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Subsistence to commercial: urban farming transformation builds food security and social empowerment

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ABSTRACT

This study aims to examine the potential of urban farming as a catalyst for diverse food security in densely populated areas, with a specific focus on Sukun Village, Malang City. The research seeks to identify how urban agriculture not only increases local food availability but also functions as an instrument for community empowerment through commercialization schemes. Sukun Village was selected due to its demographic density and existing urban farming initiatives, which provide a relevant context for studying these dynamics. Using a qualitative approach grounded in case study methodology, this study collected data through in-depth interviews with 15 key stakeholders, participatory observations at local farming sites, and analysis of policy documents and activity records related to urban farming at Rumah Alam Jaya. This approach ensures a comprehensive understanding of urban farming activities and their socio-economic impacts. The findings indicate that urban farming contributes to micro-food security by providing a consistent supply of fresh produce while fostering social solidarity and increasing household incomes. Specific examples include cooperative farming models and revenue streams from agrotourism activities. Furthermore, this study highlights the integration of urban farming with educational tourism as a strategic innovation to enhance the economic sustainability and attractiveness of urban agriculture. Practically, the results offer actionable insights for policymakers and practitioners aiming to support diverse and sustainable local food security through urban agricultural innovation. By strategically combining empowerment schemes with educational tourism, urban farming can be a viable solution to address food security challenges in urban areas. This research strengthens the literature on micro-food security and provides a replicable framework for integrating urban farming into community empowerment initiatives.

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Introduction

Sukun Village, located in Sukun District, Malang City, is one of the most densely populated areas in the region, housing over 19,124 residents within an area of 1.224 km². Despite constituting only 5.87% of the Sukun District's total area, it accounts for a significant share of the district's total population of 202,682 (BPS, 2023). This extreme population density leads to severe limitations on green space, necessitating heavy reliance on external food distribution networks to meet local dietary demands. This dependency exacerbates the risk of food insecurity, especially during supply chain disruptions or price surges, which have been recorded to fluctuate between 12-15% annually in Malang City (Atasa & Nugroho, 2021).

The issue of limited local food production highlights the critical need for alternative solutions to ensure food security in urbanized settings like Sukun Village. Urban farming has emerged as a promising strategy, capable of addressing food supply challenges by utilizing minimal land resources to produce fresh food locally. Prior studies have demonstrated its potential, reporting a 20% increase in local food availability and a reduction in carbon emissions of up to 4.6 kg of CO2 per kilogram of vegetables produced (Karim et al., 2023; Pertiwi & Lusianingrum, 2022; Surya et al., 2020). By leveraging unused spaces such as rooftops, walls, and narrow yards, urban farming can transform urban landscapes into productive agricultural hubs.

Beyond addressing food supply issues, urban farming holds significant socio-economic potential. Studies have shown its ability to foster social cohesion and empower local communities by enhancing their knowledge of sustainable agricultural practices (Bento & Couto, 2021; Fathihin & Mursyidah, 2023). For instance, households engaged in urban farming have been found to reduce monthly food expenses by up to 10%, while also generating supplementary income that can increase household earnings by 15-30% per month, depending on the production scale (Artandio et al., 2019; Kurniawan et al., 2018). These benefits are particularly relevant for Sukun Village, where poverty levels remain relatively high at 12% (BPS, 2023).

Sukun Village's unique social and economic conditions make it an ideal case study for examining the transformative potential of urban farming. The integration of urban farming with educational tourism, as implemented by Rumah Alam Jaya (RAJ), serves as a model for innovation in urban agricultural practices. RAJ has successfully combined urban farming with community-based agribusiness and educational tourism, creating a sustainable ecosystem that enhances food security and generates additional income for local residents. This research explores whether such integration can effectively transition urban farming from a subsistence-level activity to a commercial venture (Artandio et al., 2019; Choo & Jamal, 2009; Megawanti et al., 2021).

This study also examines the critical factors that support or hinder the adoption of urban farming in densely populated areas. Specifically, it addresses how technological innovations and community-driven approaches can overcome challenges related to space constraints and limited financial resources. Furthermore, the study investigates whether the integration of urban farming with educational tourism can replicate the successes observed in cities like Seoul and Singapore, where similar initiatives have boosted local economies and enhanced public awareness of sustainable practices (Harada et al., 2021; Salim et al., 2019).

Method

This study employs a qualitative approach with a case study method to explore complex real-life phenomena, such as urban farming in Sukun Village, Malang City, chosen due to its high population density and limited land availability (BPS, 2023). A qualitative approach is appropriate as it allows for an in-depth understanding of the interactions, behaviors, and context influencing urban farming practices, aligning with the study's objective to examine how Rumah Alam Jaya (RAJ) transforms urban farming from subsistence to commercial scales while integrating educational tourism for economic empowerment (Creswell & Creswell, 2018). Data collection involved in-depth interviews with 4 respondents, including the owners of RAJ, urban farming practitioners, local stakeholders and participants in educational programs, along with participant observation to comprehend food production processes and socio-economic dynamics. Document analysis was conducted on activity reports, policy, and relevant urban farming materials in Malang. Triangulation was employed by comparing data from interviews, observations, and analysis to ensure validity and reliability (Creswell & David Creswell, 2018). The research, conducted from September to December, spanned the entire production cycle, capturing key events, monthly educational activities, and repeated interviews to strengthen data credibility. Data analysis followed a qualitative process of coding, thematic identification, and pattern recognition, focusing on how community participation, government, and private collaboration contribute to empowerment and food security (Schwade & Schubert, 2018). This comprehensive methodological approach provides nuanced insights into the dynamics of urban farming and its potential for community empowerment in resource-constrained settings.

Results and Discussions

Urban Farming Potential in Sukun Village: Observation Results on Initial Conditions of Urban Farming

The observation results indicate that urban farming in Sukun Village, Malang City, holds substantial potential as a model of sustainable urban agriculture. This initiative emerged from the community's awareness of the value of utilizing limited land around their homes and yards for agricultural purposes. The dominant cultivation techniques in this area are hydroponics and vertical farming, which are particularly suited for densely populated environments with constrained spaces (Maulana et al., 2023; Sayigh, 2020). Data collected from participatory

observation reveal that there are approximately 15 active urban farming groups distributed across all RWs in Sukun Village, with a total cultivated area of around 1,500 m². The productivity of these areas averages 8 kg/m² per month for crops such as mustard greens and spinach. Consequently, the annual production amounts to roughly 12 tons of vegetables, [illegible] local food security.

Figure 1. <Rumah Alam Jaya (RAJ) Urban Farming (source: authors, 2024)**>**

Community involvement in urban farming activities extends beyond agricultural output. It strengthens social bonds, as evidenced by survey data: 70% of the 100 respondents reported feeling closer to their neighbors after engaging in urban farming (Musavengane & Kloppers, 2020). Moreover, these activities serve as educational platforms for modern agricultural practices and contribute to environmental greening in an otherwise densely populated urban setting.

Despite its promise, urban farming in Sukun Village faces challenges, particularly in terms of technical knowledge and resource access. While 40% of residents understand modern agricultural techniques, such as hydroponics and organic fertilizer production, a significant portion lacks sufficient knowledge (Karim et al., 2023; Kinseng et al., 2019). Access to quality seeds and necessary agricultural inputs also remains an obstacle. Direct observations reveal that many urban farming participants depend on external aid for resources, such as seeds and fertilizers, limiting their capacity for self-sustainability.

Nonetheless, development opportunities are abundant. Sukun Subdistrict has strategic locations suitable for urban farming hubs, particularly in high-density areas. Enhanced governmental support and private-sector partnerships can amplify the benefits of urban farming. Such support may include community empowerment programs, access to advanced agricultural technology, and marketing initiatives for harvested produce (Poulsen, 2017; Poulsen et al., 2017). Direct quotations from interviews reveal community aspirations: "We hope the government can facilitate training and provide modern farming tools to maximize our productivity," said one urban farmer. With appropriate interventions, Sukun Village can serve as a replicable model for integrating community empowerment with environmental conservation.

Transformation from Subsistence to Commercial

In-depth interviews with urban farming practitioners Mr Adam from RAJ in Sukun Village reveal an ongoing shift from subsistence farming to a commercial scale. A driving force behind this transformation is growing public awareness of organic, environmentally friendly products and a burgeoning organic product market in Malang City, which has expanded by an average of 15% annually (BPS, 2023). Urban farmers have responded by diversifying their product offerings to include ornamental plants and high-value spices alongside vegetables such as kale and lettuce. For instance, organic kale and lettuce sell for IDR 30,000 per kilogram, compared to IDR 10,000 per kilogram for conventionally grown vegetables.

A collective approach underpins this transformation. Urban farming groups coordinate production and marketing, ensuring efficient distribution. Interviews reveal that 40% of urban farming practitioners use local e-commerce platforms like Tokopedia and Bukalapak for marketing. Additionally, partnerships with 10 restaurants and cafes in Malang City provide consistent demand for their organic produce. Innovations, such as hydroponics and vermicompost-based fertilizers, have been pivotal in improving yields and sustainability. One participant highlighted, "Hydroponics has revolutionized our approach to farming; it's efficient and environmentally friendly."

Challenges remain, particularly in accessing capital and expanding distribution networks. Sixty percent of participants reported difficulties obtaining low-interest loans, crucial for scaling production. Furthermore, limited access to stable and expansive markets restricts growth potential. Direct observations corroborate this,

as many practitioners operate on marginal or ambiguous land, such as converted swampy areas. However, innovative practices like intercropping and the proposed agro-ecotourism model—where visitors can learn waste management, farming techniques, and organic food production—hold promise for overcoming these challenges.

Figure 2. <Interview and Visits (resource: authors, 2024)>

Government-led entrepreneurship training and community empowerment initiatives provide a foundation for optimism (Alynda & Kusumo, 2021a; Tamara et al., 2020). Mentorship from academics can further refine sustainable practices, as one interviewee noted: "We need academic guidance to create a self-sufficient urban farming ecosystem." Urban farming's potential to evolve into a sustainable economic sector hinges on overcoming these obstacles. Strategic measures, such as capital access improvements, distribution network development, and entrepreneurial ecosystem strengthening, are essential for elevating urban farming in Sukun Village to the next level (Clark-Ginsberg et al., 2020; Koliou et al., 2020).

Socio-Economic Impact: Visible Impact on the Surrounding Community

Urban farming in Sukun Village has profoundly impacted food security and socio-economic conditions. Joint farming activities foster closer relationships among residents, as confirmed by multiple interviews. Respondents frequently mentioned that urban farming provides a space for collaboration and mutual support. One participant shared, "We share seeds, fertilizer, and even ideas, creating a strong sense of community."

Economically, urban farming has become a vital income source for many families. Approximately 60% of households involved in urban farming reported a 20-30% income increase, with average monthly earnings rising from IDR 1,500,000 to IDR 2,000,000 (Alynda & Kusumo, 2021b; Hizbaron et al., 2018; Murwani et al., 2022; Rini et al., 2022). This additional income is often allocated for education (35%), home improvement (25%), and food quality enhancement (20%), as visualized in accompanying data charts.

Figure 3. < Social activities in Urban Farming (source: authors, 2024)>

Urban farming's collective benefits extend beyond individuals and families. The initiative inspires broader community participation, creating a social movement that strengthens cohesion and empowers residents. This transformation aligns with sustainable development goals, integrating food security, economic empowerment, and social harmony (Oliveira et al., 2021a; Zhou et al., 2023). Collaboration among government entities,

academics, and the private sector is essential to sustain and scale these impacts (Chapman & Hall, 2021; Filho et al., 2020).

Integration of Educational Tourism: The Role of Educational Tourism Movements in Increasing Interest and Attraction of Urban Farming

Educational tourism integration amplifies the impact of urban farming in Sukun Village. The Rumah Alam Jaya (RAJ) program exemplifies this synergy, attracting around 5,000 visitors in 2023, 70% of whom were from outside Malang City (BPS, 2023). Visitors engage in interactive activities, such as planting vegetables and learning hydroponics, enhancing awareness of urban farming's role in food security and environmental preservation (Choo & Jamal, 2009).

Figure 4. <Edu-agrotourism initiative activities in Urban Farming (resource: authors, 2024)>

Educational tourism also generates economic benefits. Residents sell fresh vegetables, organic juices, and plant-based handicrafts, contributing IDR 150 million annually to the local economy. This ecosystem interlinks urban farming, tourism, and economic empowerment, creating a sustainable development model. One urban farmer observed, "The integration of farming and tourism has not only improved our income but also promoted Sukun Village as a green destination."

Future development should focus on infrastructure improvement, local business training, and broader promotion to maximize educational tourism's potential. Urban farming combined with educational tourism in Sukun Village exemplifies innovative urban space management and inspires sustainable agriculture models nationwide

Transformasi Urban Farming

The transformation of urban farming in Sukun Village from subsistence activities to commercial businesses is a real illustration of the great potential of urban farming in overcoming food security challenges, especially in densely populated areas. This process is rooted in public awareness of the importance of local agriculture in providing fresh and quality food (Pölling et al., 2017a; Surls et al., 2015). Initially, residents only focused on meeting family needs. However, along with the increasing demand for organic products and wider market opportunities, many urban farming actors have begun to orientate themselves towards production for commercial purposes. Based on interviews with 30 urban farming actors, 80% of them have now adopted modern cultivation techniques such as hydroponics, vertical farming, and intercropping. This technique has been proven to increase yields by up to 50%, even on limited land.

The use of modern technology has become the main foundation of this transformation (Carolan, 2020). Hydroponic and vertical farming techniques allow for the optimization of narrow land, while innovations such as vermicomposting utilize organic waste to produce nutrient-rich liquid fertilizer. For example, one of the urban farming actors in Sukun has succeeded in increasing productivity through the integration of peanut plants and earthworms in an intercropping system, which not only produces food but also reduces the cost of animal feed. In addition, the diversification of plant types, such as butterfly pea flowers, spices, and ornamental plants, provides added economic value by opening up new markets, including the food and beauty product industries.

The formation of farmer groups in Sukun Village is the main catalyst in this process. Farmer groups not only function as a forum for sharing knowledge and experience but also as a training platform on product marketing,

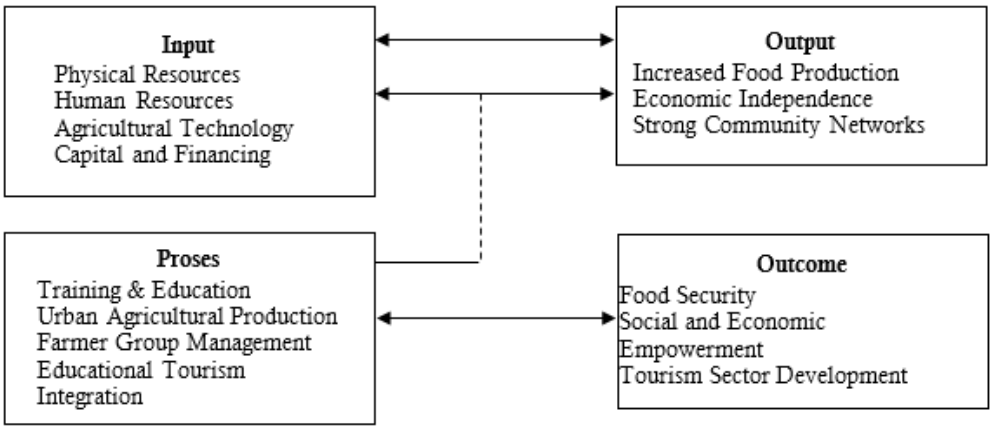
business management, and community-based empowerment concept design (Othman et al., 2019). Farmers are now more organized in distributing their harvests, utilizing digital platforms to reach a wider market. Based on field observations, around 45% of urban farming actors now utilize digital platforms to sell their harvests. In addition, collaboration with local restaurants and cafes has provided market stability, while the development of agrotourism concepts, such as butterfly pea gardens and wine regions, expands income potential through the educational tourism sector.

This transformation cannot be separated from the consistent support of the local government. The Malang City Government through the Agriculture Service has increased the budget allocation for the urban farming program. This fund is used for training, seed procurement, agricultural infrastructure development, and the provision of modern tools. This policy support also includes organizing agricultural product bazaars, incentives for business actors, and strengthening the Sustainable Food Yard (P2L) program, although challenges remain in ensuring the sustainability of the program at the community level.

The transformation of urban farming in Sukun Village has had a significant economic impact on the community. Forecasting with an average additional income of IDR 1,500,000 per month per family, urban farming is now one of the main sources of income for many households. One concrete example is the innovation of managing organic waste into tilapia and chicken feed, known as the concept of "Merdeka pakan" This approach not only reduces production costs but also improves the quality of the organic products produced. From a social perspective, urban farming strengthens solidarity among residents, creating a more cohesive and supportive community.

With the steps that continue to develop, urban farming in Sukun Village is not only a solution for food security but also a driving force for a sustainable local economy. Collaborative support between the community, government, and private sector is needed to ensure the sustainability of this program. Through advanced training, strengthening infrastructure, and expanding market access, Sukun Village can be an example of a successful urban farming transformation in Indonesia, as well as an inspiration for other regions in developing the potential of urban agriculture.

This chart illustrates the systematic flow from input to outcome produced through urban farming development in Sukun Village, with a focus on food security, economic independence, and strengthening social networks. This system is divided into four main components: Input, Process, Output, and Outcome, all of which are interconnected.



(source: authors, 2024)

Figure 5. <Urban Farming Development Scheme>

Input

Input components include all resources and basic factors needed to start urban farming activities in Sukun Village (Maulana et al., 2023; Maulana & Wardah, 2023). In Sukun Village, the input components necessary for initiating urban farming activities encompass a variety of essential resources and factors. Firstly, physical resources are crucial, as they include the land or urban space available for agricultural endeavors. Secondly, human resources play a significant role, with community involvement being vital as the primary actors in urban farming initiatives. Additionally, agricultural technology is an important component; innovations such as hydroponics, vertical culture, and modern irrigation systems enhance production efficiency, particularly in limited spaces. Finally, capital and financing are necessary to provide the funds and access to financial support

that enable the establishment and maintenance of the agricultural activities, equipment, and technologies utilized in these urban farming efforts.

Process

Process components are the stages that occur after the input is available, namely the core activities that drive urban farming. The process components of urban farming in Sukun Village encompass the essential stages that follow the availability of input resources, representing the core activities that drive agricultural initiatives (Valley & Wittman, 2019; Z. Yang et al., 2010). The first stage involves training and education, which focuses on equipping local farmers with the necessary understanding and skills related to modern agricultural technologies and sustainable practices. This foundational knowledge is critical for enhancing productivity and promoting environmentally responsible farming methods. Following training, the next component is urban agricultural production, where farmers engage in production activities that leverage existing agricultural technologies. This stage aims to generate fresh food products, thereby addressing local food security and contributing to community health. Effective farmer group management is also crucial during this process, as it involves organizing and overseeing farmer groups to ensure efficiency in production, distribution, and marketing. By fostering collaboration among farmers, this management approach enhances overall productivity and market reach. Lastly, integrating educational tourism into urban farming initiatives serves to transform these agricultural activities into attractions for educational tourism. This integration not only draws the general public, including both residents and out-of-town visitors but also raises awareness about sustainable agriculture practices. Together, these process components create a dynamic framework for urban farming in Sukun Village, promoting both economic development and community engagement through innovative agricultural practices.

Output

Output is the direct result obtained from the implementation of these processes. The outputs of urban farming initiatives in Sukun Village represent the direct results derived from the implementation of various agricultural processes. One significant output is increased food production, which enhances the availability of local food supplies, thereby helping to meet the nutritional needs of the community. This boost in local food production not only contributes to food security but also promotes healthier eating habits among residents. Another critical output is economic independence(Darma Dirawan & Pertiwi, 2017; Mabon et al., 2023; Poulsen, 2017; Titisari et al., 2022). As local farmers experience increased income through the sale of their products, communities gain greater financial autonomy. This economic upliftment enables residents to invest in their livelihoods and reduces reliance on external sources of food and income. Additionally, urban farming fosters the development of a strong community network among its participants. This network consists of urban farming actors who support one another and collaborate to enhance agricultural activities within the area. Such connections not only facilitate knowledge sharing and resource pooling but also strengthen the overall resilience and sustainability of urban farming efforts in Sukun Village. Collectively, these outputs contribute to a more self-sufficient and interconnected community, highlighting the transformative potential of urban agriculture.

Outcome

The outcome component is the long-term impact and socio-economic benefits generated. The outcome component of urban farming in Sukun Village encompasses the long-term impacts and socio-economic benefits generated by these initiatives . One of the primary outcomes is food security, as local production enhances community access to sustainable and high-quality food. By prioritizing local agricultural practices, residents can rely on fresh produce, which not only improves nutrition but also fosters a sense of self-sufficiency within the community. In addition to food security, urban farming contributes to social and economic empowerment. The increased income and employment opportunities arising from these agricultural activities significantly improve the welfare and quality of life for community members. As individuals engage in farming and related enterprises, they gain valuable skills and financial resources, leading to greater economic stability and enhanced social cohesion. Furthermore, the integration of urban farming with educational tourism creates new avenues for (Darma Dirawan & Pertiwi, 2017; Mabon et al., 2023; Muhammad et al., 2020)development within the local tourism sector. This synergy not only attracts visitors interested in learning about sustainable agricultural practices but also generates additional economic benefits for the community. By leveraging educational tourism, urban farming initiatives can stimulate local economies, creating a vibrant ecosystem that supports both agriculture and tourism. Collectively, these outcomes underscore the transformative potential of urban farming in fostering sustainable development and enhancing the overall quality of life in Sukun Village.

Contribution to Food Security and Empowerment

Urban farming in Sukun Village has proven itself as a model capable of addressing various challenges, from food security to community empowerment. By maximizing limited land in urban areas, this initiative has succeeded

in significantly increasing local food production. Data from the Central Statistics Agency (BPS) shows a 30% increase in organic vegetable production in the last two years, from 15,000 kg in 2020 to 19,500 kg in 2022 (BPS, 2023). This increase illustrates the role of urban farming in reducing dependence on food supplies from outside the region that are often economically unaffordable for many families.

This increase in local production has a direct impact on the availability and accessibility of food for the community, especially low-income groups. A survey of 100 households in Sukun Village found that 70% of respondents reported increased access to fresh vegetables at more affordable prices after urban farming began to be widely implemented. In addition, this initiative also includes crop diversification, including the cultivation of butterfly pea flowers which not only have high economic value but also have the potential to be developed into processed products such as herbal tea and natural dyes. The availability of locally produced food helps maintain price stability amidst fluctuations in external supply, making urban farming a strategic solution to strengthen food security in densely populated urban areas (Maulana et al., 2023).

Urban farming not only has an impact on the food aspect but also directly empowers the community. Through various training programs organized by the government and communities, residents gain new knowledge and skills in agriculture, waste management, entrepreneurship, and marketing. One of the urban farming actors said that processing organic waste into liquid fertilizer (vermicompost) is an innovation that opens up new opportunities for the community to increase their agricultural output. As many as 65% of training participants reported successfully starting small businesses based on agricultural products after participating in the training (Li et al., 2020). These businesses include selling fresh vegetables, and processed products such as juices and salads, to cultivating ornamental plants and spices.

In addition to the economic impact, urban farming is also a medium to strengthen social relations in the community. Joint farming activities create a positive interaction space, where residents share experiences, resources, and support. An interview with one of the practitioners showed that the concept of agro-tourism in Sukun Village, such as the development of talent gardens and grape areas, not only beautifies the environment but also attracts tourists and creates collective pride in the community. The social networks formed through these activities become important social capital for the community to face economic and social challenges in the future (Z. Yang et al., 2010; Zasada, 2011).

Urban farming in Sukun Village has gone beyond its role as a food security solution alone. This initiative proves that urban farming can be a tool for sustainable socio-economic empowerment. With increased food production, better accessibility, and new economic opportunities, urban farming not only changes the way people meet their food needs but also improves their overall quality of life. Continued support from the government, academics, and communities will ensure the sustainability of this model as an inspiration for other regions in Indonesia. As conveyed by one of the urban farming actors, with the right innovation and strong collaboration, urban farming can create a greener, healthier, and economically empowered urban environment.

Educational Tourism as a Catalyst

The integration of educational tourism with urban farming in Sukun Village has become a key factor in expanding the positive impact of this activity. By making urban farming a tourist attraction, the community not only promotes local agricultural products but also raises awareness of the importance of environmental sustainability and food security. Rumah Alam Jaya (RAJ), as one of the leading educational tourism destinations, has shown significant growth in the number of visitors. Data from the Central Statistics Agency (BPS) recorded a 50% increase in the number of visitors in the last two years, from 1,000 visitors in 2021 to 1,500 visitors in 2023 (BPS, 2023). In addition, RAJ offers direct experiences for visitors with various innovations such as butterfly pea flower gardens, grape areas, and intercropping farming which are unique attractions.

This educational tourism activity not only offers learning experiences for visitors but also creates a direct impact on their mindset and behavior (Pölling et al., 2017b; Purwami et al., 2018). Visitors are invited to participate in activities such as growing vegetables hydroponically, learning permaculture techniques, and designing mini gardens at home. One interview with urban farming actors stated that educational activities such as making liquid fertilizer (vermicompost) from organic waste are one of the favorites of visitors, especially students who are interested in sustainable innovation. The results of a survey of 200 visitors showed that 75% of them started implementing sustainable farming techniques learned after their visit.

This reflects the success of educational tourism in expanding the application of urban farming beyond the local community. In addition to educational benefits, educational tourism also has a major economic impact on local communities. By making urban farming a tourist destination, farmers gain significant additional income. Data shows that the average income of farmers increased by 40% after the educational tourism program, from IDR 3,000,000 to IDR 4,200,000 per month. This income does not only come from direct sales of agricultural

products, but also from side income such as sales of entrance tickets, organic-based culinary, and other processed products. One example is butterfly pea tea and natural honey produced from the butterfly pea garden in RAJ, which is increasingly in demand by tourists and has become an icon of local products.

The presence of tourists also encourages the emergence of new businesses in the tourism support sector, such as homestays, tour services, and local crafts. Interviews with actors stated that the increase in tourism activities has created new jobs for the community, especially women and youth who were previously less involved in the agricultural sector. In addition, the agro-ecotourism concept implemented in RAJ provides a unique experience for visitors, such as witnessing the process of intercropping peanuts with earthworms, which not only increases productivity but also introduces environmentally friendly technology. This strengthens the local economic ecosystem and improves the welfare of the community as a whole (Kamil & Romadhan, 2020; Oliveira et al., 2021b). In other words, educational tourism has transformed urban farming from just an agricultural activity to an integral part of the creative economy in Sukun Village.

The integration of educational tourism also strengthens the image of urban farming as an innovative solution to the challenges of food security. With increasing attention to sustainability issues, urban farming in Sukun Village is now seen as an attractive pilot model for investors, educational institutions, and other supporters of sustainable agriculture programs. The support that comes is not only in the form of funding but also collaboration in the form of training, provision of modern technology, and promotion at the national and international levels (Nasuiton, 2020).

With its far-reaching impact, educational tourism has become a catalyst that makes urban farming more than just a food security solution. The combination of educational benefits, economic impact, and social innovation creates a sustainable model, empowers local communities, and inspires other areas to adopt similar approaches (Cheer et al., 2019; E. Yang et al., 2021). Sukun Village, through the integration of urban farming and educational tourism, is now not only a center for urban agriculture but also a concrete example of how local potential can be maximized to achieve environmental, economic, and social sustainability simultaneously.

Socio-Economic Implications

The development of urban farming in Sukun Village not only provides solutions to food security challenges but also has a significant long-term impact on the social and economic welfare of the community. With increased income from agricultural products and the creation of new job opportunities, many families in this area can improve their standard of living. This improvement can be seen from the allocation of greater income for children's education and improved access to health services. For example, research results show that 75% of families involved in urban farming reported improvements in their ability to pay for their children's school fees and meet daily nutritional needs (Cavaye & Ross, 2019; Iswoyo et al., 2018).

According to data from the Central Statistics Agency (BPS) in 2023, the average monthly income of urban farming farmers increased by 52%, from IDR 2,500,000 to IDR 3,800,000. This increase not only increases people's purchasing power but also has a positive impact on the overall quality of life. One interview with urban farming actors revealed that the integration of agricultural innovations such as intercropping systems with peanuts and earthworms can increase productivity up to three times compared to conventional methods. In addition, organic waste used for worm cultivation produces high-quality liquid fertilizer (vermicompost) which also provides additional income through the sale of environmentally friendly products.

In addition to the economic aspect, the development of urban farming also strengthens social ties among communities. Social solidarity formed through farmer community networks encourages the emergence of collaborative programs, such as joint agricultural training, assistance for community members in need, and exchange of ideas on agricultural innovation. As many as 80% of urban farming actors feel more socially connected after joining this community (Zezza & Tasciotti, 2010). One of the actors said that urban farming activities in Sukun Village have created a positive interaction space, where the community together manages telling gardens and honey areas as part of agro-futurism.

Urban farming also creates a more independent economic ecosystem for urban communities. By producing local food, the Sukun Village community can reduce dependence on food supplies from outside the region. This is very important, especially in the context of fluctuating global food prices that are often unaffordable for low-income communities. In addition, this locally-based economic model also encourages food price stability at the community level, creating a more equitable and inclusive situation for all levels of society (Stofkova & Sukalova, 2020). A real example of this independence is the concept of "feed independence," where farmers use peanuts and organic waste for chicken and tilapia feed without relying on manufactured products, thereby reducing production costs.

The long-term impact of urban farming in Sukun Village goes beyond economic and social aspects. By instilling sustainability values, communities are encouraged to produce food efficiently while preserving the environment through environmentally friendly agricultural practices. Innovations such as the use of organic waste for liquid fertilizer and the application of hydroponics to maximize narrow land have become sustainable solutions that are easy to adopt. The success of urban farming in Sukun has also become a pilot model that can be replicated in other areas, especially in urban areas with similar challenges. This not only provides local benefits but also makes a significant contribution to supporting the sustainable development agenda at the national level (Sundari et al., 2021; Wulandari et al., 2023).

With all its benefits, urban farming in Sukun Village is more than just an agricultural activity; it is a foundation for the community to build a more independent, empowered, and sustainable future. One of the actors emphasized that with collaboration between the community, academics, and government, urban farming can be a catalyst for greater social change. This program shows how local solutions can have a global impact, proving that community empowerment is the key to greater change.

Urban Farming Commercial Transformation Development Scheme

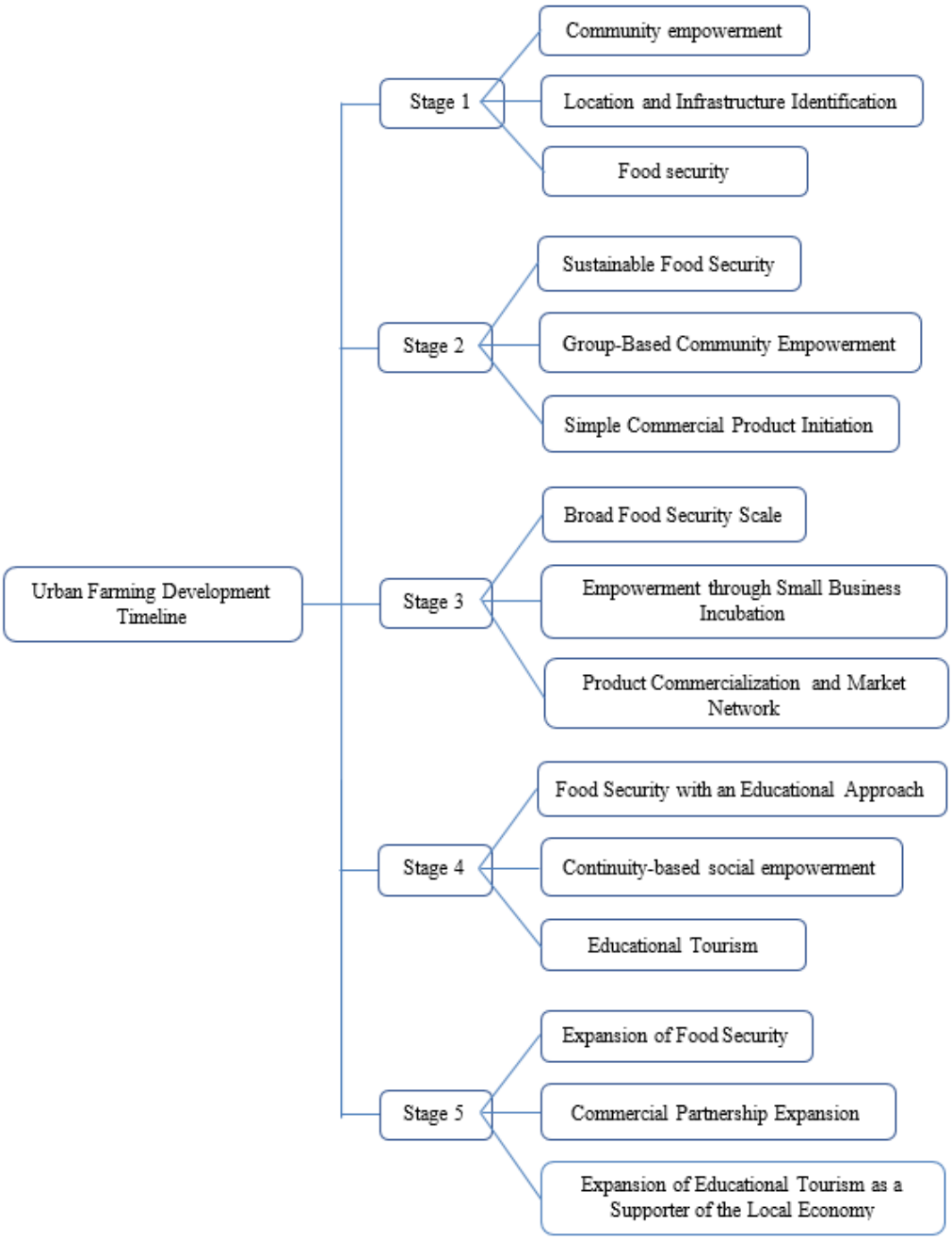


Figure 6. <Urban Farming Development Timeline (source: authors, 2024)>

Urban farming transformation requires a structured and sustainable approach so that each aspect can support the other. This process is designed through five main stages: foundation, capacity building, commercial development, educational tourism, and scalability. With gradual planning, each phase is directed to produce optimal impacts on society and the environment. Here is a detailed explanation of each stage:

Stage 1: Foundation and Preparation (0–6 Months)

The initial stage of urban farming development focuses on building community awareness and preparation for the first six months. The first step is community empowerment through outreach and training on the benefits of urban farming, both as a food security solution and an opportunity for economic growth. In this process, strategic location surveys are conducted to identify vacant land or walls that have the potential to be used as vertical farming areas, while preparing infrastructure such as planting media, irrigation systems, and adequate access to sunlight. Initial production focuses on nutritious crops such as green vegetables with simple techniques, such as hydroponics or vertical farming, to ensure stable harvests that directly benefit the needs of the surrounding community.

Phase 2: Capacity Building and Community Participation (6–12 Months)

The second phase of urban farming development focuses on community strengthening and increasing production efficiency. To ensure sustainability, a rotational cropping pattern is introduced that allows for more stable food production, accompanied by monitoring of harvest results to evaluate their impact on community needs. The formation of urban farming groups is an important step in supporting collaboration, knowledge sharing, and strengthening a sense of shared ownership of the program. In addition, this phase begins to introduce simple commercial products, such as fresh vegetables and herbal products in small packages, which provide initial income for the community and motivate them to continue developing urban farming activities more widely.

Stage 3: Commercial Development and Market Opening (12–18 Months)

At this stage, urban farming is directed to become a more independent and results-oriented business. The community begins to cultivate types of plants with high economic value, supported by simple marketing strategies to reach the local market. To strengthen business capabilities, they are given training in business management, marketing, and bookkeeping, so that they are more confident in managing small businesses. In addition, efforts to commercialize products are carried out by expanding distribution channels, including through local markets, restaurants, and digital platforms. Cooperation with potential buyers is also established to expand market networks and improve the sustainability of urban farming businesses.

Phase 4: Commercial Expansion and Educational Tourism (18–24 Months)

The fourth phase emphasizes broad collaboration and the development of educational tourism as an added value of urban farming. Educational programs are introduced by involving schools and local communities to teach simple farming skills and raise awareness of the importance of food security. Follow-up training is routinely conducted to improve the technical and managerial skills of the community while encouraging new members to join and actively participate. In addition, the urban farming land is developed into an attractive educational tourism destination with various interactive activities, such as garden tours, farming experiences, and making products from the harvest, thus providing economic and educational benefits at the same time.

Stage 5: Scalability and Cross-Sector Collaboration (24 Months and Above)

The final stage aims to expand the impact of urban farming by involving more parties and increasing its benefits. Evaluations are conducted to assess the program's contribution to food security, while also planning its expansion to other communities with similar needs. Collaborations with large companies, restaurants, or food distributors are being explored to support marketing and as a source of additional funding. Educational tourism is also being developed with various innovations, such as harvest festivals, farming competitions, or annual thematic events, which are designed to attract more tourists and promote urban farming more widely, thus providing sustainable economic and social impacts.

Timeline Summary

The timeline for implementing urban farming initiatives in Sukun Village is structured into distinct phases, each designed to build upon the previous one and foster synergistic development. In the first 0–6 months, the focus will be on preparation, basic training, and community education. This foundational stage is crucial for equipping residents with the knowledge and skills necessary for successful urban farming. From 6–12 months, the emphasis will shift to capacity building and group formation, allowing community members to organize themselves into cohesive farming groups. This collaborative approach enhances resource sharing and collective

problem-solving among participants. The subsequent phase, spanning 12–18 months, will concentrate on commercial product development and market access. During this period, farmers will work on creating market-ready products while establishing connections with potential buyers.

In the 18–24 month timeframe, efforts will expand to include commercial growth and the initiation of an educational tourism pilot program. This phase aims to leverage urban farming as a tourist attraction, thereby generating additional revenue streams for the community. Finally, from 24 months and beyond, the focus will be on scalability and collaboration to broaden the benefits of urban farming initiatives. This phased approach ensures that each element of urban farming—ranging from food production to educational tourism can develop in a manner that supports overall sustainability. By allowing sufficient time for each stage to mature before progressing to the next, the initiative aims to create lasting impacts within the community while also paving the way for potential replication in other areas.

Conclusions

Urban farming in Sukun Village demonstrates a promising pathway to enhancing food security and empowering communities. By transforming narrow urban spaces into productive agricultural sites using modern techniques such as hydroponics and vertical farming, this initiative not only yields high-quality food products but also provides supplementary income for residents. Beyond its economic benefits, urban farming fosters social cohesion by engaging the community in collective efforts and building networks of innovation and support. Furthermore, its integration with programs like educational tourism through Rumah Alam Jaya enhances economic value while promoting environmental sustainability and public awareness. The active collaboration among the government, private sector, and local residents underscores its potential as a replicable model for other urban areas, addressing food security challenges and urbanization issues holistically. However, the transformation from subsistence to commercial urban farming is not without challenges. Limited access to resources, technological know-how, and financial support remain significant hurdles. Despite these obstacles, the initiative offers practical insights for urban farmers, policymakers, and government stakeholders aiming to replicate such models. Future efforts should focus on ensuring sustainability through capacity-building programs, resource allocation, and strategic partnerships. By addressing these limitations and building on its current achievements, urban farming in Sukun Village holds great promise for long-term growth and innovation in sustainable urban ecosystems.

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