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Research Article

Urban Farming: Modern Food Preparedness in the Agrarian Region of Banten

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Abstract: Urban farming is a modern form of adaptation that is responsive to food security challenges, especially in areas with limited space such as Banten Province. This study aims to examine the dynamics of food security in the agrarian region of Banten and offer innovative solutions through urban farming practices. The global food crisis, the shrinking of agricultural land due to development and land conversion, and the decreasing public interest in farming are crucial issues that threaten local food security. In Banten, land conversion has resulted in the loss of more than 9,869.61 hectares of productive rice fields, which has a direct impact on local production capacity and increased dependence on external supplies. As a solution, this study advocates urban farming innovations such as hydroponics, vertical farming, and the utilization of idle land and home gardens. This approach not only utilizes limited land efficiently but also aligns with the principles of wise food planning as exemplified in the story of the Prophet Joseph. Qualitative methods with literature studies and content analysis were used to gather in-depth information. To create sustainable food security, this study identified three main strategies: digitalization of agricultural spatial planning using geographic information systems (GIS) to prevent illegal land conversion; Integrating circular agriculture and urban farming to manage organic waste; and engaging the younger generation as drivers of innovation through technologies such as the Internet of Things (IoT) and digital marketing. These efforts are expected to create high-quality and sustainable food security in Banten Province by combining social intelligence, technology, and environmental sustainability.

Keywords: Food security; Land conversion; Sustainability; Technology; Urban farming;

1. Introduction

The threat of a food crisis has become an increasingly real global issue, with even local communities feeling the impact. This is not only due to natural disasters or distribution issues, but also to the erosion of agricultural land and a decline in public interest and awareness in farming. This is evident in the 2024 harvest area in Banten, which was 298.84 thousand hectares, and the 2024 harvest yield of only 1.52 million tons of dry milled grain (GKG) [1]. This condition is actually caused by the narrowing of land used for residential and industrial projects. Areas that were once known as fertile and productive areas have now been transformed into land that is insignificant in creating food sources [2].

Agricultural land in various regions is shrinking due to development pressures and land conversion. Rice paddies, which once provided a livelihood, are now being replaced by rows of buildings and settlements. Meanwhile, the need for food continues, even increasing unabated. This situation raises concerns about people's efforts to meet their needs, especially in areas that are geographically and historically agricultural. Furthermore, concerns are also emerging in urban areas, where limited agricultural space dominates. Therefore, appropriate and concrete action is needed to address this food problem.

The story of the Prophet Joseph in the Quran actually provides an important lesson about careful food planning. The strategy offered is not simply about accumulating harvests, but also about building and maintaining long-term public awareness [3]. The principles instilled in the story of the Prophet Joseph remain quite relevant today, when climate conditions and food distribution are increasingly unpredictable. Building preparedness can

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begin with basic actions such as managing consumption, utilizing available space, and fostering a passion for planting.

This research reveals that Banten Province is experiencing a decline in productive rice fields covering more than 9,869.61 hectares due to conversion to residential and industrial areas. Consequently, the rice harvested area in 2024 will only reach 298.84 thousand hectares, producing 1.52 million tons of dry grain (GKG). The impact of this land reduction is exacerbated by the declining participation of local farmers, especially the younger generation, resulting in limited farmer regeneration and increased dependence on migrant workers or external capital. On the other hand, urban farming practices, including hydroponics, vertical farming, and aquaponics, have proven effective in utilizing limited spaces, such as home gardens and abandoned land, resulting in a 10–15% increase in local food supplies in pilot areas. The integration of digital technology (GIS for land mapping and IoT for crop condition monitoring) has increased cultivation efficiency by up to 20%, while an online distribution platform shortens the supply chain and eliminates intermediaries. A spiritual approach inspired by the story of the Prophet Joseph has also raised collective awareness among the community to actively contribute to long-term food security [1][2][3].

The benefits of this research include: (1) providing an empirical basis for policy makers to formulate regulations for the protection of productive agricultural land and integrating urban farming into regional spatial planning; (2) providing technical guidelines for the implementation of GIS and IoT for regional agricultural services in monitoring and optimizing agricultural land, both in urban and rural areas; (3) offering a community empowerment model that combines social, economic, and spiritual aspects to improve the welfare of small farmers; (4) encouraging diversification of food production systems thereby reducing dependence on one main commodity; and (5) opening up opportunities for further studies on the long-term impact of urban farming on food price stability, environmental quality, and socio-economic dynamics in agrarian areas.

2. Literature Review

One of the main problems identified is the conversion of agricultural land for industrial and residential purposes. Data shows that Banten has lost more than 9,869.61 hectares of productive rice fields due to land conversion. This phenomenon is not unique to Banten but also occurs in various other regions in Indonesia. Research in Karawang shows the significant impact of land conversion on farmers' livelihoods, while a study in Ciampea, Bogor, revealed that built-up land is increasing by around 218.7 hectares per year [4]. Climate change is an additional factor exacerbating food security. According to the Food and Agriculture Organization (FAO), climate change has the potential to reduce food production by up to 30% in tropical countries. FAO data also shows that rice production in Indonesia has decreased by 1.13-1.89 million tons due to climate change [5].

Urban farming is defined as the practice of growing food crops and raising livestock in urban areas using limited land such as yards, rooftops, or public spaces. This concept encompasses a variety of innovative techniques such as hydroponics, aquaponics, and vertical farming, which enable high-efficiency food production in limited spaces [6].

Research shows that urban farming makes a significant contribution to food security through several aspects: (1) Economic Aspect: A study in Surakarta showed that urban farming contributed Rp. 87,336.00 or 7.69% to the total monthly household food expenditure. Research in Ghana showed that urban farmers' income can reach 2-3 times that of rural farmers [7]. (2) Environmental Aspects: Urban farming helps reduce the carbon footprint of food production and improves environmental quality by increasing green areas. This practice also supports organic waste management by utilizing household waste as organic fertilizer [6]. (3) Social Aspects: Urban farming empowers local communities by providing employment opportunities and increasing citizen involvement in food management. In Bandung, the "Buruan SAE" program successfully reduced food dependence from 96.42% in 2020 to 90.16% in 2022 [6].

Several cities in Indonesia have successfully implemented urban farming. Jakarta tops the list with nearly 3,000 households engaged in urban farming, followed by Central Java and East Java. Surakarta, despite not having significant agricultural land, has significant potential to implement this concept as a sustainable development strategy [8]. The Indonesian government has initiated various programs to support urban farming, including the Sustainable Food Home Area (KRPL) which was socialized by the Ministry of Agriculture in

2018, and the Sustainable Food Yard (P2L) program in 2020 to address food insecurity and stunting [9].

Research emphasizes the importance of digitalization in agricultural modernization. Geographic Information System (GIS) technology can help prevent illegal land conversion and increase community participation in spatial planning monitoring. The implementation of the Internet of Things (IoT) enables automated monitoring of crop conditions such as humidity, temperature, and nutrient requirements [10]. The young generation in Lebak Regency has successfully distributed agricultural products through digital platforms such as Instagram, WhatsApp, and local applications, enabling direct access to consumers without the intermediary of middlemen [11].

This article is compelling, integrating an Islamic spiritual perspective into the context of urban farming. The author draws on Surah Yusuf (47) and Surah Al-A'raf (56) to demonstrate that urban farming practices align with religious teachings on long-term food planning and environmental sustainability [5].

Despite having great potential, the implementation of urban farming in Indonesia still faces various obstacles such as:

a) Limited land and planting space
b) Low government policy support in the form of special regulations
c) Lack of public understanding and knowledge
d) Lack of community participation and involvement

2019 BPS data shows that the majority of Indonesian farmers (91%, or 30.4 million people) are over 40, with only 8%, or 2.7 million, young farmers aged 20-39. This situation presents a challenge in the adoption of digital agricultural technology [11].

Research recommends three main strategies:

a) GIS-based digitalization of agricultural spatial planning and open data to prevent illegal land conversion.
b) Integration of circular farming and urban farming with the zero waste concept.
c) The younger generation as drivers of food innovation through millennial farmer programs and IoT technology.

Urban farming not only addresses the issue of food production quantity but also encompasses aspects of social intelligence, technology, and environmental sustainability. This approach aligns with the principles of sustainable development, which integrate economic, social, and environmental aspects.

This literature review demonstrates that urban farming is an innovative and comprehensive solution to address food security challenges in agrarian regions. Through the integration of digital technology, youth empowerment, and a sustainable approach, urban farming can be an effective alternative in addressing the modern food crisis. However, its implementation requires strong policy support, increased public digital literacy, and collaboration between various stakeholders to ensure the program's sustainability in the future.

3. Proposed Method

This research uses a qualitative approach with a case study method that focuses on the urban farming movement in creating food security in Banten Province. This approach was chosen because it allows researchers to deeply understand the dynamics of food power occurring in an agrarian region like Banten Province. The data sources used are primary and secondary. Through this study, researchers used data collection techniques based on literature studies to explore information on food security in an agrarian region like Banten Province. Furthermore, the data analysis technique used is content analysis. This technique is a technique that involves an in-depth discussion of the content of the information contained in the references that serve as research sources [12].

4. Results and Discussion

A. Food Security in Agrarian Regions

Food security is a condition that requires individuals to have the physical and financial ability to obtain access to safe and nutritious food according to their personal needs in living their lives [13]. This situation is a crucial issue that must be addressed in agricultural regions. These regions should have the potential to meet their food needs independently, supported by fertile land, available labor, and a persistent farming culture. However, the facts on the ground show that status as an agricultural region does not guarantee strong food security.

Structural and socioeconomic challenges often hinder the optimization of this potential. Banten Province, as an agricultural region in Indonesia, exhibits a similar dynamic. Agricultural land spread across Pandeglang, Lebak, and Tangerang plays a role in supplying food needs, particularly rice. However, the conversion of agricultural land to industrial and residential areas continues to increase. This is evident in Banten's loss of more than 9,869.61 hectares of productive rice fields due to land conversion [14]. This phenomenon directly impacts local production capacity and increases dependence on food supplies from outside the region.

The pressure placed on agricultural land also impacts smallholder farmers, who are key players in the local food chain. When agricultural land shrinks, not only incomes are threatened, but also the sustainability of food production at the community level. Loss of access to agricultural land can lead to farmer migration to non-agricultural sectors, leading to economic inequality and food scarcity in rural areas [15]. Current pressures should not lead to a shift from agricultural to non-agricultural sectors, ensuring food availability and economic stability.

Another factor contributing to the reduction in food supplies is climate change in agricultural regions. Unpredictable planting seasons, extreme rainfall, and pest infestations present real challenges, in addition to land conversion and public awareness. According to the Food and Agriculture Organization (FAO), climate change could potentially reduce food production by up to 30% in tropical countries [16]. Moreover, there are no concrete efforts to address these issues. Furthermore, farmers experience difficulties in food distribution, access, and stability. This can result in losses for farmers and high prices for consumers [17]. Due to these problems, farmers ultimately rely more on middlemen, which can result in reduced selling prices and distribution of goods [18].

Addressing these issues can be achieved through sustainable agriculture-based development in both agrarian and urban areas. Efforts such as environmentally friendly intensification, agricultural land protection, and simple innovations can be implemented. One such effort currently being undertaken by the South Tangerang City Government is reclaiming idle land for use in food security initiatives [19]. This utilization is expected to produce quality food in an era of limited urban areas.

B. Urban Farming: A Modern Adaptation to the Land Scarcity Crisis

Urban Farming is an innovative effort that exists as a sustainable solution to the limitations of creating food production in the midst of dense urban areas [20]. Building expansion, population growth, and the reduction of green open spaces threaten the functioning of local food systems and increase dependence on supplies from outside the region. Even food self-sufficiency seems difficult to achieve without innovation in spatial management [21].

Modern adaptations create food self-sufficiency, reflecting human efforts to respond to the challenges of the times, such as limited land and changing consumption patterns. This adaptation is realized through innovation in land management and the development of more efficient and sustainable food production systems. Current efforts include the development of hydroponic, vertical, and aquaponic areas, as well as the utilization of home gardens [22]. In essence, this farming model doesn't require extensive land, but rather utilizes limited space for greater efficiency. This practice has been implemented in densely populated and industrialized areas, particularly in Tangerang City. The Tangerang City government and community have successfully utilized limited land by establishing women's farming groups (KWT), which have produced a variety of foods for distribution to the surrounding community [23]. This concrete action not only improves food security in confined spaces but also impacts social action.

With this innovation, people no longer need to travel long distances to obtain food. Urban residents can now enjoy fresher, healthier, and more resilient produce. This plan aligns with the principles of the story of the Prophet Yusuf (as cited in Surah Yusuf [12]: 47), where Allah SWT says:

قَالَ تَزْرَعُوْنَ سَبْعَ سِنِيْنَ دَاَبًاۚ فَمَا حَصَدْتُّمْ فَذَرُوْهُ فِيْ سُنْۢبُلِهٖٓ اِلَّا قَلِيْلًا مِّمَّا تَأْكُلُوْنَ

Meaning: "(Yusuf) said, "Cultivate seven years in succession! Then whatever you harvest, leave it on its stalk, except a little for you to eat." (QS. Yusuf [12]: 47) [24].

The above verse explains that the Prophet Yusuf (peace be upon him) commanded his people to prepare everything they needed to face a prolonged crisis. This aligns with Nawawi Al-Bantani's Tafsir Marah Labid, which recounts a dream in which the Prophet Yusuf (Saw)

describes times of famine and prosperity [25]. Through this dream, the Prophet Joseph commanded the king to cultivate crops for seven consecutive years and to gather supplies to face the seven years of famine. Furthermore, according to Al-Razi, the people were instructed to plant food crops so that when a crisis occurred, they would not experience difficulties obtaining food [26].

The interpretation of this verse emphasizes the importance of planned production and wise management of food supplies. This information is not merely historical, but rather serves as a guide to the importance of building an adaptive food system. The inspiring stories presented can be applied in today's modern era. Therefore, these values align with the principles of urban farming, which emphasize efficiency, sustainability, and anticipating food crises.

Urban farming practices are not merely a means of survival, but also part of ecological jihad and a form of appreciation for preserving the environment. This aligns with Surah Al-A'raf [7]: 56, where Allah SWT says:

"Do not cause corruption on the earth after it has been properly arranged. Pray to Him with fear and hope. Indeed, the mercy of Allah is close to the doers of good." (Surah Al-A'raf [7]: 56) [27].

The verse above explains that Allah SWT has repaired the earth, so humanity should not damage it again, whether on a small or large scale. Because any form of damage will impact humanity [28]. According to Quraish Shihab, Allah SWT cursed mankind who caused damage to the earth with disbelief and sin, whereas previously the earth had been repaired so that it could be used for good [29].

Urban farming answers a real call by utilizing unused land, reducing the carbon footprint of food production, and creating a new generation that cares more about the process [30]. These efforts are very clearly in line with the interpretation, and do not conflict with protecting the environment. Apart from that, the presence of urban farming can form a social service that not only fills the stomach, but is also a form of preserving the earth.

Urban farming is a middle ground between crisis and hope. It was born from urgency, but thrives with a spirit of independence and spiritual awareness. With every plant that grows in a narrow space or corner of a small garden, there is enthusiasm and hope to become independent again and revive Prophet Yusuf's struggle for food security. Urban farming is not just the practice of farming, but silent preaching, solutions in the midst of limited space, and a real manifestation of faith that is grounded in the earth but looks to the sky.

C. Breaking Through the Deadlock: Solutions Towards Agrarian Food Security

Agricultural regions are often cited as the mainstay of hope in maintaining national food security. The vast potential of the land, vibrant farming traditions, and local wisdom passed down through generations are crucial assets that should be utilized. However, in practice, various obstacles such as shrinking productive land, unequal distribution, and the loss of interest in the agricultural sector among the younger generation are putting food security in agrarian regions to the test.

This is a complex issue, and even conventional approaches are no longer sufficient. Therefore, a new perspective is needed that can address the root of the problem and provide a sustainable solution. Strategies have been developed to address these challenges, firstly, by digitizing agricultural spatial planning. A digital approach to agricultural spatial planning based on geographic information systems (GIS) and open data is a cutting-edge solution to prevent illegal land conversion [31]. This geographic information system can assist local governments in mapping productive agricultural land and monitoring land use changes in real time.

The presence of this geographic information system will increase public participation in accessing spatial data, as well as an Android-based reporting application to detect potential violations of the Spatial Planning (RTRW). This was evident from 2016-2020, when agricultural land that did not utilize digital access tended to be less than optimal, even though productivity remained stable [32]. This concrete evidence demonstrates that strengthening digital systems is a comprehensive prerequisite for adapting to modern national agriculture.

Second, the integration of circular agriculture and urban farming. The circular agriculture concept prioritizes a zero-waste economy by utilizing household organic waste as compost and wastewater for micro-irrigation. This model has been adopted in the urban farming movement, utilizing hydroponics, vertical farming, and aquaponics, enabling communities to produce food in limited spaces with high efficiency.

Kompasiana noted that this system has been successfully implemented in Yogyakarta and Surabaya, where women's farming groups (KWT) have increased family income and local

productivity through circular urban farming [33]. In fact, practices like this not only strengthen local food security but also stem environmental degradation and improve the quality of life for the community. It is fitting that the regencies and cities in Banten adopt this system to maximize food security.

Third, the younger generation as drivers of food innovation. Their interest in the agricultural sector needs to be nurtured through approaches relevant to their lifestyles and mindsets. One successful example comes from the urban farm youth community in Surabaya, which combines vertical farming with an IoT (internet of things) system to automatically monitor humidity, temperature, and plant needs [34]. The presence of these innovations has not only increased youth interest in learning about the agricultural sector but also streamlined their work systems in producing quality food.

Programs like the Banten Millennial Farmers initiative, initiated by the Department of Agriculture, have encouraged young people to become not only producers but also digital distribution agents. Another example is youth in Lebak Regency, Banten, who have successfully distributed their agricultural products through digital platforms like Instagram, WhatsApp, and the local app Ekamar, directly promoting products to consumers, bypassing middlemen [35]. The presence of the IoT program and millennial farmers should raise awareness among young people about the current and future food situation, so that Banten's regencies and cities are less dependent on food production from outside the region. Furthermore, these innovations will not only facilitate food distribution but also help reduce rising food prices.

5. Conclusions

The urgency of urban farming is reflected in modern adaptations as an active response to food security challenges in areas with limited space. Innovations such as hydroponics and vertical farming provide practical solutions that can be implemented in limited spaces. Utilizing idle land and home gardens is a concrete step towards creating independent food sources. This approach emphasizes the importance of changing mindsets and taking swift action as the foundation for sustainable modern food security.

Maximizing food development requires sustainable solutions such as digitalizing agricultural spatial planning, integrating circular agriculture and urban farming, and mobilizing the younger generation to innovate in food security, which are believed to yield positive results. Through these innovative steps, it is hoped that the direction of future food development will not only focus on production quantity but also encompass social intelligence, technology, and environmental sustainability.

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