



Exploring the potentials of Community Supported Agriculture (CSA) in Food Loss (FL) mitigation. Alnarp's Agroecology Farm Skåne, Sweden.

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Exploring the potentials of Community Supported Agriculture (CSA) in Food Loss (FL) mitigation. Alnarp's Agroecology Farm, Skåne, Sweden

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Abstract

Food Loss (FL) is considered a threat to local, regional and global food security. It is a common phenomenon in the mainstream food system, due to factors such as supply chain management, high regulation standards, and consumer preference. This study investigates the potentials of Community Supported Agriculture in vegetable FL mitigation, in Alnarp's Agroecology Farm, in Skåne, Sweden. A qualitative approach was followed, through an in-depth interview with staff, volunteers and subscribers. The empirical findings gathered were analysed using the theoretical lens of Shove et al, (2012) practice theory. To evaluate how materials, competence and meanings influenced the current state of vegetable Food Loss in the farm, in relation to the existing agricultural practices. The study reveals that, Food Loss reduction attributed to Community Supported Agricultural practice in the farm may be associated to decentralized pick up points, food donation scheme, integrated pest management, and production-based subscriptions. The study provides an experimental space, where the potentials of Community Supported Agriculture in Food Loss mitigation is Alnarp's Agroecology Farm in Skåne, is critically looked at

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Preface

How it all started!

Writing my thesis project on Alnarp's Agroecology Farm was not a coincidence. But before taking you through that episode of my adventure, I would like you to bear with me, in engaging your memories by reflecting on my journey to Swedish University of Agriculture (SLU) to pursue a master's degree in Agroecology.

After completing my undergraduate degree in Agricultural Science at University of The Gambia (UTG), it was my desire to pursue a postgraduate master's degree in sustainable food systems, but in a diverse educational setting. However, during my search for alternatives, I came across some interesting programs in SLU, which really caught my interest. These were Agroecology and Horticulture, but Agroecology being my first option at the time of application, I was fortunate to be admitted in the 2023/25 cohort. I later applied for a Swedish Institute Scholarship for Global Professionals (SISGP), which was successful, and I was awarded a scholarship to study masters in Agroecology in Swedish University of Agricultural Sciences (SLU).

During my studies at SLU Alnarp Campus, I received orientations on different multi-disciplinary approaches to agroecological practices, through lectures, seminars and field visits. This influenced my course selection, after my introductory courses. I was able to choose courses that aligned with my interest such as Environmental Issues in Crop Production, Horticultural Systems and Future Challenges, Food Planning and Project Management and Process Facili

tations. This enabled me to holistically understand the interdisciplinary nature of sustainable food issues, and how to adopt a system thinking mentality in approaching complex issues such as Food Loss (FL).

Back to my thesis work at Alnarp's Agroecology Farm, I conceived the idea during a literature seminar on food and nutritional security. in one of my elective courses called Food Planning. After reviewing some reports and scientific journals on food and nutritional security, where the impacts of FL on food and nutritional security and climate change were highlighted. This motivated me to devote my thesis work on FL mitigation in an Alternative Food Network (AFN) setting, CSA in particular. Alnarp's Agroecology Farm was chosen, because of its inclination to CSA and Agroecological principles. Which I came to realise during my past field visits to the farm in my previous courses, Agroecology Basic and Horticultural Systems and

Future challenges. Despite the challenges, exploring the potentials of CSA in FL mitigation provided an insight into FL mitigation strategies used in a CSA practice with reference to Alnarp's Agroecology Farm

To find more about these mitigation strategies, follow me through my thesis.

Yours sincerely,

Kebba.

Acknowledgment

I would like to recognise the support of individuals and institutions, that contributed to the completion of this thesis work, and by extension my studies at Swedish University of Agricultural Sciences (SLU). Notably my supervisor Jonas Bååth , for his supportive guidance and supervision throughout the entire process. The board and management of Alnarp's Agroecology Farm for given me the opportunity to carry out my independent thesis project in the farm. My heart felt appreciation goes to Swedish Institution Scholarship for Global Professionals (SISGP) for awarding me a scholarship for my masters in Agroecology program. Finally, I want to thank my family, friends and staff of Swedish University of Agricultural Sciences (SLU) who have supported me in this academic journey of mine, without which I cannot come this far. Therefore, I appreciate all supports accorded to me.

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Abbreviations

Abbreviation	Description
AAF	Alnarp Agroecology Farm
AFN	Alternative Food Network
CSA	Community Supported Agriculture
FAO	Food and Agriculture Organisation
FL	Food Loss
FSC	Food Supply Chain
FW	Food Waste
HLPE	High Level Panel on Environment

1 Introduction

Food Loss (FL) mitigation is widely seen as an important way of reducing the cost of food production, increasing resource use efficiency, improving food and nutritional security, and environmental sustainability (FAO, 2019). The phenomenon is regarded as a threat to global food and nutritional security, environmental sustainability, and resource conservation (HLPE, 2014). It is mainly attributed to factors such as overproduction and associated resource use, like water, land, fertilizers, and other agrochemicals. (FAO, 2019). It is a concern at global, regional, and local levels which requires the attention and commitments of stakeholders in the food production and distributions landscape, to promote sustainable food production and consumptions practices.

FL is described as the decrease in quality and quantity of food intended for human consumption, due to inefficiencies in production, and postharvest handling (FAO, 2013). It is associated to the upstream Food Supply Chain (FSC), that is from production to distribution. However, it is usually confusing with the term Food Waste (FW), but a clear distinction exists between the two. According to the Food and Agriculture Organization (FAO), FW occurs when food suitable for human consumption is being discarded either at retail or consumer level (downstream) of the FSC, due to market saturation or related consumer behaviors (FAO, 2013). It is estimated that 14% of the food produced globally is lost at the post-harvest stage, while 17% is wasted at households, retail stores, and food services (Magalhães, Ferreira and Silva, 2022). This amount varies with regards to food types, countries, and regions. (Domínguez et al., 2025). Notwithstanding, leafy vegetables and fruits are the most affected categories due to their susceptibility to various forms of spoilage (FAO, 2011). Thus, it has a significant impact on food and nutritional security and climate change.

It is estimated that FL from production to land use change, example conversion of land meant for forestry or other ecosystem services for agricultural use and disposal generates 4.4 Gt CO₂-eq annually, or about 8% of total anthropogenic GHG emissions (Mariam et al., 2020). About one-third of the edible food produced for human consumption are lost, which is equivalent to 1.3 billion tons (FAO, 2011). This is a staggering amount of food produced for human consumption, is lost due to inefficiencies in the agrifood systems and higher regulation standards with bureaucratic and stricter import and export rules. This results in loss of significant amount of food in the global north especially fruits and vegetables (Domínguez et al. 2025). Which is not sustainable, considering the amount of resources used in the production and distribution of food, and the challenges confronting the global food systems, with regards

to sustainable production and consumptions (HLPE, 2014). Thus, transitioning from the mainstream industrial food regime to alternatives that prioritized local sourcing of food is necessary. Through adhering to sustainable ecological principles, fair and sustainable production and consumption practice, such as CSA an example of Alternative Food Network (AFN), (Tay, Ng, and Lim, 2024).

AFN is a platform for farmers and customers who are committed to local sourcing of food in an ecological friendly environment, through alternative means such as organic farming, and regenerative agriculture, while reducing the environmental footprint associated to production and transportation (Bååth and Fuentes, 2024). REKO-ring in Sweden is an example of such platforms. A local Facebook group, where suppliers and customers meet and market their products through posting ads, and customers place their orders. When payments are made, deliveries are conducted weekly or bi-weekly, through organized picked-up events (Bååth and Fuentes, 2024).

CSA is an example of AFNs but operates on different principles and practices when compared to other AFNs such as market gardening and farm market. It is a participatory bottom-up approach that fosters direct and closer partnership between producers and subscribers (Tay, Ng, and Lim, 2024). Where risk and rewards in production are shared between producers and subscribers, through upfront payment of subscriptions, tailored on a production based on subscription (Lara, et al, 2024). This reduces FL due to overproduction and consumer preference, while prioritizing local sourcing of food in a sustainable ecological setting. Thus, it plays a transformative role in the localization of food production system, relying on core agroecological principles such as the use of renewable inputs like compost and plants residues in promoting soil health and other microbial activities, this enhances below the ground biodiversity and improves crop yield and quality (Anderson et al., 2019). It is a useful practice in fixing social and environmental issues in food production and consumption, through sustainable agricultural practices such as production based on subscriptions, and reduced food miles (Medici, et al, 2021). This strengthens the social connection between the producers and consumers, and supports the local economy, through the creation of community of growers and consumers with a share goal in sustainable food production and consumptions (Tay, Ng, and Lim, 2024).

To achieve such sustainability ends, FL reduction would be key to any CSA. Thus, such initiatives hold potential solutions to mitigate FL or provide insights regarding challenges for doing so in agroecological practice, with reference to the practice theory, which provides a more practical and holistic system thinking perspective

1.1 The knowledge gap

Extant literature on CSA practices in Nordic and Sweden in particular were more focus on sustainable food production and relational work on AFNs (Bååth, 2024). Thus, little was known about how CSAs influences FL reduction. However, studies were conducted on the causes of FL and its mitigation strategies in Sweden, but most of these studies were centered on the mainstream food system (Engström and Carlsson-Kanyama, 2004). The potentials of CSA practice in FL mitigation is yet to be explored. Therefore, this study provide an experimental space in bridging the knowledge gap that exist with regards to CSA practice in FL mitigation in Skåne, and beyond,

1.2. The research aim

This study aims to investigate the significance of FL mitigation in promoting sustainable production and consumption, through evaluating sustainable agricultural practices used in the production and distribution of vegetables in Alnarp's Agroecology Farm (AAF) Skåne,

1.2.1 The research objective and questions

The objectives of the study is to explore the current state of vegetable FL in AAF, in relation to the potentials of CSA practice in vegetable FL mitigation. To achieve this objective of the study, the question I engages with is: How can FL reduction be achieved and improved by CSA?

To answer this question, I will engage with the following sub-questions, in studying the case of AAF.

1. What is/are the current state of vegetable FL in AAF, and how does it relate to the existing agricultural practices?
2. What significant role does the CSA model contribute to vegetable FL reduction in AAF?

Taken Shove et al, (2012) practice theory to evaluate how material, competence, and meaning influenced the current state of vegetable FL in AAF, in relation to the existing agricultural practices. Together, the answers to these two sub-questions will offer new insights regarding both challenges of solutions to FL mitigation in CSA.

1.3 Thesis Structure

In the introduction section, I explained the study by presenting the challenges pose by FL to the global food and nutritional security, environmental sustainability and other socioeconomic issues. Through outlining the existing knowledge gap in relation to CSA practice and FL mitigation in Skåne and beyond, and the research aim and questions. This is followed by Chapter (2) which deals with the background of the study, where I reviewed relevant literature in relation to FL definition, causes, and impacts, as well as the emergence of CSA practice. Thereafter, in Chapter (3) I explained the theoretical framework, guiding the study. The case and methodology used in the study is presented in Chapter (4), which focused on AAF in Skåne, Sweden and the research tools and analytical strategies used. In chapter (5) I presented the results and analysis, using the theoretical framework of Shove, et al, (2012) practice theory. In Chapter 6, I discussed my findings in relation to food and nutritional security, challenges in CSA practice, practice theory and agroecological practices and the limitation of the study. Finally, I concluded the thesis with Chapter 7, where I presented a summary of my findings and recommendations.

2 Background

2.1 When is food considered a loss?

The definition of FL has attracted debates among researchers and policy makers in recent times. However, as indicated in my introduction, a clear boundary exists between FL and FW. Thus, these debates foremost concern how to quantify FL, rather than conceptually define it. FL is described as a reduction in both quality and quantity of food intended for human consumption from postharvest to distribution (Caldeira, et al, 2017). This is consistent with the definition of FAO, (2013) which described FL as the decrease in quality and quantity of food that was initially intended for human consumption (FAO,2013). On the other hand, High Level Panel on Environment (HLPE) described FL as a decrease in the quantity of food at all stages of the food supply chain prior to the consumer level (HLPE, 2014). The latter considered FL as a decrease in quantity, while the former described it as losses in both quality and quantity. This represents some of the divergent views on quantification and definitions of FL. For the fact that quantification involves defining what to count. Thus, FAOs definition implies counting both the mass of items and indication of degradation, while HLPEs definition only consider the former. Yet as indicated these definitions are not conceptual definitions that distinguish the defined phenomena, they are commensurate i.e definitions that reduces the phenomenon to comparable measures. Therefore ignoring conceptual dimensions which do not lend themselves to be measured in comparable figures. Thus, this study will be more aligned to the FAOs definition, which considers both quality and quantity as FL, and its linked to food and nutritional security.

2.2 The Causes of FL

FLs are consequences of the way the global food systems function agronomically, technically, socially, culturally, and economically. It varies between and within regions, countries as well as agricultural produce (Domínguez et al., 2025). It can be heterogeneous in nature, depending on the type of food. According to FAO, (2011) 54% of the world's food wastage occurs upstream of FSC. That is during production, post-harvest handling, and storage (FAO, 2011). Therefore, it is important to understand how the current food regime operates with regards production, distribution, and regulation standards governing the food ecosystems (Domínguez

et al., (2025). This is essential in establishing the causes, impacts, and the potential mitigation strategies by adopting an integrated and holistic view of the agrifood systems. However, it should be understood that the causes of FL are not isolated events. They are triggered by a variety of interconnected factors such as climate, materials, the skills set of practitioners and the practice involved, this affects the conditions in which food is produced and distributed and the resource use efficiency in sustainable agricultural practices (Realpe et al, 2024). About 14% of the food produced globally are lost in the FSC, fruit and vegetables are the most affected categories, as they constitute about 66% of the losses and wastes. (Magalhães, Ferreira and Silva, 2022).

However, it can be argued that FL is more prevalent in the “global south” than “global north.” Yet, they all have their peculiarities (Wang et al, 2021). According to Domínguez et al., (2025) FL in the “global south” is caused by limited harvesting techniques, lack of modern and appropriate rural infrastructure, humid climatic conditions, pests, and diseases prevalent, and insufficient post-harvesting systems. While in the “global north” FL is primarily associated to overproduction, non-compliance to production standards, consumer behaviours, and extended FSC especially for produce with short shelf life, such as fruits and vegetables (Domínguez et al., 2025). Example, in the fruit and vegetables industries in Europe, around 22% of production in the EU is lost somewhere between the postharvest and distribution stages of the FSC (Domínguez et al, 2025). Therefore, overproduction, consumer behaviours and non-compliance to regulation standards are part of the leading causes of FL in the “global north.” This has significant impacts on sustainable production and consumption, climate change, and other related issues.

2.3 The effects of FL

FL has a significant impact on the lives and livelihood of the world population, which are cross cutting, on both biotic and abiotic aspects of the environment. Therefore, the effects of FL can be discussed in two main categories. These are environmental and socio-economic effects.

2.3.1 Environmental effects

FL poses a significant challenge to the overall sustainability of the global food systems, with increases in land, water, and carbon footprints (FAO,2011; 2013). Agriculture, being one of the key contributors to climate change, contributes significantly to GHG emissions, eutrophication, and loss of biodiversity (HLPE, 2014). Most of these are attributed to the inputs used in crop

production, such as fertilizer, pesticides, and farm machineries. It is evident that Industrial agriculture relies on resource intensification, which has substantial environmental consequences on the ecosystem and ecosystem services (Wunderlich and Martinez, 2018). It is reported that food loss and waste constitute about 8% of global GHG emission and consumes a quarter of all water used for agricultural production. It occupies almost 1.4 billion hectares of land; this represents close to 30% of the world's agricultural land area- (Cattaneo, Federighi and Vaz, 2020; HLPE, 2014). This has a significant impact on both agricultural production and productivity. Thus, FL represents a huge waste of resources, and opportunities to feed the world's growing population (Bancal and Ray, 2022). Hence, the need for a holistic and sustainable solution to mitigate FL and its related impacts is imminent.in reducing food and nutritional insecurity and improves the lives and livelihoods of people for a sustainable living.

2.3.2 Socio-economic effects

FL is considered to be one of the key drivers to global food insecurity. It is estimated that about 1.3 billion tons of food are lost annually (FAO,2011). This contributes to about 795 million people going without food and 1 billion people being undernourished (Manzoor et al., 2024). Half of which could be avoided with reliable, and efficient supply chain management. It was further stated that, if this amount of FL could be reduced by half globally, it can save one-billion people from hunger and malnutrition. (Bancal and Ray, 2022). Studies have further revealed that FL has a significant effect on both the quantity and quality of food supply. Thus, it remains a key contributor to malnutrition, micronutrient deficiency, and obesity (FAO, 2013).

It is estimated that about 1.4 billion people are overweight out of which 500 million are obese (WHO, 2013). This is associated with inadequate access to the required diet, due to the absence of fruits and vegetables in the diet systems, this has put a high economic and social cost on budgets globally. Food and nutritional security is not only about the required amount of calories intakes, but rather the required amount of nutrients a diet holds (balanced diet). Fruits and vegetables forms key ingredients in the micronutrients requirement of our diet systems. Apart from the nutritional aspects, it contributes to raising the income level of small-scale farmers with limited financial advantage, to remain economically active by producing and selling food for human consumption both in the “global south” and “global north,” for sustainable livelihood (Ray, 2022). Thus, the socio-economic effect of FL cannot be underestimated as far as sustainable production and consumption is concerned.

2.4 The emergence of CSA

The local sourcing of food contributes significantly in reducing the social and environmental issues related to food production and distribution. It is evident that the global food systems contribute to a myriad of crises, while failing to provide sufficient food for all (Graziano, Boillet, et al, 2024). Thus, localization of the agrifood system is important for sustainable food production and consumption. However, changing this status quo requires a participatory and holistic systemic thinking approach. As industrial agriculture remains under increasing scrutiny within consumers and social activists, due to its unsustainable practices such as, the use of chemical fertilizers, pesticides, and extensive FSC (Tay, Ng, and Lim, 2024). Multiples of questions emerged from consumers, as to; Who produces their food? Where is it produced? And how is it produced? The answers to these questions led to the emergence of AFNs, such as CSA, as an alternative to the mainstream industrial food regime.

CSA is considered as a suitable alternative to the mainstream food system in food production, distributions, and consumption due to its sustainable and ecological friendly practices. Such as regenerative agriculture, organic farming, or agroecological principles and shorter food miles (Hitchman, 2019). This increases access to food in the community food hubs, with shorter delivery time on weekly bases. Which helped in FL mitigation, especially for highly perishable produce like vegetables and fruits (Rosman et al., 2024). This strengthens the resilience of the local food systems against any externalities as emphasized in the EU Farm to Fork Strategy. CSA is a grassroot movement in agriculture, also known as “solidarity farming.” Which establishes direct partnership between farmers and subscribers (Spanier, 2025). Where cost and output are shared between farmers and subscribers (Hitchman, 2019). This is done through the payment of upfront subscription fees at the beginning of every growing season, and in return the subscribers receive a weekly subscription of the produce throughout the entire season (Bonfert, 2022). It is principled in risk, reward, and responsibilities sharing.

However, the concept of CSA is not new, its history can be traced back to the early 1970s in Japan, where it was known as "teikei". Meaning “Food with the face of the farmer” and “trust” (Hitchman, 2019). A similar but independent idea was also developed in Switzerland (Lara, Feola and Driessen, 2024). The concept is gaining popularity globally, and Europe in particular due to its resilient and transformative nature, especially during and after the Covid 19 pandemic, when the global FSC, controlled by multinational companies, faced massive supply chain disruptions (Bonfert, 2022). CSA proved to be effective due to its short food miles, transparency

in food production and distribution, and democratic food governance's. Thus, based on this and other related factors, CSA attracted the admiration of people as a practice that one can relied on. In meeting seasonal nutritional and food requirements, while fulfilling its ecological functions such as promotion of biodiversity and other ecosystem services.

3. Theoretical Framework Practice Theory

This study is guided by the theoretical design of Shove, et al, (2012) practice theory. It is applied in the context of agroecological food provisioning in sustainable production and consumption. To address the research question, how FL reduction can be achieved and improved by CSA? This provides a holistic and systemic thinking approach to societal issues, rather than a an isolated one. It helps in evaluating how the elements of practice associated with relevant issues integrate, recruit, and evolve (Shove, et al 2012). Therefore, here I would engage with the research questions to clarify how Shove et al practice theory may provide answers to it. By enabling understanding on contextually relevant practices of specific phenomena such as FL in relation to food ecosystems. Hence, delivers a new insight on policy levers for influencing change towards sustainable production and consumption practices (Sahakian and Wilhite, 2013). FL being a complex social phenomenon, therefore, should not be viewed as a result of isolated individual behaviour or solely a structural inefficiency, rather an outcome of routine practice, embedded in the daily and seasonal agricultural activities and their organization.

Practice is a routinised and socially dispersed way of doing a particular thing. However, Reckwitz (2002), described it as a” block” or “pattern” that is constituted of multiples of single connected bundles of actions executed by cohorts of practitioners. Where each enactment of this single action contributes to changing the contour of practice, in the form of material, meaning and competence (Reckwitz, 2002). On the other hand, Shove, et al, (2012) postulated that practices are shaped and configured around three interdependent and connected elements, these are material, meaning and competence (Shove, et al, 2012). Thus, Shove’s definition answers the questions as to what people do (materials), how they do it (competence), and why it is done (meaning).Notwithstanding these elements are social not psychological and thus, focus on elements which are shared among practitioners of a practice and their variation rather than the uniqueness of individuals practitioners performance of a given practice.

3.1 Materials

Material are significant in constituting practices as it configures its users (Shove et al, 2012), This implies that it dictate what people do and how they do it. Thus, It serves as the primary unit of practices, which plays a fundamental role in providing practitioners an opportunity to utilize their knowledge, skills, and experience, through interaction and experimentation. However, materials such as farm infrastructure, tools, inputs, and technologies used in and

outside the farm, are essential in crop production and distribution. This reinforces the claim that to conduct certain practices involves apprehending material configuration (Shove, et al, 2012). For instance, in order to grow crops materials such as land, water, seeds and other related inputs are prerequisites. Hence, it can be argued that FL mitigation practices are constituted through materials in relation to other elements of practice (Shove et al, 2012), as experienced in the case of AAF.

3.2 Competence

The availability of the requisite materials alone does not suffice in constituting and sustaining a practice. Rather, the materials needs to be configured, integrated, and utilized within a given space, with the required knowledge, skills, and experience. Therefore, this denotes that practices materialized through performance. Where the embodied skill, knowledge, and experience of practitioners are actively utilized in enacting and reproducing an established pattern of practice (Shove, et al, 2012). Thus, the sustenance of CSA practice in AAF, is strongly linked to the abilities of its practitioners to integrate and utilize the required material elements. This is indeed significant in FL mitigation, as it promotes effectiveness and efficiency in production and distribution of vegetables.

3.3 Meaning

Meanings are critical element that answers the “why” of a practice as well as outlined the purpose of practice. Thus, they are described as symbolic and cultural values, attached to practices (Shove, et al, 2012). However, it should be understood that meaning do not stand alone. They are attachment enacted through the integration and utilization of materials and competence. This helps people in making perceptions and deposition in inferring meanings to practices such as CSA. There is a saying that “meaning makes or breaks a practice.” This may be a valid argument because meaning portrays the image of a practice. Therefore, they are essential in FL reduction through aesthetic values and consumer preference. Particularly in a CSA practice, where subscribers see food as a “common” instead of a “commodity.”

However, it is important to note these elements of practice do not exist independently, but interdependent instead. Therefore, one should recognize the possible scenarios that may exist; One the availability of relevant elements without being linked (proto practice) and the second practice disintegrates when links are not sustained as illustrated in figure 1[p12]. (Shove, et al 2012)

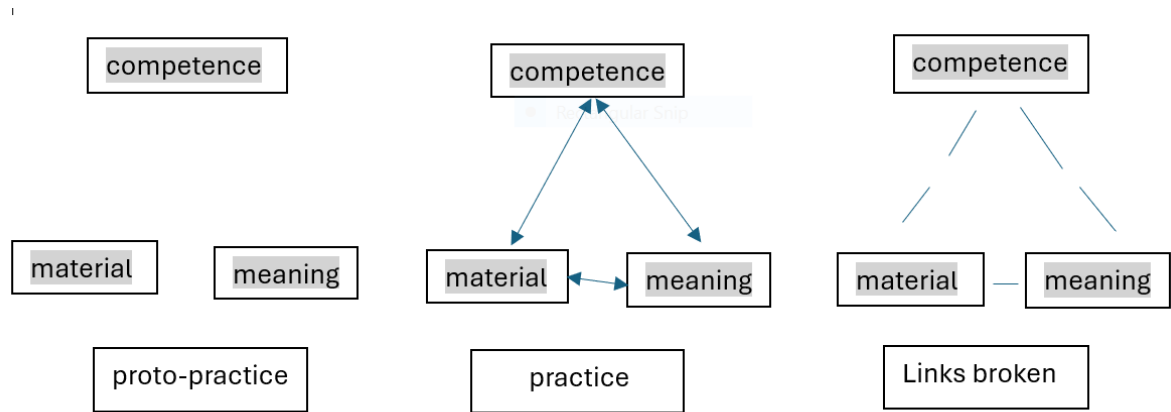


Figure 1. An illustration of the scenarios involves in the elements of practice(Shove et al, (2012)

4. Case & Methodology

A qualitative approach was followed as the most suitable approach to explore the potentials CSA in FL mitigation in AAF. It is useful in eliciting views, experience, and opinion of participants through interviews and constructs reliable meaning (Creswell and Creswell, 2018). FL being a complex social phenomenon which goes beyond individual behaviours. In order to understand how it relates to the daily and seasonal agricultural activities, I followed the theoretical lens of Shove, et al, (2012) practice theory in analysing the FL mitigation practices used by the farm in the management of FL. Therefore, in this section I will outline and justify the case and method use to generate and analyzed the empirical data of my findings.

4.1 Case

4.1.1 Why Skåne?

The issue of FL has recently received much attention due to its social, economic, and environmental consequences, on the lives and livelihood of people (FAO, 2019), The United Nations SDG 12 on Sustainable production and consumption target 12.3 aims to halve per capita global food waste at the retail and consumer levels, and reduce FL along production and supply chains, including post-harvest-losses by 2030 (Nations, 2017). This is aligned to the EU farm to fork strategy under The European Green Deal, which Sweden is a major stakeholder. According to The Swedish food reduction project 2013-2015 report about 65% of iceberg lettuce is lost at production, while 5% is lost from producer to retailer (Swedish National Food Agency, 2016). This is a significant amount of iceberg lettuce, which could have been consumed.

Skåne, the southern province of Sweden is the hub for cereals and horticultural production in Sweden. It constitutes about 20% of the agricultural land, with favorable climate conditions, such as cold winters and long summers, coupled with long growing seasons (Jordbruksverket, 2008). This has placed the area in the most privileged position in grains and horticultural production in Sweden compared to other areas in Sweden, particularly northern part. It has the characteristics of northern European agricultural settings with regards to socioeconomic and topographic conditions, as well as in land management (Dribe, et al, 2016). It is not only recognized for its productivity in agriculture, but it also serves as an entry, processing, and repackaging point for fresh fruit and vegetables entering the Swedish market through

Helsingborg on the south coast. Thus, considering these factors, it can be argued that FL may be more associated with Skåne than other regions of Sweden.

4.1.2 Alnarp's Agroecology Farm

CSA is a niche concept in Sweden, compared to other European countries such as France, Germany, and Switzerland. Hence, AAF, is one of few farms in Skåne operating on a CSA model, aligned with agroecological principles. This influenced my selection of the farm, based on CSA and agroecological dimensions. It is a small-scale farm established in 2021, by agroecology master's students of SLU Alnarp Campus. With the vision to create a space for developing practical (hand on) skills on sustainable farming practices. Where theories on sustainable small-scale agricultural production can be integrated with practices. The application of knowledge and integration of methods and approaches is crucial in solving environmental and socioeconomic problems (Shin, et al, 2001). The farm operates at 400 m² initially, in front Grohuset due to lack of limited space on Alnarp Campus. In 2022, the project benefited from land in Mellangård for the expansion of the farm. Currently the farm is operating 2000 m² for vegetable production, 2000 m² of land the apple orchard, and incorporates some perennials species and trees using agroforestry principles as shown in figure 2. below. However, CSA is the foundation on which the farm production and marketing systems are built on. 80% of the vegetables produced go to CSA subscriptions, while 20% go to farm markets and restaurants.



Source: <https://www.alnarpsfarm.se/>

Figure 2. The photo showing the the view of AAF

However, considering the amount of food that is lost through the mainstream food systems, it is prudent to explore alternatives in mitigating vegetable FL. There have been several studies on FL reduction, but the potential of CSA is yet to be explored, Sweden in particular. Extant studies also suggested that, while AFNs of different kinds are marginal phenomena, the offer

the ability to experiment on and evaluate alternatives to conventional food chain operations (Schiller-Merkens, 2022). Understanding how CSA models influence FL patterns could provide insight into practical solutions that are beneficial to both producer and subscribers.

4.2 Method

4.2.1 Sampling and participants selection

To identify and recruit participants for the interviews to generate data, purposive sampling was used considering the experience and involvement of participants on how the concept of CSA works. It is instrumental in getting insights from a variety of actors operating on the farm, with regards to the current state of vegetable FL in the farm in relation to the CSA model used. It is an important aspect of research design, as it influences the reliability and trustworthiness of the results. The trustworthiness and relevance of the research finding relies heavily on the participants knowledge on the subject matter (Adeoye-Olatunde and Olenik, 2021). The staff and CSA subscribers being the main stakeholders in the operation of the farm. Their knowledge and experience are important in generating reliable and credible data, for a successful research outcome. Thus, to discover a shared understanding of the causes of vegetable FL in the farm, using the CSA model the participants should be homogenous and share a critical similarity with regards to the phenomena (DiCicco-Bloom and Crabtree, 2006). Six participants were selected for the Semi-Structured Interview, five farm workers including volunteers with different levels of background and competences in small scale agricultural production, and a CSA subscriber who served on a dual role. That is a volunteer and a subscriber on a subsidiary share. This gives a balance between individuals with more knowledge on the phenomena and those who can provide different perceptions to it for a balanced analysis. This process enhanced the identification of the key informant for the Interviews.

4.2.2 Semi- Structured Interview

To explore the phenomena of the causes of vegetable FL in the farm, in relation to the use of the CSA model. An in-depth semi-structured interview referred to as "interviews" was conducted. It is a tool used in qualitative research to collect data, through predetermined questions, which are administered by the interviewer. It is a process where the interviewer elicits emotion and perspectives, belief and values, actions, and behaviours, to understand participants' responses to questions and meanings they construct about their experience (Cypress, 2015). The interview was the preferred qualitative method used, due to its flexibility

in exploring complex phenomena. It permits the interview process to be focused but not rigid in approaches. It gives the interviewer the autonomy to explore pertinent issues that may come up during the course of the interview, to understand the phenomena (Adeoye-Olatunde and Olenik, 2021). It is also useful in eliciting views and opinion from participants, and constructs reliable meaning (Creswell and Creswell, 2018),

In the case of AAF, an interview guide is prepared containing fifteen predetermined open-ended questions see appendix 1 [p.43]. However, prior to the interview, a preliminary pilot finding was conducted with one of the staff to test the quality and reliability of the questions designed in meeting the research objectives. This was useful in incorporating certain categories of questions, while editing the parts that appeared as repetitions. These sets of predetermined questions serve as a checklist in guiding the interview processes.

4.2.3 Analytical Strategy

The data analysis plan was determined prior to data collection. This is important in ensuring the required data are captured through interviews and field observation (Adeoye-Olatunde and Olenik, 2021) The interviews were recorded in audios, for easy reflection and referencing during transcription. I started the transcription of the audios upon completing the first four participants. This was done in relation to my notes and observation during the interview sessions. This was critical in reflecting on the transcribed document in relation to the interview guide. A similar process was followed for the remaining two participants. The content of the transcribed documents were reviewed, this gave me the opportunity to reflect and relate to the data by comparing the transcripts with the audio recordings, and field notes (Tessier, 2012). This is critical in detecting inconsistencies that might require further clarification for a credible research outcome.

Upon transcriptions of the interviews and organizing my field notes, I started my analysis with the coding process. Since my analysis is theory driven, I decided to use deductive coding. Notwithstanding, inductive coding was used at some stage, to capture emerging codes (Saldana, 2012). The initial codes generated were based on the three elements of practice: material, competence and meaning (Shove et al 2012). These served as the three diverse categories, wherein codes like “weekly veg box” are categorized under materials. The predetermination of themes was helpful in filtering codes into the right theme. Despite this an additional theme

emerged called Compound practice, which served as the integration of the three elements of practice. Thus, I analyzed my data based on these four themes indicated.

4.2.4 Ethics

Ethical considerations are critical components in research work particularly in qualitative research work that relies on thoughts and experiences of people in generating data (Cypress, 2015). This was given the required priority at the earlier stage of my findings. The farm was notified prior to the data collection, about the aim and objectives of the research. This was helpful in identifying the participants for the interview, where the farm was supportive in the sampling process. The identified participants were informed that participation is voluntary, thus, they have the right to withdraw anytime they want to do so. I seek their consent to record the interviews for further analysis at the beginning of every interview session.

The identity of the participants is not disclosed for the sake of confidentiality and anonymity; this is important in unearthing the relevant information without any issue of insecurity that might arise (Mirza et al., 2023). Then I decided to use participants instead of their names, but the name of the farm is in public. Participants were reminded of these issues at the beginning of every interview session, to build confidence between the interviewer and the participants.

4.2.5 Reflexivity

As a student in Masters in Agroecology program with a background in Agricultural Science, my academic and personal interest shaped the direction and focus of this research. Despite having no direct connection with AAF, my broader understanding of food systems and sustainability was my motivation to explore the role of CSA in FL mitigation. However, throughout the research process, I remained conscious of my disciplinary training and prior exposure to ecological farming practices could influence how I framed my research questions, interpreted my data, and interacted with the concept of FL. Therefore, I approached the entire process with a general positive view of CSA, which required me to consciously remain open to critical perspectives such as limitations and inefficiencies within the systems. However, the use of practice theory helped me maintain focus on routines and material arrangements, rather than personal attitude, which supported my analysis.

5 Results and analysis

In this chapter, I present my findings regarding FL management in AAF, and analysed them based on the theoretical framework of Shove, et al, (2012) practice theory. On a research project aimed at exploring the potential of CSA in vegetable FL mitigation in AAF. I analysed my empirical findings based on the three elements of practices by Shove, et al, (2012). This is done by giving chance to views, perceptions, and experience of individual participants in the study, which formed the basis of my analysis.

This chapter is divided into four sections, which constitute the themes of my findings and analysis. This included materials used in and outside the farm, competence of staff and subscribers, meanings attached to CSA practice, and compound practice of vegetable FL mitigation. The integration of the said themes will present a holistic view of how practice theory can be used to identify practices for promoting sustainable production and consumption in small-scale vegetable production.

5.1 Materials: The Farm Infrastructure, Inputs, Tools, and Social Media

The availability of the requisite materials are critical in promoting sustainable production, distribution, and consumption in the food ecosystems, particularly in small scale agricultural production. Therefore, materials are a necessity in food production and distribution landscape. As indicated. AAF is a small-scale farm specialized in vegetable production, it uses organic and agroecological principles such as the use of renewable inputs like compost, chicken manure and plant residues in soil conservation and management. It relied on simple farm tools such as rake, wheelbarrow, spades, and digging forks for its operations. The farm used organic certified seeds, and “no dig” approach of soil conservation, otherwise known as no tillage, and crop rotation and diversification to promote biodiversity and other ecosystem services, highlighted by participants. The plant residues used in the farm served as mulch, to reduced evapotranspiration, and optimized soil moisture and temperature. This is essential in preventing plants from wilting and other nutrient deficiencies. As outlined by one of the participants during the interviews. He stated that,

...these inputs and practices minimized soil disturbance and enhanced both below and above the ground biodiversity. The compost and plant residues. served as an effective way of managing weeds in the farm, and it improved the soil carbon level.... participant 4

The farm has an irrigation system that supplies plants with water as shown in figure 3, below.. This helped in mitigating FL associated with the impact of climate, such as drought. As expressed by one of the participant that,

”here we are not affected by drought, because the farm has a reliable and efficient irrigation system that we used in supplying water to our crops” participant 3.



Source: <https://www.alnarpsfarm.se/>

Figure 3. Illustration of the irrigation process in the open farm and inside the tunnel

Thus, It can be argued that, FL associated with drought and animal intrusion are not familiar issues in the farm, because of a secure perimeter fence and the irrigation system in the farm, However, some crops are housed inside tunnels for protection, due to their nature and cultivars as shown in figure 3 above. A participant highlighted that,.

“.... last season, the farm produced about thirty-three different vegetables; these excluded the different cultivars, on a rotational basis; and some of which were grown under the tunnel....” participant 5.

This provides subscribers with a variety of vegetables in meeting their seasonal nutritional demands and mitigated the risk of crop failure, expressed by participants.

The farm used a number of social media handles such as Facebook, Instagram and REKO ring in advertising and selling its produce to potential subscribers. This and the localized delivery system gave subscribers easy access to their weekly veggie subscriptions, from the established pickup points in Lund, Malmo, and Alnarp Farm, as illustrated in figure 4 [p.20]. This practice is seen to be instrumental in reducing the food miles, and connects the subscribers to the farm, expressed by participants.



Source: <https://www.alnarpsfarm.se/>

Figure 4. Photos of the pick up points of the weekly vegetable subscription in Lund Malmö, and Alnarp

Materials used in the farm such as compost, plant residues, and pick-up points. are critical in institute and sustaining the CSA practices. Hence, this corroborated the argument that practices are also embedded through material and not only on social networks (Shove, et al, 2012). This is reflective in the case of AAF, where materials such renewable inputs (compost, and plant residues) and reusable vegetables boxes, helped in constituting CSA practice. This reduces certain courses of FL. For example, in the case of pickup points established by AAF, enabled the subscribers to have timely and easy access to their vegetables subscriptions, while preventing FL associated with food supply chains. This aligned with the claim that materials configure their users (Shovel, et al, 2012). In this case, the farm exhibited this by altering the default method of food acquisition, shifting it from consumer driven supermarkets to farm and subscriber centered distribution. This promotes greater participation and prevents impulse buying and advertently contributes to FL reduction. Furthermore, it promotes freshness and longevity of the veggies, due to the reduced food miles. This implies that the veggies will last longer, thus, decrease the spoilage opportunity as well. Thus, materials in AAF are not viewed as mere logistics, but active elements that shaped the framework of sustainable vegetable production and consumption in a CSA practice.

5.2 Competence: knowledge, skills, and experience in small-scale agronomic and CSA practice

The integration and sustainable utilization of the farm infrastructure, tools, inputs and technologies, require diverse set of knowledge, skills, and experience ranging from production, supply chain management, and community participation. However, the interview data

suggested that the practitioners in the AAF (staff, volunteers, and subscribers) demonstrate a diverse set of competence in small-scale agricultural production, which are complementary with reference to organic and agroecological principles. The illustration in figure 5 [p. 22] below demonstrates how bed preparation and transplanting are conducted, respectively. Most of the staff have either studied agricultural science or are studying it at an advanced level. This is reflected in the farm's operations, particularly in areas like soil and water conservation, crop diversification and rotation, integrated pest management, and community building. This enhanced production and productivity in the farm, through recruitment and empowerment of volunteers, with skills in sustainable, vegetable production and consumption at regular intervals. During the interviews one of the participants remarked that,

“.....the farm serves as an agency for volunteers and interns in sustainable vegetable production and consumption using CSA. We receive volunteers throughout the season in the farm, who actively take part in farm work and some volunteers eventually become part of our board.....” participant 2

This indicated that the farm contributes in training peoples on small scale agricultural practices, using organic and agroecological principles, while scaling the concept of CSA practice in Skåne, and beyond. The data further revealed that practitioners exhibit skills in the use of renewable inputs such as compost and plant residues in improving soil health and soil carbon level. The participants considered soil health as a precondition for healthy plant growth. Therefore, soil being the only medium of growing vegetables in the farm, a lot has been invested and sacrificed to sustain its regeneration and productivity, emphasized by participants. It was highlighted that the farm experienced low soil carbon level, this has affected the soil nutrient compositions. Carbon being an essential element for plant growth, its deficiency affects both the quality and quantity of vegetables. Therefore, to restore it,

.... We lost our KRAV organic certification label because we used too much compost in the soil. It is against KRAV rules to use too much compost in the soil, but we broke the rule consciously because we want to restore the soil carbon level participant 4.

A Similar view was expressed by one of the participants, but in a different context. She highlighted that,

... here we don't rely on KARV labels to market our produce, due to our proximity with our subscribers. As most of them know how their vegetables are produced, and some do take part in its production.....participant 2

This outlined the significance of food production initiatives which prioritized community involvement and participation in food production. It reinforces a sense of local ownership

among subscribers, this makes certification less important, as long as the products are not traded in the mainstream food market, which relies on labels to attract customers.

The foundation of AAF was built on CSA; thus, it was not a coincidence that 80% of the farm's production went to CSA subscriptions. However, this was achieved through community building and subscription planning. Which was essential in sustaining the practice, through the implementation of different activities on the farm, such as workshops, pizza events, and other open farm events. These local events helped the farm to establish a local network between the farm and community, underscored by participants. The diverse sets of skills and experience in the farm made operations easier, and interactive said participants. It enabled the farm to operate on different units, such as production, marketing, education, and community building.

“..... We have a board of ten members, four of them are employed on part-time basis, while the remaining six work as volunteers. and decisions on the farm are made at board level....” participant 1.



Source: <https://www.alnarpsfarm.se/>

Figure 5. Illustration of how bed preparations are done in AAF.

Therefore, the roles played by “the core staff” in the farm, otherwise referred to as board members, is central in the operation of the farm. They serve as an embodiment of knowledge, skills, and experience in institute the CSA practice. Through initiating volunteers and subscribers into the concepts and principles of CSA, by interacting with materials in and outside the farm. This skilled them in vegetable production, distribution, and consumption. Hence practitioners are described as the carriers of practices. However, skills are not static, it evolves over time and space (Shove, et al, 2012). For example, the participants (farm workers) highlighted that subscribers to the weekly vegetable subscriptions, developed competencies such as food storage techniques, adapted to batch cooking and relying on what is available

(meal planning). On the other hand, the farm workers, particularly the volunteers, developed skills in small scale organic vegetable production, event and subscription planning, and supply chain management. This was explained by one of the participants who is a volunteer, stated that

“I don’t have any background in agriculture, my background is in architecture, working in AAF, helped me in developing my skills in growing vegetables without using chemicals”
participants 1

These competencies were developed through CSA activities such as vegetable production, seasonal recipes, and open farm events, which minimized vegetable FL. Furthermore, the carbonization of the soil through regular addition of inputs such as compost also helped in promoting soil health for sustainable vegetable production. Practices are iterative, thus, competence is developed through repeated engagement and experimentation with materials by the practitioners can help in sustaining a practice (Shove, et al, 2012). The carbonization practice of the soil highlighted the fact that, for a practice to be sustainable, it does not necessarily have to rely on a regulation in certain instances, as seen in the case of the AAF, when its KRAV label was lost. However, it must be acknowledged that regulations do serve as tools in guiding the sustainability of practice.

5.3 Meaning: The Symbolic, Cultural and Emotional Values attached to the vegetables

Meaning concerns the “why” of a practice, which was shown during interview with the participants, Different perceptions emerged from them with regards to what CSA represents to them. One of the participants (a staff) described CSA as.

*.... a practice that is principled on partnership and trust between farmers and subscribers for the sustainable production of food and the promotion of ecosystem services*participants 6

While his description about CSA practice resonates with the activities of AAF, with regards to sustainable food production and promotion of ecosystem services. Other participants have a different perception. A participant who held a dual role in the farm, that is a subscriber and a volunteer, expressed what CSA is to him.

.....other than the provision of seasonal nutritious vegetables, I see the farm as a place that create work live balance for me. This is why almost every weekend I do come to the farm, work and interact with people...” participant 5

This is an indication that the meaning of CSA practice is not limited to food production and consumption, but it also has a recreational dimension, where people come to the farm for leisure and interact with other subscribers and farm workers. This outlined the cultural values,

symbolic and emotional dynamic in the practice. It is through these activities that perception and disposition are formed.

Therefore, in the case of AAF subscribers see CSA practice as a transparent way of vegetable production and a reliable source for fresh and nutritious vegetables, as shown in figure 6 [p. 25]. It reflects their social values and fulfills their seasonal vegetable needs. The inclusive share policy based on the income level of individual subscribers. and willingness to subsidize for other subscribers who are unable to pay for a full subscription, makes the price of the veggies fairly reasonable. Here a subscriber explained how he changed from one share bundle to another,

.....I was a subscriber last season on a regular share and this season to a subscriber, but on a different share. This season I subscribed for the subsidiary share which is a bit higher than the regular share. Because you pay for your subscription and subsidize another subscriber...

Participant 5

On the other hand, the staff and volunteers see it as “viable socio economically practice” particularly “the upfront payment of subscription” as phrased by most participants. It reduced the market vulnerability of vegetables and provided an aspect of financial stability, in meeting the operational cost of production. Despite this, the farm has funding issues as most of its activities are not costed,

“The upfront payment of subscription gives us some aspects of economic resilience in covering our production cost. In the farm. We are not affected by price fluctuation as it is experienced by conventional or mainstream food systems” Participant 2

Subscriptions of shares in the past seasons increased significantly. Notwithstanding, the farm experienced losing some subscribers at the end of each season. This may be considered normal, looking at the number that remained in addition to the new subscribers. However, it is a challenge that the farm is currently working on, remarked by participants. Both subscribers and staff sees CSA as sustainable because it aligned to sustainable ecological practices, social norms, and values with little economic cost on production. This promotes the co-creation of a sustainable ecology of food systems, which connects subscribers to the food system, through participating in food production and governance, and cultivates the sense of community ownership, highlighted by participants.



Source: <https://www.alnarpsfarm.se/>

Figure 6. Illustration of the preparation of the weekly vegetable CSA subscriptions

However, meanings are contextual, thus, do not operate in a vacuum. Hence it is mostly derived from interconnection with other interdependent elements such as material and competence (Shove, et al, 2012). This resonates with the sets of meanings attached to the CSA practice, by staff and subscribers in the farm. As they are linked to the way vegetables are produced, distributed, and consumed. This is influenced by materials and competence used. For instance, phrases like “sustainable way of vegetable production” and “food and nutrition secured practice” were often used by subscribers and staff when describing CSA practice. However, it should be understood that the said meanings evolved from the integration and utilization of materials in and outside the farm. This shaped the perception and disposition of people about the vegetables produced by the farm, to enhance its local, cultural, and symbolic relevance. This contributes in mitigating FL associated with consumer preference.

5.4 Compound practice of FL

Compound practices of FL simply describes the factors that contributes to the current state of FL in AAF, in relation to the agricultural practices as stated in the research question, sub-question (1). The phenomenon is not an isolated event as indicated instead, it is connected to myriads of factors such as insufficient materials, competence level of the practitioners, and the meanings attached. Or a combination of all three factors, described as compound practice of FL. However, before delving into the compound practice of FL mitigation in AAF, it will be ideal to look at the main causes of FL in the farm, in order to establish the state of FL in the farm.

It is important to acknowledge that a common understanding existed among participants as to what constitutes FL in general see appendix 2, [p. 43]. Despite divergent perceptions as to where it occurs and when it is considered a loss, here are snippets of the views of participants with regard to FL.

“To me food loss is anything that makes it not to be eaten and it ends up in the trash” remarked participant 1,

While another participant described it as,

“.....anyway, for me food is not completely loss once it is used as compost because it adds nutrient to the soil....” participant 6.

Nonetheless, participants acknowledged that about 5% of the vegetables produced on the farm went into losses last season. This was seen to be quite minimal, when compared to the amount of vegetables produced on the farm. A participant went further to state that,

“.....this 5% is not considered as a complete loss to us, because most of it was used as compost.....” participant 2

This highlighted the fact that the farm reused the lost vegetables incurred by the farm as compost, which forms the materials used in replenishing soil nutrients. Furthermore, it implies that despite participants acknowledging the existence of FL in the farm, their meaning of FL to an extent, differs from the extant literature. However, we must not lose sight of the fact that the ultimate goal of food production is consumption. Anything that affects that intended purpose may be considered as causes of FL.

5.4.1 Causes of Vegetable FL

The causes of FL varies between regions, countries, production systems, and types of produce. In the case of the said farm, the causes of FL were mostly attributed to pests such as slugs, caterpillar rodents (mice), and worms. This affected specific crops like lettuce, radish and sometimes carrots.

“...lettuces are the most affected vegetable with losses last season, due to pests like slugs and caterpillars, and overgrowth which turned it bitter and unconsumable to subscribers. Carrots are also affected by mice and worms which resulted in muddiness of some carrots....” Participant 4

Going by these findings, it can be said that FL associated with consumer preference, supply chain management, over production and regulation standards were rarely experienced in the

farm. This may be attributed to the effectiveness and efficiency in the integration and utilization of materials in and outside the farm, and the meanings attached to the vegetables produced by AAF.

5.4.2 Compound Practices of FL Mitigation

The integration and utilization of multiple practices constituted the compound practice of FL mitigation used by the farm. This includes production-based subscription, integrated pest management, and food donation schemes, in the farm production, distribution and consumption domains. Which proved to be effective and efficient in minimizing vegetable FL in the farm, said the participants.

Production based subscriptions played an integral role in FL mitigation emphasized by participants. It minimizes overproduction, as vegetables are produced based on the number of registered subscribers. This determined the scale of production, in relation to size of the farm, and the resources available for production and distribution. It is seen as an effective and efficient way of mitigating vegetable FL due to overproduction. However, executing this requires skills and knowledge in planning and forecasting to meet the needs of subscribers. This is one of the key areas where the farm proved to be efficient in vegetable FL mitigation.

“...planning ahead and based on subscription is our main method of growing. The amount of vegetables produced highly depends on the total number of shares despite given some allocation to staff and volunteers” participant 2.

Using the expertise of staff in integrating materials such as crop residues and compost as inputs, in soil and water conservations, served a dual purpose, highlighted by participants. Other than carbonization of the soil, it serves as a mulch and suppressed weeds, The integrated pest management practice used by the farm is anchored on crop diversification and rotation principles. This helped in mitigating vegetable FL due to pests’ prevalence, by breaking their lifecycle and exposing them to natural enemies.

“.....we don't use pesticides and herbicides on the farm, instead we use Integrated Pest Management approaches like use of natural enemies, crop rotation and diversification.....” participant 6

This was absolutely essential in promoting organic production of vegetables on the farm, using agroecological principles. However, collaboration between the staff and subscribers, phrased

by participants as “farmer and subscriber relationship” has paid dividends in the production and distribution of vegetables. It increased appreciation and reduced rejection of “non-standard” or surplus vegetables, through building emotional connection between subscribers and vegetables produced. It becomes hard to reject or waste it, considering the amount of commitment involved in its production. “The non-selective nature of the model” as phrased by most participants, enabled the farm to mitigate losses when compared to the mainstream food system. Subscribers in CSA did not determine what goes into their weekly veg box, deliveries are made based on what is available on the farm as shown above in figure 6. [p.25]. This helped in reducing losses based on preference and aesthetic values highlighted by participants.

“To me CSA is a system that allows consumers to engage with the farm, and the people who produced their food throughout the growing season and have a commitment in the production of vegetables in the farm. This established trust and emotional connection between people and the food that is produced.....” Participant 5

However, the farm operated a food donation scheme for staff and volunteers as a way of redistributing surplus vegetables, see figure 7, below. As a result of this and other related practices, little went into losses on the farm. Because surplus vegetables are shared among volunteers and staff, and sometimes other outlets like people's kitchen in Lund.

“Throughout last summer I did not buy any vegetables, the surpluses I did receive from the farm were able to serve me.....” participant 6



Source: *Source: <https://www.alnarpsfarm.se/>*

Figure 7. Photos showing food donation scheme in AAF

The farm used an array of techniques and strategies in its production and distribution circuits in curbing Vegetable FL. Which is an indication of the complexity of the phenomenon. Relying on the theoretical lens of Shove, et al, (2012) practice theory, it can be argued that FL mitigation used in the farm is not a product of a single practice, but an interplay of several interdependent practices that were deeply intertwined. For example, the production-based subscription used by the farm in minimizing overproduction, has multiple bundles of connected practices, which influenced vegetable FL mitigation in the farm. Such as organic and agroecological practices, community building, local distribution, and resource mobilization. These created the required local network in establishing a community of growers and subscribers, which was essential in FL mitigation to increased food and nutritional security. Thus, the interlinked changes in material conditions, skills and meanings reshaped not only what people do, but how they understand and value their own actions (Shove, et al, 2012). Hence, the compound practice of vegetable FL mitigation provides a holistic explanation of how FL is minimized in the farm, not as a result of an isolated behavior change, but through reshaping of production, distribution, and consumption activities in and outside the farm.

6 Discussion

Having analyzed my findings in the previous chapter using Practice Theory, which conceptualizes practice as the configuration of materials, competences, and meanings (Shove et al, 2012). The findings suggested that CSA plays an essential role in reshaping production, distribution, and consumption of vegetables from the farm to fork. This helped in mitigating vegetable FL in the FSC. Therefore, my discussions with regards to these findings are centered on Food and Nutritional Security, Challenges of CSA practice, Practice theory and Agroecological practice and the limitations of the research.

6.1. Food and Nutritional Security

The result from the study is consistent with findings from the extant research that FL impedes food and nutritional security. The data from the study revealed that FL is a critical enabler to food and nutritional insecurity. Thus, reducing FL through alternative means like CSA with the required materials, competence and right meaning attached, may impact positively on food and nutritional security. This finding is corroborated by (FAO) reports (FAO,2011; 2019). In a similar but a different study by Manzoor, et al., (2024), outlined that millions of people are deprived of food and about one billion people are undernourished (Manzoor, et al., 2024). If these losses incurred by the global food systems are half the amount, millions of people may be saved from the trap of hunger and malnutrition (FAO, 2011). However, most of these losses are associated with the mainstream food systems (Domínguez, et al., 2025), CSA practice offers a different approach in promoting sustainable production and consumption practices through FL reduction in enhancing food and nutritional security. In the case of Alnarp's Agroecology Farm, CSA participation promotes food and nutritional security, through FL mitigation by improving availability and accessibility pillars to fresh and nutritious vegetables within the local proximity. The surplus redistribution practice in and outside the farm contributes to uplifting the nutritional status of subscribers and practitioners in the farm. This resonates with Slavin and Lloyd, (2012) claim that nutritional outcomes are improved and sustained with increased consumption of fresh and nutritious vegetables and greater dietary diversity (Slavin and Lloyd, 2012). This is the ultimate co-value on which CSAs operate. However, despite the gain doubts remain on the scalability of CSA in meeting growing demands of locally grown food.

6.2 Challenges of CSA practice

The findings showed some challenges with regards to the CSA practice used in the farm in relation to finance and retention of some of its subscribers. However, this is consistent with previous studies. CSA farms in general rely on subscriptions to finance its operations, this offers income predictability (Medici et al, 2021). Notwithstanding, it also presents financial insecurity if subscription for shares fluctuates. Most of the CSAs operates on thin margins due to their small nature and ethical commitments to fair price, and respect to the environment (Medici, et al, 2021). This makes the CSAs vulnerable to the activities of the mainstream food markets, especially those selling local produce (organic).

Access to financial support from traditional banking systems and public institutions proved to be difficult. As they viewed CSA concept as too informal and unscalable. This has affected the economic sustainability of the farm to an extent. For instance, the farm depends on manual labour for most of its activities, which is anchored on voluntarism with few part-time staff and no subsidies from the local and regional authorities. Under the EU direct payment system, subsidies are given according to land size. This has given farms with higher regular income, also receive the highest payments. In addition, agricultural holdings under 5 hectares are ineligible for the direct EU payments (Bonfert, 2022). Most of the CSAs fall under this category because they could not meet the land threshold for payment. The policy is seen to be protecting large and medium scale farms.

Attrition of some subscribers remain an issue in the farm, despite the farm continuing to attract many new subscribers. However, this is not peculiar in a CSA practice as indicated in extant research. Many European CSA initiatives have reported difficulties in maintaining a stable membership particularly during economic turndown, when house budgets tighten (Urgenci.net, 2015). Seasonal availability in produce quality and quantity may also affect subscribers' satisfaction and retention. However, the farm is engaged on a pool of community activities that may commit subscribers to their seasonal subscriptions.

6.3 Practice Theory and Agroecological practices

The findings indicated that practice theory reinforces agroecological practice in different dimensions, such as material, competence, and meanings. Thus, application of this theory in agroecological production is essential in understanding how agroecological practices spread and change over time. This aligned with Shove et al, (2012) claim that practice diffuses through interaction, demonstration and circulation of materials and competence, rather than rational

persuasion (Shove et al, 2012). This resonates with the operations of Alnarp's Agroecology Farm, which can be described as “farm field school” where practitioners share their knowledge, skills, and experience with colleagues, volunteers, interns, and CSA subscribers. This contributes to the sustenance, reproduction, and circulation of agroecological practices on the farm and beyond. Therefore, it would be important to understand that agroecology is not just a set of approaches, but a bundle of practice anchored on ecological, social, cultural and environmental commitments (Anderson et al., 2019). Further, the findings revealed that agroecological practices rely a lot on material arrangements of renewable inputs, such as soil, seeds, water, compost, and chicken manure. Thus, in the absence of such materials, agroecological practices on the farm will be difficult to be enacted. For the practices to be enacted and sustained requires constant and regular interaction with such materials. Doing this effectively and efficiently requires knowledge, skills, and experience (competence). Agroecology is considered a knowledge driven practice, which relies on the embodied skills of the practitioner, Indigenous knowledge, and ecological literacy (Gliessman, 2016). Thus, practice theory Shove et al, (2012) can be considered useful in studying agroecological practices, as it foregrounds the interplay of materials meanings and competences in shaping how agroecology is enacted as a discipline and produced.

6.4. Limitation of the research

The focus of study was on vegetable FL which excludes other types of FL such as meat, dairy, fruits, and grains. While this was helpful in narrowing the scope of the research due to the limited time, it may not reflect FL in a diverse CSA practice. Therefore, the result may not be generalized, due to its limited scope. Furthermore, the study relied on a limited number of participants for the interview, this may not represent the full perspectives of all CSAs in the region. In addition, the selected participants in the study are highly engaged members of the farm with good knowledge on sustainability and FL management strategies. This may result in underreporting FL or overstating sustainable practices, which could affect the accuracy of the data. The fact participants are highly trained on agroecology, they might rely on knowledge or competences that other farmers lack access to.

7.1 Conclusion

This study aimed to investigate the potential of CSA in mitigating vegetable FL in Skåne, with reference to AAF in Lomma, through the lens Shove, et al, (2012) practice theory framework. By analysing the interconnected elements of practice, such as material, competence, and meaning. The findings revealed that FL mitigation in CSA is not confined to a single bundle of practice, but a compound practice embedded in vegetable production, distribution, and consumption. It is evident from the findings that CSA encourages more sustainable food production and distributions practices, by reconfiguring subscribers and producers through their routine activities in relation to vegetable production, distribution, and consumption. However, the FL reduction associated with CSA practice of the farm, can be more related to reduced food miles, production based on subscription, food donation scheme, integrated pest management, and the relationship between subscribers and the staff. This reduced the rejection of vegetables based on aesthetic values. The analysis further revealed that, while CSA provides a structural and technical remedy for FL mitigation, its scalability remains an issue. Due to its niche concepts in Sweden and financial stability, as most of the work is conducted by volunteers with few part-time staff.

FL is a complex and dynamic issue, which CSA may not give an immediate solution, but it represents an important experimental space, where alternative sustainable food production and distribution practices flourish. The challenge lies in its scalability into broader systemic change, without compromising the relational and ethical qualities that the practice is known for.

7.2 Recommendation

To promote a sustainable and scalable CSA practice in Skåne, and beyond, the practice must be anchored on the right policy framework both at regional and national levels that give it the leverage to maximize its opportunities. This is possible through public-private partnership, where municipalities in collaboration with the central government integrate CSAs into the public procurement systems for schools, hospitals, and other public institutions, and subsidize subscription for members. This will not only promote sustainable food production, but it will have an overarching impact on food and nutritional security, employment and promotes local resilience. This can be achieved through advocacy and networking with other CSA farms in the region and beyond and relevant stakeholders in instituting CSA values in regulatory frameworks for sustainable production and consumptions. Furthermore, the food literacy campaigns and workshops conducted by the farm should be extended to the non-subscribers in

the community and beyond to create awareness on sustainable agricultural practices in food production and consumption, this will be essential in transitioning from a niche practice.

The farm should scale up its integrated pest management methods by introducing pest resistance cultivars especially for lettuce and radish in mitigating losses. It will be essential if the farm can regain its KARV label, this will help in scaling up its production and recognition in sustainable food production to increase its income level. Looking at the pools of programs that AAF is currently engaged in, such as volunteer and internship program, vegetable production, community engagement, apple plantation, and plans of incorporating chicken in the farm. Thus, partnering with institutions in Sweden and beyond will be important in recognizing the farm as a "Living Lab" with opportunities to host research activities, seminars, and apprenticeship program in small scale organic and agroecological production. This will help the farm diversify its source of income, while reproducing the culture of sustainable food production and consumption on a larger scale.

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Appendix 1. Popular Science Summary

The issue of Food Loss (FL) has recently received much attention at global regional and local level. It has contributed significantly to food and nutritional insecurity and climate change, of which vegetable and fruits are the most affected categories due to their susceptible nature, particularly in Europe. However, a number of farms in Skåne, Sweden such as Alnarp's Agroecology Farm, is mitigating this through alternatives like Community Supported Agriculture. Where subscribers are committed to sourcing food directly from local farms, through weekly subscriptions.

This study looked at how Community Supported Agricultural practice on the aforementioned farm contributes to vegetable Food Loss mitigation in and outside the farm, through sustainable production and consumption. To holistically achieve this, I utilized the practice theory approach in analyzing my findings. Where Food Loss is not viewed as an isolated individual behavior, rather, a complex social phenomenon, embedded in our everyday practice. The study revealed that the Community Supported Agricultural practice use by the said farm encourages Food Loss mitigation practices like production based on subscription, food donation, integrated pest management and decentralized pick-up points in Alnarp farm, Malmo, and Lund, respectively. In addition to these practices, subscribers and volunteers have developed new competences in meals panning, batch cooking, and recipes preparation, this has contributed to both Food Loss and Waste mitigations in and outside the farm.

Therefore, it is evident that Community Supported Agricultural practices does not only provide local, fresh, and nutritious vegetables to subscribers in an ecological friendly environment. But it also served as a sustainable alternative in mitigating vegetable Food Loss. This explained the rationale behind supporting local food networks for sustainable production and consumption in a more resilient food system.

Appendix 2. The interview guide.

Materials

- 1 What are the common causes of food loss in the farm?
- 2 What is/are the relation(s) between Community Supported Agriculture (CSA) and the current agricultural practice in the farm?
- 3 What are the inputs and tools use by the farm in vegetable production and distributions?
- 4 What are the main challenges of practicing CSA in vegetable production in the farm?

Competence

- 1 How does farm interact with its subscribers and potential subscribers?
- 2 How frequent do you visits/work in the farm?
- 3 What experience or training do you have in small scale agricultural production?
- 4 How does the farm handles surplus or unsold vegetables?
- 5 From experience, how does Community Supported Agriculture (CSA) helped in reducing vegetable food loss?
- 6 What are the innovative practices that can be used in improving vegetable food loss reduction using the CSA model?

Meaning

- 1 What is food loss to you?
- 2 What is Community Supported Agriculture (CSA) to you?
- 3 How do you think Community Supported Agriculture contributes to sustainable food system?
- 4 What are some of the biggest challenges experienced by the farm in reducing food losses?
- 5 What are the obstacles in scaling up Community Supported Agriculture (CSA) in Skåne?

Apendix 3. An illustration of the participants’ perception on Food Loss (FL) in general

<i>Participants</i>	<i>Perceptions on Food Loss (FL)</i>
<i>Participant 1</i>	<i>“To me food loss is anything that makes it not to be eaten and it ends up in the trash”</i>
<i>Participant 2</i>	<i>“.... anything meant for human consumption, and it is not eaten, but thrown away is a food loss”</i>
<i>Participant 3</i>	<i>“Food is lost when consumers don't eat it, and it is thrown into the trash”</i>
<i>Participant 4</i>	<i>“Yes, for food is lost when it did not get into the gut of human due to its nature “</i>
<i>Participant 5</i>	<i>“Food loss occurs when the food produced did not get to the final consumers due to some reasons”</i>
<i>Participant 6</i>	<i>“For me food is not completely lost once it is used as compost because it adds nutrient to the soil”</i>

Appendix 4. Factsheet on Alnarp Agroecology Farm



Alnarp Agroecology Farm (AAF)

Factsheet:

Exploring the potentials of Community Supported Agriculture (CSA) in Food Loss (FL) mitigation. Alnarp's Agroecology Farm (AAF) Skåne, Sweden.

Audience: Farmers

This factsheet highlighted how CSA practice contributes to FL mitigating in Alnarp's Agroecology Farm (AAF). Through production-based on subscription, decentralised food pick-up points, integrated pest management, and food donation schemes to promote sustainable production and consumptions.

Background

Food Loss (FL) is described as a decrease in both quality and quantity of food intended for human consumption, from production to distribution (3). It contributes significantly to global food and nutritional insecurity, climate change and its related impacts (4). About 14% of the food produced globally is lost at post-harvest stage (5). These losses are mainly associated to industrial

agriculture. Thus, moving from the current food regime to alternatives that prioritized local sourcing of food, ecological benefits and fair and sustainable production and consumption practice, such as CSA, may provide a sustainable solution (8). CSA is a useful practice in fixing social and environmental issues related to food production and consumption (6). It shortens food miles, which is critical in reducing FL associated with extensive supply chain, particularly vegetables due to their perishable nature. It strengthens social bonds and supports the local economy (8). It reduces the carbon footprint associated to transportation of food. This has a positive impact on climate change and its related factors, for sustainable development.



Delivery of weekly subscriptions

Research Aim and Questions

This study aims to investigate potentials of CSA in FL mitigation in promoting sustainable production and consumption in the food ecosystems. Through evaluating the practices used in the production and distribution of vegetables in AAF

This will be achieved by investigating the role of CSA in reducing vegetable FL. By providing answers to the following questions

1. What is/are the current state of vegetable FL in the Farm, and how does it relate to the existing agricultural practices?
2. What significant role does the CSA model contribute to vegetable FL reduction in the farm?

Materials & Methods

An in-depth semi-structured interviews is used, to collect data from the selected participants through predetermined questions. It is a process where the

interviewer elicits emotion to understand participants' responses to questions and meanings they construct about their experience (2). The interviews were analysed by transcribing the audios and field notes into scripts, which were coded manually using three predetermined themes and one emerged theme, from deductive and inductive coding process (7). The findings are presented based on those themes, which includes materials, competence meaning, and compound practice of FL mitigation.

Food Loss mitigation practices

The current state of FL in AAF is very minimal. It is estimated that about 5% of the farm produce went into losses last season. Most of which were associated with pests and specific crops such as lettuce, radish and carrots. The low rate of FLs in the farm were mainly associated with the practices carried out in and outside the farm. Which promotes sustainable production and consumption practices, such as decentralised pick-up points, production based on subscription, integrated pest management, and food donation scheme.

Decentralized pick up points

The farm operates pick up points in places such as Malmo, Lund and AAF, where subscribers collect their weekly vegetable subscriptions. This was essential in reducing FL associated with food supply chain. It reduces the food miles and the carbon footprint associated with food

transportation (5). This makes vegetable accessible to subscribers within the required proximity, with little or no hidden cost.



Decentralised pick up point

Production based on subscription.

Production of vegetables in AAF is determined by the number of people that have subscribed for shares with the farm. This is important in mitigating FL associated with overproduction and consumer preference (8). The total number of shares for each subscriber is known prior to production,. Notwithstanding, allowances are given to grow extra beds of vegetable in case of any eventualities, and to cater for staff and volunteers

Integrated pest management

The farm operates on organic and agroecological principles, thus it does not use chemicals or pesticides. It uses integrated pest management methods in managing pests. Such as crop diversification and rotation, with about thirty-three different types of crops excluding cultivars. Where natural enemies

are used to feed on the pests. This was seen to be very effective despite experiencing some pest-related losses in lettuces, radish and some carrot

Food donation scheme

This is a scheme used by the farm in redistributing surplus vegetables from the farm to staff and volunteers in mitigating FL. This was an important practice used by the farm in mitigating losses, at the same time promotes household food and nutritional security. It saved staff and volunteers from the cost of buying vegetables throughout the season. Furthermore, the farm also donated vegetables to places outside the farm such as people's kitchen in Lund. These donations were very important in mitigating FL as well as creating a community of food growers.



Food donation initiative

Challenges and recommendation

Challenges

AAF experience challenges with regards to access to finance, subsidies, retention of CSA subscribers and KARV label. These are issues that hinders the farm's operations in scaling up its activities, in the farm and beyond

Access to finance

The farm finds it difficult to access financial support from traditional banking and public institutions. As they viewed the CSA concept as too informal and unscalable; thus, they do not risk doing business with the farm. This limits the farms' operations and investment plans. Whereby restricting it to embark on certain projects.

Lack of subsidies

The farm receives no subsidies from the local and regional authorities. Under the EU direct payment system, subsidies are given according to land size. Therefore, Agricultural holdings under 5 hectares are ineligible for the direct EU payments (2). This affects mainly small-scale farms

Retention of CSA subscribers

Despite the seasonal increased rate of subscriptions in AAF, the farm struggles to retain some of its subscribers, which the farm is working to improve on.

Pest related FL

Despite the use of integrated pest management, the farm experienced some

pest related losses in specific crops like lettuces, radish and carrots. Thus, it requires reinforcement in its operations.

Recommendations

To promote a sustainable and scalable CSA practice in AAF and Skåne, in general, the practice must be anchored on,

- The right policy framework both at regional and national levels. This will give it the leverage to maximize its opportunities.
- A strong public-private partnership between CSA farms and municipalities, in collaboration with the central government to integrate CSAs product into the public procurement systems for schools, hospitals, and other public institutions, and subsidize subscription for members.
- The farm should scale up its integrated pest management methods by introducing pest resistance cultivars especially for lettuce and radish.
- It will be essential if the farm can regain its KARV label, as it will be important in scaling up its production which will increase the farm's income level.



Photo of alnarpsfarm

Conclusion

This study aimed to investigate the potential of CSA in mitigating vegetable FL in Skåne, with reference to AAF in Lomma. The findings revealed that FL mitigation in CSA practice is not confined to a single bundle of practice, but a compound practice embedded in vegetable production, distribution, and consumption. By reconfiguring subscribers and producers through their routine seasonal agricultural activities in vegetable production, distribution, and consumption. Therefore, FL reduction in AAF can be more associated to food donation scheme, integrated pest management, decentralized pick up points, production based on subscription. This reduced the rejection of vegetables based on aesthetic values. The analysis further revealed that, while CSA provides a structural and technical remedy for FL mitigation, its scalability remains an issue in the region and beyond.

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