

Community Supported Agriculture Model as a Climate Change Adaptation Strategy in Ensuring Food Security in Bandung City

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Abstract. Bandung City depends on 96% of its food supply from outside the region, making it vulnerable to climate change impacts that could disrupt food security. The Buruan SAE program has been developed as a strategy to increase local food production and minimize carbon emissions. In its implementation, the program has not been a significant solution to food security, and the supply chain remains long, resulting in high carbon emissions and expenditure. This research proposes the Community Supported Agriculture (CSA) model as an alternative approach for sustainable food security solutions. The model bridges the gap between producers and customers while reducing carbon emission expenditure. The primary objective of this research is to examine the potential of the CSA model as a climate change adaptation strategy for ensuring food security. Using a qualitative and case study approach, this research identifies food system challenges, explores the characteristics of CSA, and formulates relevant implementation recommendations. The results show that the CSA model has the potential to reduce food system vulnerability, promote sustainable agricultural practices, and shorten supply chains to minimize carbon emissions. CSA serves as an effective strategy for climate change mitigation and adaptation, directly contributing to the improvement of local food security.

Keywords: Community Supported Agriculture (CSA), Climate Change, Food Security, Urban Farming.

Introduction

Food security and climate change are two interrelated global challenges that are key concerns in achieving the Sustainable Development Goals (SDGs), particularly SDG 2 (Zero Hunger) and SDG 13 (Climate Action). The global food system is currently responsible for approximately one-third of anthropogenic greenhouse gas (GHG) emissions, and at the same time, it is highly vulnerable to the negative impacts of climate change (Crippa et al., 2021). Therefore, there is a global consensus to design a more sustainable food system that can minimize environmental impacts while still meeting the food needs of an ever-growing population (Wezel et al., 2014).

Urban cities, which house more than half of the world's population, play a crucial role in this dynamic, as they contribute around 70% of GHG emissions and 70% of global food consumption (FAO, 2015). In Indonesia, the city of Bandung, as one of the metropolitan cities, faces complex challenges. Despite being known for its innovative culinary industry and youth initiatives, its food supply is highly dependent on external sources, reaching 96.42% in 2020 (BPS Kota Bandung, 2023). This situation makes Bandung highly vulnerable to price fluctuations and supply disruptions caused by conditions in supplier regions, including the impacts of climate change.

Previous studies have explored the relationship between food systems and climate change. Li et al. (2022) highlighted that food transportation (food miles) contributes significantly to greenhouse gas emissions, while Jensen and Orfila (2021) emphasize the importance of effective urban food governance. At the local level, government programs such as Buruan SAE in Bandung City have attempted to promote urban agriculture to increase local production. However, its effectiveness in cutting the supply chain and significantly reducing carbon emissions still needs to be further explored.

Based on this background, this study aims to analyze the potential of the Community Supported Agriculture (CSA) model as a climate change adaptation strategy to ensure food security in Bandung City. Specifically, the objectives of this study are to analyze the challenges of the Bandung City food system in relation to its potential under climate change conditions. Additionally, this study explores the characteristics and potential of the CSA model as an adaptation strategy. After analyzing the challenges and potential, the final section will formulate recommendations for implementing the CSA model relevant to the context of Bandung City.

This study builds a conceptual framework based on the Regional Food System Framework, which assesses and plans resilient and sustainable urban food systems by RUAF and FAO with adaptation. This conceptual framework consists of subsystems that group actors and their activities based on the food value chain. These subsystems place stakeholders based on their roles in the food system and their activities in the food value chain.

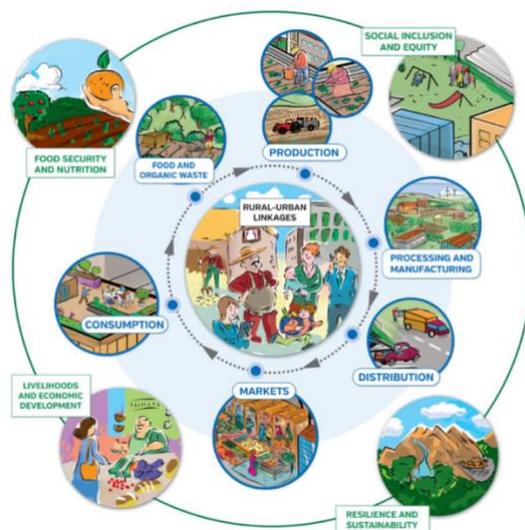


Figure 1. The overview of framework in food Systems

Methods

This study uses a qualitative approach with a descriptive-exploratory case study design in Bandung City. Informants were selected purposively, consisting of representatives of the Buruan SAE urban farmer group, the Seni Tani group, academics, the Bandung City Food Security and Agriculture Agency, and the Bandung City Environment Agency. Primary data was collected through structured in-depth interviews, while secondary data was obtained from regional policy documents, BPS reports, and related scientific studies. Data analysis was conducted using thematic analysis techniques to identify patterns and main themes and was enriched with descriptive analysis to describe the condition of the food system and the impact of climate change. Data triangulation was applied to enhance the validity and reliability of the findings. The research results are expected to provide a comprehensive understanding of the dynamics of the urban food system and the potential for strengthening food security through the CSA model. The research discussion flow is illustrated in the following conceptual framework table.

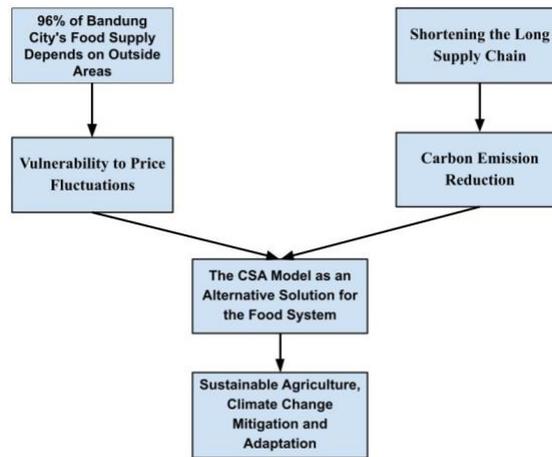


Figure 2. Conceptual Framework

Result and Discussion

The food system in Bandung faces complex structural challenges, mainly due to its high dependence on external supplies. Data from the 2020 Food Balance Sheet (NBM) shows that 96.42% of the city's food needs are met from outside the region (BPS Kota Bandung, 2023). This situation creates a long and vulnerable supply chain susceptible to price fluctuations, supply uncertainties, and distribution delays. From an environmental perspective, long supply chains also increase food miles, which leads to high carbon emissions from long-distance transportation (Pretty et al., 2005). The local government's efforts through the *Buruan SAE* urban agriculture program are commendable, as it has initiated more than 400 urban farming groups that utilize limited space for local food production. However, the scale of this intervention is still limited to meeting household needs and has not been integrated into the city's macro distribution system, so its contribution to food security remains relatively small. This aligns with Swyngedouw's (2019) study, which emphasizes that local initiatives will struggle to achieve systemic impact without policy support and institutional integration.

In this context, the Community Supported Agriculture (CSA) model offers a more strategic approach to strengthening urban food resilience. CSA emphasizes direct relationships between farmers and consumers through a membership-based scheme, which not only shortens the supply chain but also creates market certainty for farmers (Feagan & Henderson, 2009). The implementation of CSA in Bandung can be done by integrating the *Buruan SAE* group as a collective production unit connected to urban consumers, thereby reducing dependence on external supplies while also reducing carbon emissions from transportation. Additionally, CSA strengthens the socio-economic aspect by fostering solidarity between producers and consumers, which in turn promotes ecologically based sustainable agricultural practices. Thus, CSA is not only relevant as a climate change adaptation strategy but also as an instrument for transforming the food system toward greater equity and sustainability.

Another important dimension to consider in urban food system development is organic waste management. As a metropolitan city, Bandung generates large amounts of organic waste, primarily from households and traditional markets. If not managed properly, this waste has the potential to produce methane (CH₄) emissions, which are far more harmful than carbon dioxide. Through a circular economy approach, organic waste can be processed into compost or vermicompost, which is highly valuable for urban farming communities. Integrating organic waste management with CSA farming practices creates a closed-loop system where household waste is transformed into a productive resource for farmers. This concept is in line with the idea of a circular economy, which emphasizes resource efficiency and waste minimization (Geissdoerfer et al., 2017). Thus, in addition to strengthening food security, this model can also make a real contribution to climate change mitigation at the local level.

Integration Strategy Framework

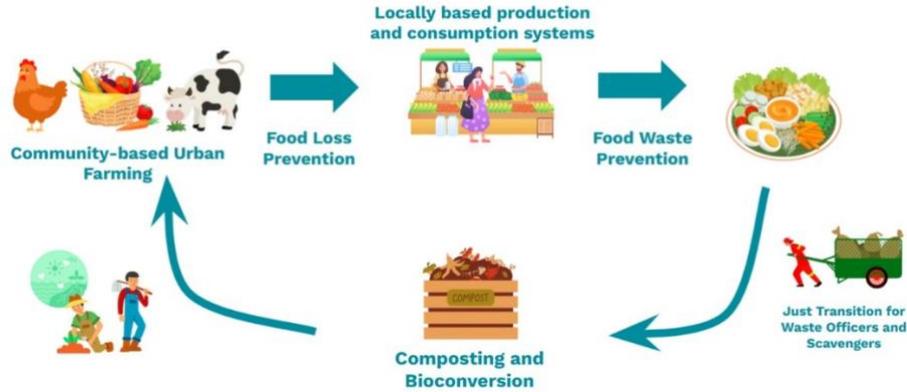


Figure 3. Organic Waste Framework for Sustainable Food Systems

The success of CSA implementation is highly dependent on the existence of a collaborative ecosystem across actors. Local governments, through the Food Security and Agriculture Agency (DKPP), act as regulators and facilitators that can provide incentives, regulations, and urban land use for urban farming. Academics and research institutions strengthen technical capacity through innovation and evidence-based research, while communities are key actors as both producers and consumers. The private sector, particularly in the fields of technology and food distribution, can contribute to the development of digital platforms and expand market access. Literature on collaborative governance (Ansell & Gash, 2008) shows that the success of a policy is largely determined by the presence of trust, shared commitment, and facilitative leadership. This is also relevant in the context of CSA in Bandung, which requires synergy between the government, community, academia, and private sector to build a resilient food system.

Despite the challenges of limited land and the need for initial investment, the potential for implementing CSA in Bandung is relatively high. Government support through *Buruan SAE*, increasing public awareness of healthy and local food, and advances in digital technology can serve as social and institutional capital in CSA development. Therefore, implementation strategies should focus on building a digital platform for distribution management, providing policy incentives that support sustainable agricultural practices, and strengthening multi-stakeholder collaboration. With this approach, Bandung has the potential to develop a more adaptive, sustainable, and resilient urban food system capable of withstanding climate change shocks, while also making a tangible contribution to sustainable development agendas at both the local and global levels.

Stakeholder Integration in Waste and Food Management

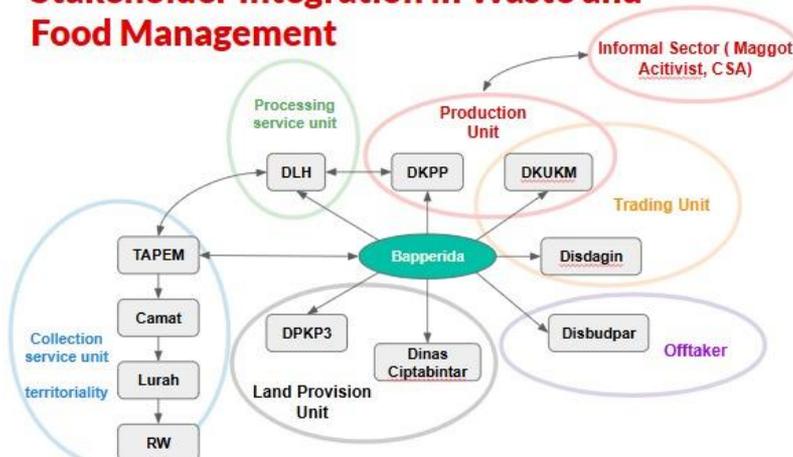


Figure 4. Stakeholders in Waste Management Integration and Sustainable Food Systems

Conclusion

Bandung City's food dependency, which reaches 96.42% on external supplies, shows serious vulnerability to price fluctuations, distribution disruptions, and the impacts of climate change. This situation is exacerbated by a long supply chain that not only increases the risk of food instability but also generates high carbon emissions due to long-distance transportation (food miles). The government's efforts through the Buruan SAE program have successfully initiated urban farming practices and involved the community, but the scale of the intervention remains limited, failing to make a significant contribution to the city's overall food security.

In this context, the Community Supported Agriculture (CSA) model offers a more strategic approach by shortening the supply chain and directly connecting producers and consumers. CSA not only provides market certainty for farmers but also promotes sustainable agricultural practices, strengthens socio-economic solidarity, and opens opportunities for integrating organic waste management within a circular economy framework. Its successful implementation depends heavily on the support of a collaborative ecosystem across actors, including local government, academia, communities, and the private sector. Thus, CSA has the potential to become an important instrument in transforming Bandung's food system towards a more adaptive, equitable, and sustainable direction and contribute to climate change adaptation.

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