation, densification, land scarcity, and food insecurity. We demonstrate that Järfälla's urban spaces can become places of resilience, growth and connection.

Järfälla can promote circular practices such as responsible food consumption and food waste management and, at the same time, promote social cohesion by integrating residents in agriculture activities through three key interventions (recipes): community gardens, green rooftops, and agroforestry. These recipes leverage edible landscaping and place attachment as core principles to drive positive change. They emphasise a strong collaboration between key stakeholders, including but not limited to municipal planners, residents, and schools. Through this, Järfälla can foster a sense of shared ownership and ensure that initiatives remain successful in the long term.

For example, community and rooftop gardens enhance local organic food production while fostering strong social bonds between residents interacting with these new urban agricultural places. Similarly, agroforestry and place-based strategies support connections between residents and their environments, enhancing local biodiversity and reinforcing Järfälla's identity as a municipality that values environmental and social sustainability.

The cookbook recipes are designed to be adaptable, ensuring that their benefits can be scaled to other neighbourhoods and socio-economic contexts.

Their implementation is based on ongoing collaboration and stakeholder engagement, and we hope they can serve as models for other Swedish municipalities striving toward similar ideals.

While the recipes are not without their challenges and difficulties, where navigating barriers such as limited funding might hinder development, this cookbook is both an invitation and a challenge for planners, residents and stakeholders alike. We want you to envision a Järfälla where communities can sustainably and regeneratively Grow Together. We have written the recipes; now it is time for Järfälla to gather the cooks and prepare the supper.

Placemaking/Urban Agriculture in Järfälla Municiplaity. © Authors.

REFERENCES

A

Abundant Earth Foundation. (2024, June 21). Join the Permaculture Movement. Abundant Earth Foundation.https://abundantearthfoundation.org/

Adrià Carbonell, “A Landscape Inventory: Ulla Bodorff’s Mapping of the Järva Field”, Infrastructural Love: Caring for Our Architectural Support Systems, ed. Hélène Frichot, Adrià Carbonell, Hannes Frykholm and Sepideh Karami. (Basel: Birkhäuser, 2022)

Agroforestry Sweden (2024). Agroforestry Sweden. https://agroforestry.se/

Artmann, M., Sartison, K., & Vávra, J. (2020). The role of edible cities supporting sustainability transformation – A conceptual multidimensional framework tested on a case study in Germany. Journal of Cleaner Production, 255, 120220. https://doi.org/10.1016/j.jclepro.2020.120220

Ashby, S. et al. (2016) ‘Measurement of the dimensions of food insecurity in developed countries: A systematic literature review’, Public Health Nutrition, 19(16), pp. 2887–2896. doi:10.1017/s1368980016001166.

Aslanoğlu, R., Kazak, J. K., Szewrański, S., Świąder, M., Arciniegas, G., Chrobak, G., Jakóbiak, A., & Turhan, E. (2024). TEN QUESTIONS CONCERNING THE ROLE OF URBAN GREENERY IN SHAPING THE FUTURE OF URBAN AREAS. Building and Environment, 112154. https://doi.org/10.1016/j.buildenv.2024.112154

B

Baczyk, J., Minja, A., Toma, C., Martens, J., & Vandenbussche, M. (2023). Adequate Housing for Järfallä. In KTH. KTH. https://www.kth.se/social/files/65dc9841571bce96e0e64905/adequate-housing-for-jarfalla.pdf

Barkarby Science. (2022). Barkarby Science - Smarta växter i klimatets tjänst, ”SVIKT”. Smarta Växter I Klimatets Tjänst, ”SVIKT”. https://barkarbyscience.se/projekt/svikt/

Baldwin, E. (2022, May 16). An Architect#8217;s Guide To: Green Roofs. Journal. https://architizer.com/blog/product-guides/product-guide/green-roofs/

Beltrami, S. (2020, March 16). How to minimize the impact of Coronavirus on food security | World Food Programme. UN World Food Programme (WFP).https://www.wfp.org/stories/how-minimize-impact-coronavirus-food-security

Boardman, A. E., Greenberg, D. H., Vining, A. R., & Weimer, D. L. (2018). Cost-Benefit analysis. https://doi.org/10.1017/978110823559

Bradley, L. (2019, June). How to organize a community Garden | NC State Extension Publications. https://content.ces.ncsu.edu/how-to-organize-a-community-garden

Brown, B. B., Altman, I., & Werner, C. M. (2012). Place Attachment. International Encyclopedia of Housing and Home, 183–188. https://doi.org/10.1016/b978-0-08-047163-1.00543-9

Brown, B. B., & Perkins, D. D. (1992). Disruptions in Place Attachment. In Place Attachment (pp. 279–304). Springer.

Byron Shire Council. (n.d.). Byron Shire Community Garden Guidelines. https://www.byron.nsw.gov.au/Council/Plans-Strategies/Policies/Community-Gardens-Policy

C

Cabral, I., Keim, J., Engelmann, R., Kraemer, R., Siebert, J., & Bonn, A. (2017). Ecosystem services of allotment and community gardens: A Leipzig, Germany case study. Urban Forestry & Urban Greening, 23, 44–53. https://doi.org/10.1016/j.ufug.2017.02.008

Carlsson-Kanyama, A., Dreborg, K. H., Moll, H., & Padovan, D. (2007). Participative backcasting: A tool for involving stakeholders in local sustainability planning. Futures, 40(1), 34–46. https://doi.org/10.1016/j.futures.2007.06.001

Castleton, H., Stovin, V., Beck, S., & Davison, J. (2010). Green roofs; building energy savings and the potential for retrofit. Energy and Buildings, 42(10), 1582–1591. https://doi.org/10.1016/j.enbuild.2010.05.004

Çelik, F. (2017). The importance of edible landscape in the cities. Turkish Journal of Agriculture - Food Science and Technology, 5(2), 118. https://doi.org/10.24925/turjaf.v5i2.118-124.957

Cerrada-Serra, P. et al. (2018) ‘Exploring the contribution of alternative food networks to food security. A comparative analysis’, Food Security, 10(6), pp. 1371–1388. doi:10.1007/s12571-018-0860-x.

Chandran, R. (2020, April 21). Urban farms to traffic bans: Cities prep for post-COVID-19 future. Thomson Reuters Foundation. https://news.trust.org/item/20200421073605-d7mba

Clarke, M., Davidson, M., Egerer, M., Anderson, E., & Fouch, N. (2019). The underutilized role of community gardens in improving cities' adaptation to climate change: a review. People Place and Policy Online, 12(3), 241–251. https://doi.org/10.3351/ppp.2019.3396732665

Climate-smart food grown on campus here - Uppsala University. (2021, June 23). https://www.uu.se/en/news/2021/2021-06-23-climate-smart-food-grown-on-campus-here

Compton, C. (2019, December 9). What does living soil actually mean? Living Soils. https://livingsoilsfertiliser.com/blogs/news/what-does-living-soil-actually-mean?srsltid=AfmBOooMZTnv3hAoC_kkj2j0NGsE_zxJn2vSBDrkQSuZqNTc2qfldkII

Constructive Voices. Zweedse biodiversiteit: Hoe Zweden biodiversiteit bevordert en beschermt. Geraadpleegd op 22 oktober 2024, van https://constructive-voices.com/nl/Zweedse-biodiversiteit/

Conway, T. M. (2016). Home-based edible gardening: urban residents' motivations and barriers. Cities and the Environment, 9(1), 3. https://digitalcommons.lmu.edu/cate/vol9/iss1/3/

D

Del Monte, B., & Sachsé, V. (2018). Urban Agriculture: From a creative disorder to new arrangements in Rome. In S. Glatron & L. Granchamp (Eds.), The Urban Garden City (pp. 271–288). Springer.

E

Egerer, M., & Fairbairn, M. (2018). Gated gardens: Effects of urbanization on community formation and commons management in community gardens. Geoforum, 96, 61–69. https://doi.org/10.1016/j.geoforum.2018.07.014

Egli, V., Oliver, M., & Tautolo, E. (2016). The development of a model of community garden benefits to wellbeing. Preventive Medicine Reports, 3, 348–352. https://doi.org/10.1016/j.pmedr.2016.04.005

Ekologigruppen. (2018). Handlingsplan för ökad biologisk mångfald i Järfälla kommun. Järfälla kommun.

Elstein, J., Welbaum, G., Stewart, D., & Borys. (2008). Evaluation growing media for a shallow-rooted vegetable crop production system on a green roof. Acta Horticulturae, 782, 177–184. https://doi.org/10.17660/actahortic.2008.782.20

European Commission. (n.d.). At a glance: Sweden's CAP Strategic Plan. Retrieved November 21, 2024, from https://agriculture.ec.europa.eu/system/files/2024-01/csp-at-a-glance-sweden_en.pdf

F

FOA & ICRAF. (2019). Agroforestry and tenure. https://openknowledge.fao.org/server/api/core/bitstreams/2a3fe0f9-4395-4e6a-b2f6-7dd6447ea898/content

FoodloopzSwedenAB.(2023).Cirkulärstadsodling. Cirkulär Stadsodling. Retrieved November 4,2024, from https://www.cirkularstadsodling.se/

Foley, J. A., Ramankutty, N., Brauman, K. A., Cassidy, E. S., Gerber, J. S., Johnston, M., Mueller, N. D., O'Connell, C., Ray, D. K., West, P. C., Balzer, C., Bennett, E. M., Carpenter, S. R., Hill, J., Monfreda, C., Polasky, S., Rockström, J., Sheehan, J., Siebert, S., . . . Zaks, D. P. M. (2011). Solutions for a cultivated planet. Nature, 478(7369), 337–342. https://doi.org/10.1038/nature10452

Fullilove, M. T. (1996). Psychiatric implications of displacement: Contributions from the psychology of place. American Journal of Psychiatry, 153(12),1516–1523.https://doi.org/10.1176/ajp.153.12.1516

fundsforNGOs. (2024, October 21). Sample Proposal on "Sustainable Urban Planning: Creating Eco-Friendly Cities" - FundsforNGOs - Grants and Resources for Sustainability. fundsforNGOs - Grants and Resources for Sustainability - Grants and Resources for Sustainability. https://www.fundsforngos.org/proposals/sample-proposal-on-sustainable-urban-planning-creating-eco-friendly-cities/

G

Ghose, R., & Pettygrove, M. (2014). Actors and networks in urban community garden development. Geoforum, 53, 93–103. https://doi.org/10.1016/j.geoforum.2014.02.009

Glover, T.D. 2003. Community garden movement. In Christensen, K. and Levinson, D. (eds). Encyclopedia of Community: From the Village to the Virtual World, vol. 1. Thousand Oaks, CA: Sage Publications. pp. 264–266.Google Scholar

Gustavsson, R. (1982). Nature on our doorstep: Swedish developments and vegetation structure as a guide in urban landscape design. Alnarp, Sweden.

Gustavsson, R. (1982). Nature on our doorstep: Swedish developments and vegetation structure as a guide in urban landscape design. Alnarp, Sweden.

Graff, D. (2020, March 21). 3 ways that leaves can help improve your soil. Abundant Mini Gardens. Retrieved December 1, 2024, from https://abundantminigardens.com/3-ways-that-leaves-can-help-improve-your-soil/#:~:text=We%20have%20used%20leaves%20three,Used%20as%20a%20mulch

H

Hammar, E. (2022, September 20). What community gardens can teach us about creativity, advocacy, and navigating the present. Friends of Friends / Freunde von Freunden (FvF). https://www.friendsoffriends.com/deep-dives/community-gardens/

Hay, R. (1998). SENSE OF PLACE IN DEVELOPMENTAL CONTEXT. Journal of Environmental Psychology, 18(1), 5–29. https://doi.org/10.1006/jevp.1997.0060

He, S., Li, M., Zheng, Y., Gao, X., & Wang, R. (2024). Reflections on the production of space and justice: A study of everyday life of the SuoJincun's guerrilla gardeners. Cities, 154, 105345. https://doi.org/10.1016/j.cities.2024.105345

Hedström, F. (2019, december 19). Katastrof Scenariot: Järfälla blir det nya Venedig – Järfälla i fokus. Jarfalla Ifokus. https://jarfallaifokus.se/katastrofscenariot-jarfalla-blir-det-nya-venedig/

Hornsey, M., & Gallois, C. (1998). The impact of interpersonal and intergroup communication accommodation on perceptions of Chinese students in Australia. Journal of Language and Social Psychology, 17(3), 323–347. https://doi.org/10.1177/0261927x9801700303

Hui, S. (2011). Green Roof urban farming for buildings in high-density urban cities. World Green Roof Conference. https://hub.hku.hk/bitstream/10722/140388/1/Content.pdf

Huss-Danell, K., Carlsson, G., Chaia, E., & Palmborg, C. (2008). Nitrogen fixation in agriculture: forage legumes in Sweden as an example. In Current plant science and biotechnology in agriculture (pp. 31–32). https://doi.org/10.1007/978-1-4020-8252-8_9

I

IFAD. (n.d.). Sweden. https://www.ifad.org/en/w/membership/sweden

INJ. (2023, April 4). What are the Benefits and Types of a Community Garden. INJ Architects. https://injarch.com/what-are-the-benefits-and-types-of-a-community-garden/

IntercropVALUES. (2024, May 21). Intercrop Values. Intercrop Values. https://intercropvalues.eu/

Jais, D. (2024, May 13). Welcome to the Nordic Permaculture 2.0. Nordic Permaculture. https://nordicpermaculture.org/en

J

Jawaharlal, M., & Kumar, C. S. R. (2013). Innovation in Roof Top and Terrace Gardening. Urban and Peri-Urban Horticulture-A Perspective; Sumangla, HP, Malhotra, SK, Chowdappa, P., Eds, 12-15.

Järfälla kommun. (2020). Dagvatten och länshållningsvatten.Jarfalla.se.https://www.jarfalla.se/byggaboochmiljo/klimatochmiljo/vattnetijarfalla dagvatten.4.6f02e66014c5bd408d55babe.html

Järfälla kommun. (2023, July 10). Järfälla i siffror. https://www.jarfalla.se/kommunochpolitik/insynochrattssakerhet/

Järfälla kommun. (2024). Anlays av jordbruksmark. https://www.jarfalla.se download/18.514783ef18f2d5d6585f9e/1714459400633/Analys-av-jordbruksmark.pdf

Johnston Soil and Water. (2023, March). Soil conservation. https://www.johnstonnc.com/swc/content.cfm?pageid=wisc#:~:text=Cover%20crops%20are%20crops%20planted,wheat%20are%20common%20cover%20crops%C3%BA

Jordbruksverket. (2024, January). European Innovation Partnership Scheme. European Innovation Partnership Scheme. https://jordbruksverket.se/languages/english/swedish-board-of-agriculture/rural-development-support/european-innovation-partnership-scheme.

K

KARACA, E. (2019) ‘Edible landscapes as a solution to food security problem’, Theory and Practice in Social Sciences, p. 227.

Kimmerer, R. W. (2013). Braiding Sweetgrass: indigenous wisdom, scientific knowledge and the teachings of plants. Penguin Books.

Kortright, R. and Wakefield, S. (2010) ‘Edible backyards: A qualitative study of household food growing and its contributions to food security’, Agriculture and Human Values, 28(1), pp. 39–53. doi:10.1007/s10460-009-9254-1.

Kuo, F.E. and Sullivan, W.C. (2001). Aggression and violence in the inner city: effects of environment via mental fatigue. Environment and Behavior 33 (4): 543–571.

L

Lantbrukarnas Riksförbund. (2024). Trädgård. LRF. https://www.lrf.se/sakomraden/tradgard/

Lars. (2024, May 4). Barriers for agroforestry in Sweden – Hameliushultin. https://www.hameliushultin.se/2024/05/04/barriers-for-agroforestry-in-sweden/

Lee, T.-I., Hsieh, Y.-S., Huang, J.-H., Huang, L.-J., Li, J.-S., Syu, M.-C., & Wu, P.-R. R. (2017). Spatial factors affecting patterns of edible landscaping in urban lanes and alleys. WIT Transactions on Ecology and the Environment, 214. https://doi.org/10.2495/eco170141

M

Mack, J. (2021) Impossible nostalgia: green affect in the landscapes of the Swedish Million Programme, Landscape Research, 46:4, 558-573, DOI:10.1080/01426397.2020.1858248.

Maitra, S., Hossain, A., Brestic, M., Skalicky, M., Ondrisik, P., Gitari, H., Brahmachari, K., Shankar, T., Bhadra, P., Palai, J. B., Jena, J., Bhattacharya, U., Duvvada, S. K., Lalichetti, S., & Sairam, M. (2021). Intercropping—A low input agricultural strategy for food and environmental security. Agronomy, 11(2), 343. https://doi.org/10.3390/agronomy11020343

Manzo, L. C., & Perkins, D. D. (2006). Finding common ground: The importance of place attachment to community participation and planning. Journal of Planning Literature, 20(4), 335–350. https://doi.org/10.1177/0885412205286160

McClintock, N. (2013). Radical, reformist, and garden-variety neoliberal: coming to terms with urban agriculture’s contradictions. Local Environment, 19(2), 147–171. https://doi.org/10.1080/13549839.2012.752797

McKelvey, B. (n.d.). Community Garden Toolkit. https://www.fpconservatory.org/wp-content/uploads/2018/11/2-Community-Gardening-Toolkit-PDF.pdf

N

Oberndorfer, E., Lundholm, J., Bass, B., Coffman, R. R., Doshi, H., Dunnett, N., Gaffin, S., Köhler, M., Liu, K. K. Y., & Rowe, B. (2007). Green Roofs as Urban Ecosystems: ecological structures, functions, and services. BioScience, 57(10), 823–833. https://doi.org/10.1641/b571005

O

Oberndorfer, E., Lundholm, J., Bass, B., Coffman, R. R., Doshi, H., Dunnett, N., Gaffin, S.,Köhler, M., Liu, K. K. Y., & Rowe, B. (2007). Green Roofs as Urban Ecosystems:ecological structures, functions, and services. BioScience, 57(10), 823–833.https://doi.org/10.1641/b571005

P

Packer, L., Willis, E., & Colla, S. R. (2009). Can green roofs provide habitat for urban bees (Hymenoptera: Apidae)? DOAJ (DOAJ: Directory of Open Access Journals). https://doaj.org/article/fb44353e762240e2b0e470e63da1e77c

Pasquier, L. (2020). Barriers and Bridges for Establishing Agroforestry [Bsc Thesis, Stockholm University]. https://www.diva-portal.org/smash/get/diva2:1503247/FULLTEXT01.pdf

Permaculture Garden. (2023). Permaculture Guilds | Permaculture Gardens. Permaculture Gardens. https://www.permaculturegardens.org/permaculture-guilds

Petterson Skog, A., Malmberg, J., Emilsson, T., Jägerhök, T., Capener, C.-M., & AB Svensk Byggtjänst. (2021). Grönatakhandboken. https://gronatakhandboken.se/pdf/

Pries, J & Qviström, M. (2021) The patchwork planning of a welfare landscape: reappraising the role of leisure planning in the Swedish welfare state, Planning Perspectives, 36:5, 923-948, DOI: 10.1080/02665433.2020.1867884.

R

Riley, R. B. (1992). Attachment to the Ordinary Landscape. In Place Attachment (pp. 13–35). Springer. https://doi-org.focus.lib.kth.se/10.1007/978-1-4684-8753-4_2

Riksförbundet Svensk Trädgård. (2022, August 30). Digitala Zonkartan. https://svensktradgard.se/tradgardsrad/zonkartan/digitala-zonkartan/

Roca, E., Robles Dopazo, E., Martin, M., & IVL. (2023). Potential capacity of implementing rooftop greenhouses. A case study in Stockholm [MA Thesis, Universitat Politècnica de Catalunya]. https://upcommons.upc.edu/bitstream/handle/2117/398328/TFM_Elena_Robles.pdf?sequence=3&isAllowed=y

Ron Finley Project. (2024). The Ron Finley Project. Ron Finley. https://www.ronfinley.com/

Russo, A. and Cirella, G.T. (2020) 'Edible green infrastructure for urban regeneration and food security: Case studies from the Campania region', Agriculture, 10(8), p. 358. doi:10.3390/agriculture10080358.

Russo, A. et al. (2017) 'Edible green infrastructure: An approach and review of provisioning ecosystem services and disservices in Urban Environments', Agriculture, Ecosystems & Environment, 242, pp. 53–66. doi:10.1016/j.agee.2017.03.026.

S

Salmelin, C. (2023, October 31). How permaculture gardens are transforming Uppsala's urban landscape - SIANI. SIANI. https://www.siani.se/news-story/how-permaculture-gardens-are-transforming-uppsalas-urban-landscape/

Scannell, L., & Gifford, R. (2010). Defining place attachment: A tripartite organizing framework. Journal of Environmental Psychology, 30(1), 1–10.https://doi.org/doi.org/10.1016/j.jenvp.2009.09.006

Scannell, L., & Gifford, R. (2017). The experienced psychological benefits of place attachment. Journal of Environmental Psychology, 51, 256–269. https://doi.org/10.1016/j.jenvp.2017.04.001

Schaffer, C., Eksvärd, K., & Björklund, J. (2019). Can agroforestry grow beyond its niche and contribute to a transition towards sustainable agriculture in Sweden? Sustainability, 11(13), 3522. https://doi.org/10.3390/su11133522

Schaffer, C., Elbakidze, M., & Björklund, J. (2024). Motivation and perception of farmers on the benefits and challenges of agroforestry in Sweden (Northern Europe). Agroforestry Systems, 98(4), 939–958. https://doi.org/10.1007/s10457-024-00964-1

SSSA. (2013). Community gardens. Soil Science Society of America. https://www.soils.org/about-soils/community-gardens/

Shaykh-Baygloo, R. (2020). A multifaceted study of place attachment and its influences on civic involvement and place loyalty in Baharestan new town, Iran. Cities, 96, 102473. https://doi.org/10.1016/j.cities.2019.102473

Statistikmyndigheten. (2019, February 20). Skogen dominerar Sverige. Statistikmyndigheten SCB. https://www.scb.se/hitta-statistik/statistik-efter-amne/miljo/markanvandning/markanvandningen-i-sverige/pong/statistiknyhet/markanvandningen-i-sverige2/

Stewart, H. (2021). Food security in Swedish crisis and contingency policy: What´s the problem represented to be? [Thesis].

Stiftelsen Lantbruksforskning (n.d.). Swedish Farmers' Foundation for Agricultural Research. Lantbruksforskning. https://www.lantbruksforskning.se/in-english/#:~:text=including%20animal%20welfare.-,Funding,on%20inputs%20and%20agricultural%20products

Suman, M. (2019). Urban Horticulture prospective to secure food provisions in urban and Peri-Urban environments. International Journal of Pure & Applied Bioscience, 7(3), 133–140. https://doi.org/10.18782/2320-7051.7469

Swedish Portal for Climate Change Adaptation.. (2018, November 26). Climate-smart planning in Järfälla. Swedish Portal for Climate Change Adaptation. https://www.klimatanpassning.se/en/cases/climate-smart-planning-in-jarfalla-1.113152

Swedish University of Agricultural Sciences. (1988). Growth of Nitrogen-fixing Alnus Incana and Lupinus Spp. for Restoration of Degenerated Forest Soil in Northern Sweden.

T

Towards the Human City. (n.d.). Scandinavian Green Roof Institute: Malmö, Sweden. https://towardsthehumancity.org/initiative-53-scandinavian-green-roof-institute-malmo-sweden/

U

United Nations. (n.d.). Population | United Nations. https://www.un.org/en/global-issues/population
Uppsala University. (2021, June 23). Climate-smart food grown on campus here. https://www.uu.se/en/news/2021/2021-06-23-climate-smart-food-grown-on-campus-here

V

VanWoert, N. D., Rowe, D. B., Andresen, J. A., Rugh, C. L., Fernandez, R. T., & Xiao, L. (2005). Green roof stormwater retention. Journal of Environmental Quality, 34(3), 1036–1044. https://doi.org/10.2134/jeq2004.0364

VIBE. (2020). Webinar Groendaken. Vlaams Instituut voor Bio-Ecologisch Bouwen en Wonen.
Vinnova. (2021, June 10). Green Waterproof Roof Gardens | VINnova. https://www.vinnova.se/en/p/green-waterproof-roof-gardens/

W

Wageningen University & Research. (n.d.). Circular Agriculture: A new perspective for Dutch agriculture. In Wageningen University & Research. Retrieved December 10, 2024, from https://www.wur.nl/nl/show/circular-agriculture-a-new-perspective-for-dutch-agriculture-2.htm

Walters, S., & Midden, K. S. (2018). Sustainability of Urban agriculture: Vegetable production on green roofs. Agriculture, 8(11), 168. https://doi.org/10.3390/agriculture8110168

Weiseman, W., Halsey, D., & Ruddock, B. (2014). Integrated forest gardening: the complete guide to polycultures and plant guilds in permaculture systems. Chelsea Green Publishing.

Whittinghill, L. J., & Rowe, D. B. (2011). The role of green roof technology in urban agriculture. Renewable Agriculture and Food Systems, 27(4), 314–322. https://doi.org/10.1017/s174217051100038x

Y

Yu, Y., Stomph, T., Makowski, D., & Van Der Werf, W. (2015). Temporal niche differentiation increases the land equivalent ratio of annual intercrops: A meta-analysis. Field Crops Research, 184, 133–144. https://doi.org/10.1016/j.fcr.2015.09.010

Z

Zheng, Z.-W., & Chou, R.-J. (2023). The impact and future of edible landscapes on sustainable urban development: A systematic review of the literature. Urban Forestry & Urban Greening, 84, 127930–127930. https://doi.org/10.1016/j.ufug.2023.127930

Zheng, Z.-W., & Chou, R.-J. (2024). Experiences in promoting the development of suburban edible landscapes through place branding: A case study from Xiamen City, China. Cities, 155, 105470. https://doi.org/10.1016/j.cities.2024.105470a

Appendix

The images created by AI, were given detailed prompts by the authors of this work. The prompts were edited multiple times and multiple different effects were given to them to be able to achieve the result. The following are the shorter version of prompts used to generate the images:

Edible landscaping: fruits and vegetables inside a salt shaker.

Place attachment: People (women, men and children) engaging in gardening activities and this is all happening inside a salt shaker.

Community Garden: An illustration of a community garden in the form of brioche, where people (women, men and children) are gardening together and socializing.

Rooftop Garden: An illustration of a rooftop garden in the form of lasagna dish, where people (women, men and children) are gardening together and socializing.

Permaculture guilds: An illustration of permaculture guild (a method of agroforestry), with a apple tree in the middle and cloves, carrots, thymes and other herbs around it.

* Note: AI BIAS: Almost all prompts when asked to illustrate people, was only illustrating men.

This page is intentionally left blank!

Bon Appétit!

GROUP- URBAN AGRICULTURE
KTH-Royal Institute of Technology
HT-24