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Implementation of Urban Farming with Fertigation System on Vegetable Commodities for Food-Independent Communities

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Abstract: The objective of this community service action is to develop yards into plant cultivation areas with a fertigation system. Anticipated outcomes include the establishment of local food security within the community, which will promote a culture of food independence and protect the surrounding environment. This research was conducted from August to October 2023 through the utilization of the Participatory Rural Appraisal approach, lectures and demonstration plots. The outcome of this research is an enhancement in the partners' capacity to optimize the utilization of yards as cultivation areas for consumption crops, thereby realizing the long-term potential for achieving food independence. The researchers discovered that urban farming could be implemented in Tapis Village in order to establish a food-independent community. However, after receiving training, the researcher realized that for urban farming to be effective and increase community interest, it must also increase the economic value of the community.
Keywords: community service; fertigation; food independence; yard

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INTRODUCTION

Food security is crucial in facing global challenges involving various aspects of life, such as the economy, society, and the environment (Saputri & Rachmawatie, 2020). Amidst the escalating evidence of population expansion and climate change, which is manifested through fluctuations in global temperatures, rural areas can have a critical role in preserving food security (Wulandani & Anggraini, 2020). In general, rural areas possess the capacity to serve as a pillar in the preservation of food security. Rural areas possess more expansive agricultural spaces than their urban counterparts, which can be harnessed to attain food security

sustainably. Nonetheless, the community's productivity is currently hampered by the substantial number of migrations that transpire, in which many villagers opt to relocate to urban regions (Damaya et al., 2023). Furthermore, additional obstacles manifest in certain rural areas, where limited land resources beset certain villages due to extensive urbanization initiated by local governments and the transformation of agricultural land into industrial-related zones (Wibisono & Widowaty, 2023). Hence, it is not unusual for urban farming to be regarded as a viable approach to ensure food security in rural areas (Baskoro et al., 2021) despite its primary focus being on urban areas.

Okuputra et al. (2022) state that urban farming is an agricultural method implemented in urban regions or areas with restricted land. Its objective is to enable agricultural activities to continue despite the constraints by employing innovative approaches considering the limited land available for agricultural purposes. Scabra et al. (2021) state that urban farming typically employs a variety of constrained spaces in the vicinity, including terraces, rooftops, yards, and lands that are no longer utilized for agricultural purposes. Furthermore, urban farming contributes to environmental sustainability by mitigating the carbon footprint issue, yet another example of its positive environmental impact (Wijaya et al., 2020).

The adoption and execution of urban farming exhibit regional disparities contingent upon socioeconomic circumstances, climatic conditions, and infrastructure accessibility (Ramaloo et al., 2018). A comprehensive strategy encompassing production and distribution is necessary to ensure that urban farming effectively contributes to food security (Sonnino, 2016). A significant challenge in urban farming pertains to the scarcity of suitable land, especially adequate land (Cahyo et al., 2022). The land constraint is further intensified by the unpredictability surrounding the preservation of accessible land, primarily due to competition from other developments, particularly in the construction of buildings. From an economic standpoint, landowners generally favor construction development due to its higher profitability (Mundiyah et al., 2020).

The primary aim of the urban farming program, a Department of Agriculture initiative, is to reduce household expenditures while assisting impoverished individuals in obtaining nutritious food (Junainah et al., 2016). Nevertheless, it is critical to remember that urban farming encompasses more than mere plant cultivation in a deserted garden (Oktaviani et al., 2020). When urban farming is inadequately organized, additional complications may emerge. Urban farming implementation necessitates an initial investment in crop management. Failure to correctly implement this may result in financial strain for farmer organizations.

One approach employed to attain a food-independence community is implementing a fertigation system for vegetable cultivation. By facilitating the effective administration of water and plant nutrients, this system addresses the issue of limited land accessibility within urban farming. Therefore, the implementation of organized urban agricultural practices and the adoption of technological advancements like fertigation systems can contribute positively to the achievement of sustainable food security.

The village of Tapis is located in the Tanah Grogot Subdistrict of the Paser Regency in East Kalimantan. Its land area is 2.1 kilometers, and its population is ±4334 individuals. An examination of the population about the village area reveals a significant population density of 2.06 individuals per square meter

(Profil Desa Tapis, 2022). Population density in a restricted area necessitates the provision of adequate quantities of sustenance, both in terms of quality and quantity.

Concrete and pertinent strategies are required to mitigate the challenges of population density in a given region. The concept of installing a fertigation system in the backyard is motivated, in part, by the scarcity of land capable of producing sufficient yields to guarantee food requirements. Enhancing land potential for food production can contribute to maintaining local food security. Food security is achieved when individuals can procure an adequate quantity and quality of food that meets their requirements by optimizing their economic, social, and physical capacities (Noviani et al., 2020). Tapis Village's densely populated regions may find relief in the food requirements issue by implementing a food security strategy founded on a well-developed concept and executed effectively.

As a result, it is anticipated that the formulation of the proposed solution's benefits and objectives as part of the Student Creativity Program's food security-related activities in Tapis Village will maximize the utilization of yard land for agricultural cultivation. The utilization of the yard for food cultivation has the potential to enable the inhabitants of Tapis Village to attain food independence, thereby reducing their reliance on imported commodities. Long-term effects of this action include establishing a food-independent and productive community culture and preserving a green, clean, calm, and well-organized environment.

The researchers thereby intended to conduct research regarding the urban farming implementation in Tapis Village, Tanah Grogot District, Paser Regency, East Kalimantan Province. The researchers anticipate deriving conclusions through this research regarding the influence of urban farming on food independence and food security in the community and the determinants of urban farming's sustainability in the Tapis Village community.

METHOD

This research was implemented in August-October 2023 and was attended by 15 women farmers of Tapis Village, Tanah Grogot District, Paser Regency, East Kalimantan. The Participatory Rural Appraisal approach was applied through lectures and experiments (demonstration plots). The implementation stage was carried out as follows:

Preparation Stage

As an initial observation stage, a location survey was conducted to identify the challenges encountered by the partners. Subsequently, members of the farmer group and PKK participated in the extension activities to arouse public interest concerning implementing the fertigation system in the yard. The preparation stage included the discussion about land use permits, the timing of activity implementation, and the tools and materials utilized to reach an accord before conducting counseling.

Implementation Stage

Counseling, which consisted of a summary of the activities in material delivery, discussion, questions and answers, and practice (demo), was the initial action taken at this stage. Following the activity, participants were organized into multiple groups. They began to engage in autonomous practice while extension workers provided guidance and support regarding implementing fertigation system technology in the yards. The initial steps of the field practice were preparing tools and planting materials, filling polybags with planting media, transplanting seedlings, installing fertigation equipment, caring for the land and

plants, and implementing the drip fertigation system for watering and fertilizing. The pilot fertigation system underwent testing using suitable technology and local knowledge adaptations. It is anticipated that the implementation of urban farming inspires partners to assume the role of operators in utilizing the yards through urban farming.

Care Stage

This stage consists solely of the partners performing maintenance on the drip fertigation system installation and plants, including ensuring their sanitation and proper operation.

RESULTS AND DISCUSSION

Socialization of the Fertigation System

The offline socialization of the fertigation system took place in the yard of one of the partner members on June 17, 2023. Socialization was conducted through the extension worker distributing system-related materials to participants and installing and utilizing a fertigation system for fertilizing and watering yard crops.

Development of Fertigation Technology

Following the socialization of fertigation system-related materials, the subsequent course of action entails executing the installation of the fertigation system in accordance with the blueprint illustrated in Figure 1.

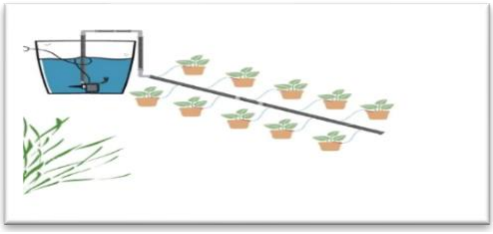

Figure 1 Design of fertigation system installation

Once the experimental phase has been successfully completed and the installation has been verified, the technology is deemed suitable for implementation in crop cultivation endeavors. It was mutually agreed that one of the food gardens in the partner's yard in Tapis Village would serve as the site for the installation.

Fertigation technology operates on the drip irrigation principle, whereby water is delivered autonomously to the root zone of cultivated plants via a hose from a reservoir by the required volume and duration of time.

Program Achievement Indicators

Implementing the fertigation system in the demonstration food garden, specifically designed to regulate environmental conditions, runs smoothly and as intended. Program achievement indicators may be assessed by:

a. The quantities of leaves and vertical extent of water spinach and bok choy increased substantially on days 7, 14, 21, and 28
b. The satisfaction of partner households' vegetable food requirements upon the commencement of the harvest period for cultivated plants, specifically on day 21 for water spinach and day 28 for bok choy.

Level of Program Sustainability

Mentoring is the last stage of implementing the fertigation system in the yard as a form of program sustainability. This activity aims to control and provide further guidance regarding evaluating and improving the fertigation system technology. The application of the fertigation system to the cultivation of plants in the yard succeeded well based on observations during direct assistance, which can be seen in Figure 2.

Figure 2 Fertigation system in the cultivation of crops

The mentoring model is carried out directly and indirectly between extension workers and partners. In contrast, indirect mentoring utilizes digital communication technology to discuss and follow up with the implementation of activities. After the mentoring activity as an act of program sustainability, partners also receive an evaluation of community service activities as in research (Pamujiati et al., 2023), which states that the purpose of the evaluation is to find out the level of success of the program carried out to partners. In this study, the data referring to the results of partner evaluation showed an increase in knowledge and expertise after socialization and training, with an average post-test result of 84.3. The post-test value indicates that every farmer group participating in the socialization and training program has a basic understanding of the necessary actions to execute urban farming using the fertigation system. Additionally, researchers discovered that urban farming instructed the community to provide water spinach and bok choy in sufficient quantities to meet the community's periodic requirements. If the practice is continued, the harvested water spinach and bok choy can be sold for additional revenue. The findings presented here are consistent with the assertions made by Chairinisa et al. (2022) and Kencana et al. (2021) that urban farming can generate quantities that meet the community's expectations and requirements. Furthermore, the researchers assessed the degree of contentment among farmer groups regarding the scientific investigation of the fertigation system the researchers conducted. Based on the responses to the questionnaire, all farmer groups (100 percent of participant groups) expressed satisfaction with the knowledge acquired, as it aligned with the circumstances of the vicinity, particularly the densely populated Tapis Village area, which caused insufficient land for farming. Nevertheless, during the evaluation phase about the taught urban farming system's development, researchers discovered that out of 15 farmer group representatives who attended the training, 8 of them (53.33%) stated that while they did comprehend the fertigation urban farming system, they still required support in developing the system further, particularly for other crops, as well as a viable sales system so that it could significantly help community income either as a side business or converted into a business that became the main source of income from the community. Analogous investigations were undertaken by Ali et al. (2023) to assess the efficacy of training program implementation centered around community service activities, and the programs achieved a success rate of 77.14%. Urban farming, which is a creative and innovative solution that can be utilized to the greatest extent possible by the community without questioning an individual's educational background, can provide a high level of satisfaction to those who have been trained in or have implemented it in areas with limited land, according to the explanation provided by Listyowati et al. (2023). Furthermore, a study conducted by Husodo et al. (2021) unveiled that urban farming could potentially yield substantial economic benefits provided that the relevant stakeholders establish a brand that aligns with agricultural products and demands

in the region and can serve as an emblematic figure for the affected village, thereby enhancing public awareness of the locality. The participants anticipate that the Tapis Village government will provide favorable guidance and support for the expansion of assisted village activities following the conclusion of this community service activity.

CONCLUSION

Based on the community service activity in Tapis Village, it is concluded that this program enhances partners' capacity to optimize the use of yard space to cultivate consumer crops and achieves the potential for local food security through long-term food independence. Additionally, this research demonstrates that the community can be incentivized to adopt urban agricultural practices through economic impact.

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