Urban farming model innovation with vegetable alley system to support sustainable urban agriculture governance evidence in Yogyakarta City, Indonesia

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Abstract. One innovative solution in the development of urban agriculture is the vegetable alley, which utilizes narrow spaces in alleys or residential pathways for cultivating food crops, ornamentals, and medicinal plants. This study aims to analyze and explain the management of urban agriculture through vegetable alley activities in Yogyakarta City. The research involved 80 respondents selected using a Simple Random Sampling method, with data collected through questionnaires. Data analysis was conducted using Descriptive Analysis and the Spearman Rank Correlation Test. The results indicate that the management of vegetable alley in Yogyakarta falls into the "good" category, covering aspects of planning, organizing, mobilizing, and controlling activities. Furthermore, correlation analysis identified five factors significantly related to urban agriculture management through vegetable alley: farming experience, the role of extension workers, the role of group leaders, member participation, and knowledge. Meanwhile, education level showed no significant relationship with vegetable alley management. Importantly, the implementation of vegetable alley as form of urban agriculture contributes to climate change mitigation by increasing green cover, enhancing carbon sequestrations, and promoting localized food production that reduces the carbon footprint from food transportation. Therefore, strengthening vegetable alley management requires enhancing member capacity, increasing the active roles of extension workers and group leaders, and reinforcing participation so that it can serve as a sustainable model of urban agriculture and support climate adaptation and resilience in urban communities.

1 Introduction

The rapid growth of the urban population presents significant challenges to food availability due to limited agricultural land. Urban farming has emerged as an alternative strategy to address food needs while responding to climate change impacts [1]. By utilizing narrow or

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unused spaces in urban areas, urban farming enables communities to independently and sustainably produce part of their food supply. This practice supports food security through crop diversification and enhances local resilience to climate-related risks such as flooding, drought, and extreme weather, which often reduce the productivity of conventional agriculture. Diversified cropping also strengthens food stability, as the failure of one crop may be compensated for by the survival of others under varying climatic conditions [2].

Urban farming additionally contributes to climate change mitigation and low-carbon urban development [3]. Producing food closer to consumers reduces transportation distances, shortens supply chains, lowers emissions, and creates new green spaces that function as carbon sinks. Beyond food sustainability, urban agriculture generates new economic opportunities through entrepreneurship, product commercialization, and employment creation. Therefore, urban agriculture serves not only as a food provisioning strategy but also as an instrument for building sustainable food systems, improving environmental quality, and strengthening community adaptation to climate change [4].

However, competition for land in urban areas continues to reduce available agricultural space. Rapid population growth has accelerated land conversion, exacerbated environmental degradation, and increased the risk of future food crises if local food production does not keep pace with demand. These conditions have encouraged public awareness of the need for self-sufficiency and environmental stewardship. Urban agriculture has emerged as a viable response by utilizing limited spaces for growing food, medicinal plants, and ornamentals. It is increasingly recognized as part of a sustainable lifestyle aligned with climate resilience, environmental protection, and energy transition [5].

Urban agriculture holds strategic value due to its economic, ecological, social, educational, and aesthetic benefits. Its presence in cities supports green space development while providing opportunities for additional household income through high-value crop production. Moreover, urban agriculture improves overall quality of life by creating healthier, greener, and more live able environments. Engagement in farming activities also strengthens community well-being by connecting people to food sources and fostering creativity in managing limited urban spaces productively [6].

Yogyakarta City, one of the most densely populated urban areas in Indonesia, faces increasing pressure on land availability due to rapid population growth and ongoing land conversion for residential and commercial purposes. This condition limits the availability of yard or open spaces for agricultural production and potentially threatens local food availability if food production cannot keep pace with growing demand. In response to these challenges, the Yogyakarta City Government, through the Agriculture and Food Service Agency, initiated several urban agriculture programs, including wall nursing, vegetable villages, cendol catfish cultivation, and its flagship initiative, the Vegetable Alley program. This program utilizes narrow alleys as productive planting areas for vegetables, medicinal plants, and ornamental species with the support of farmer groups and women farmer groups at the community level. Since its launch in 2019, the program has expanded through mentoring initiatives, farmer training, and community capacity building, serving as a strategy to strengthen local food security and increase urban green spaces [7] [8].

Urban agriculture has gained global recognition as an approach capable of delivering multiple benefits, including climate resilience, environmental enhancement, and improved household well-being. Previous studies highlight that urban farming supports urban food systems, generates economic opportunities, strengthens social cohesion, and contributes to low-carbon development pathways. However, despite growing interest, empirical evidence specifically examining community-led initiatives such as the Vegetable Alley program remains limited. Most existing research focuses on the potential benefits or conceptual framing of urban farming, while there is insufficient analysis on how such programs are managed, which factors affect participation and sustainability, and what operational challenges emerge in implementation within dense urban environments.

This gap indicates the need for a systematic evaluation of the management processes and determining factors that influence the performance of community-based urban agriculture programs. Addressing this gap is critical, as the long-term sustainability of urban agriculture depends not only on infrastructure or policy support but also on effective community engagement, leadership roles, and local capacity. Therefore, this study was conducted to describe the management practices of the Vegetable Alley initiative, analyze the factors associated with its implementation, and identify existing barriers or constraints.

The novelty of this research lies in its analytical focus on the management and operational dynamics of a government-supported, community-driven urban agriculture model in an Indonesian metropolitan context. By providing empirical evidence from the Vegetable Alley program, this study offers new insights that may support the replication, institutionalization, and scaling of similar initiatives in other cities facing comparable spatial and food security challenges.

2 Research Method

This study uses a descriptive analysis method with a quantitative approach. This approach is used to obtain an in-depth and comprehensive picture of the phenomenon that is systematically researched based on real conditions in the field. The focus of this research includes the management of urban agriculture through vegetable alley activities, factors that correlate with such management, and obstacles that arise in its implementation. The location of the research was determined purposively, namely in the city of Yogyakarta, because this city is the only area that implements urban agriculture programs through vegetable alleys, especially in Danurejan, Umbulharjo, and Kota Gede Districts. The sample determination was carried out using the Simple Random Sampling technique for farmer groups and their members. Through a random selection process using the spinner application, 20 farmer groups were obtained as sample units, and from each group 5 respondents were selected so that the total number of respondents was 80 people.

The type of data used in the study consists of primary and secondary data. Primary data were obtained through interviews using open and closed questionnaires, field observations, and visual documentation related to vegetable alley activities. Meanwhile, secondary data was obtained from related agencies such as the Agriculture Office and the Central Statistics Agency (BPS). Data collection techniques are carried out through observation, interviews, and documentation to ensure that the data obtained is complete and valid. The research variables include aspects of vegetable alley management based on management functions (planning, organizing, moving, and control), supporting factors, and obstacles analyzed using Rank Spearman Coefficient Correlation.

Data analysis was carried out through descriptive analysis to describe the characteristics of respondents and the level of management of vegetable alleys using the Likert scale. In addition, Spearman's Rank correlation analysis was used to test the relationship between factors that were suspected to be influential and the level of vegetable alley management. The results of this analysis provide information about the strength of the relationship between variables with a range of coefficient values between -1 to 1.

The characteristics of members of farmer groups involved in the management of urban agriculture through the vegetable alley showed variations in aspects of age, gender, and education. An explanation of the characteristics of the respondents can be seen in table 1.

The demographic profile of farmer group members in Yogyakarta City provides important insights into the composition and potential dynamics of participation in the Vegetable Alley program. Most respondents are in the middle-age category, with ages ranging from 40 to 52 years (46.25%), followed by 53–65 years (32.5%). Only a small proportion of members are younger (28–39 years, 8.75%) or elderly (66–77 years, 12.5%). This distribution suggests that the program is largely driven by experienced adults, while the participation of younger individuals—who could contribute to long-term sustainability and regeneration—is still limited.

Table 1. Respondent Characteristics of Farmer Groups Member in Yogyakarta City

Characteristics	Description	Number of People	Percentage (%)
Age (year)	28 – 39	7	8.75
	40 – 52	37	46.25
	53 – 65	26	32.5
	66 – 77	10	12.5
	Total	**80**	**100**
Education Level	Elementary School	5	6.25
	Junior High School	11	13.75
	Senior High School	41	51.25
	University	23	28.75
	Total	**80**	**100**
Occupation	Housewife	48	60
	Entrepreneur	14	17.5
	Teacher	2	25
	Retired	4	5
	Business Owner	11	13.75
	Unemployed	1	1.25
	Total	**80**	**100**
Income (IDR)	< 1000,000	29	36.25
	1,000,000–1,999,999	13	16.25
	2,000,000–2.999,999	21	26.25
	3,000,000–3,999,999	10	12.5
	>4,000,000	7	8.75
	Total	**80**	**100**
Farming Experience (year)	1 – 9	63	78.75
	10 – 18	11	13.75
	19 – 27	4	5
	28 – 35	2	2.5
	Total	**80**	**100**

In terms of education, the majority of respondents have completed senior high school (51.25%), while a substantial number of hold university degrees (28.75%). A smaller segment of participants completed junior high school (13.75%) or elementary school (6.25%). This indicates that most members have adequate educational background to engage in structured agricultural activities and to adopt new urban farming practices, which can facilitate effective program management and learning.

Occupationally, a significant proportion of respondents are housewives (60%), followed by entrepreneurs (17.5%) and business owners (13.75%). Other occupations include retired individuals (5%), teachers (2.5%), and unemployed (1.25%). The predominance of housewives reflects the social dimension of the program, as women's active involvement in urban agriculture can enhance household food security, provide additional income, and foster community cohesion.

Regarding income, the majority of respondents earn less than IDR 1,000,000 per month (36.25%), while others fall within the ranges of IDR 1,000,000–1,999,999 (16.25%), IDR

2,000,000–2,999,999 (26.25%), IDR 3,000,000–3,999,999 (12.5%), and more than IDR 4,000,000 (8.75%). These figures suggest that the program primarily attracts lower- to middle-income groups, highlighting its potential role in supporting economic empowerment and improving livelihoods through urban agriculture.

Finally, most respondents have limited farming experience, with 78.75% having 1–9 years, while a small proportion has 10–18 years (13.75%), 19–27 years (5%), or 28–35 years (2.5%). This indicates that the Vegetable Alley program largely involves relatively new or inexperienced urban farmers, emphasizing the importance of training, extension support, and mentoring to build skills and enhance program effectiveness.

Overall, the respondent profile suggests that the program is largely supported by middle-aged, moderately educated, lower-income individuals, particularly women with limited farming experience. These characteristics have important implications for program design, particularly regarding training, motivation, leadership, and sustainability strategies.

3 Results and Discussion

3.1 Farmer Group Activities

The activities of this farmer group are a series of activities carried out by all group members in the city of Yogyakarta. The types of activities that are often carried out by the farmer group are routine meeting activities, extension activities, and urban agricultural management activities through vegetable alley activities.

3.1.1 Routine Meeting Activities

Regular meetings are a routine activity of each farmer group, and its implementation is important to increase understanding among the members of the farmer group. This routine meeting activity is a forum for group members to discuss and share experiences, discuss the strengths, shortcomings and abilities of each group member as well as other difficulties faced for the development of farmer groups in the future. This routine meeting is generally held once a month for each farmer group.

Basically, the purpose of holding a meeting of group members is to build rapport with each member and discuss what should be done in the future to mobilize and develop the farmer group.

3.1.2 Extension

Counseling is one of the non-formal educations for members of farmer groups which includes activities in the cultivation and skills of the field to the members of the farmer group. The same chemistry extension workers who will guide and foster what must be done by group members in carrying out programs, especially in the use of urban yards. So that the activities in the farmer group will be monitored by extension members from each sub-district.

3.1.3 Vegetable Alley Activities

Urban agriculture management activities in each farmer group are currently still developing, where this activity aims to optimize narrow land to be inhabited by various plants, both vegetable plants, fruit plants, ornamental plants, and medicinal plants . The Yogyakarta City Government through the Agriculture and Food Service has established an urban agriculture model by carrying out vegetable alley activities with the aim of strengthening food security

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for the community. This in the use of yards is done because yards have the potential to be developed as food products, improve nutrition, and increase family income .

The urban agriculture program in Yogyakarta City is implemented with the existence of a vegetable alley. Vegetable alley is a program from the Agriculture and Food Service by utilizing narrow places or empty spaces such as alleys, walls, fences, and walls planted with vegetable plants, medicinal plants, fruit plants and ornamental plants and utilizing them as a food source through planting vegetable plants by considering the potential and needs of the local community. Plants that can be planted in the vegetable alley include vines and plants that can be planted using polybags, wall planter bags and pots.

Fig. 1. Vegetable Alley is one of the farmer groups

Vegetable alley in Yogyakarta City is an urban agricultural innovation that utilizes narrow alleys in residential environments as productive spaces for the cultivation of vegetables, family medicinal plants, and ornamental plants. This concept emerged in response to the limitations of agricultural land in urban areas and is developing as an effective strategy in supporting local food security. In addition to producing healthy and easily accessible food, vegetable alley also provides social and ecological benefits through improving environmental quality, establishing productive green spaces, and strengthening community interaction and participation [9]. In practice, the community utilizes various cultivation techniques such as Verti culture, direct planting, and hydroponic systems, so that vegetable alley is not only an ecological solution but also a sustainable urban farming learning model and innovation. One of the implementations of the vegetable alley from one of the farmer groups can be seen in Figure 1.

The implementation of vegetable alley activities is inseparable from the necessary infrastructure facilities starting from seed storage, seed houses and vegetable alleys to keep these alley activities running well. Urban agriculture has a positive impact on groups and individuals.

3.2 Urban Agriculture Management Through Vegetable Alley in Yogyakarta City

Vegetable Alley Management is a series of activities that plan, implement, monitor and evaluate activities for the use of urban yards with a vegetable alley system so that they run effectively and efficiently. The aspect of the management system in the implementation of the vegetable alley is how farmer groups manage the management functions of the Planning Function, the Organizing Function, the Driving Function, and the Control Function.

3.2.1 Planning Function

Fungi planning is the setting of goals and finding ways to realize urban agricultural management activities through the vegetable alley in the city of Yogyakarta. This is done so that the activity runs in accordance with the purpose. The following is a table of planning frequencies in the management of urban agriculture through the vegetable alley.

Table 2. Scores and Categories of the Planning Function for Vegetable Alleys

No	Indicator	Score	Average	Category
1.	The Agriculture and Food Office plan the Vegetable Alley program.	1 - 5	3.23	Good
2.	Extension officers recommend planning for the Vegetable Alley program.	1 - 5	3.48	Good
3.	Members of farmer groups participate in the socialization of the Vegetable Alley program.	1 - 5	3.26	Good
4.	There is a selection of commodities to be planted in the Vegetable Alley.	1 - 5	3.56	Good
5.	There is a selection of growing media for planting in the Vegetable Alley.	1 - 5	3.91	Very Good
6.	Farmer groups prepare the equipment needed for the Vegetable Alley program.	1 - 5	3.59	Good
7.	Farmer groups prepare an activity schedule for the Vegetable Alley program.	1 - 5	3.84	Very Good
8.	The Agriculture Office provides the necessary resources for the Vegetable Alley program.	1 - 5	3.71	Very Good
Total			**28.58**	**Good**
Average			**3.57**	

Score Categories: Not good = 1 – 2.33; Good = 2.34 – 3.66; Very Good = 3.67 – 5

Based on Table 2, it can be seen that for the criteria for the Agriculture and Food Service to plan the vegetable alley activity and the extension officer recommends that the vegetable alley is included in the good category, because most farmer groups hold alley activities on the basis of recommendations from the Yogyakarta City Agriculture and Food Office.

The planning function plays a fundamental role in ensuring that the Vegetable Alley program runs systematically and aligns with its intended objectives. The overall score of 3.57, categorized as Good, indicates that the planning aspects are generally well implemented, although some elements still require reinforcement. Indicators with the highest scores such as the selection of growing media (3.91) and activity scheduling (3.84) suggest that technical and operational planning is strongly established. This reflects that farmer groups have a clear understanding of cultivation techniques and time management, which are essential to maintaining plant growth cycles and program sustainability. Similarly, the provision of resources by the Agriculture Office (3.71; Very Good) demonstrates strong institutional support, which is critical for the continuity and scaling of community-based agricultural initiatives, this is in line with research on urban agriculture [10].

However, several indicators with relatively lower scores, including program planning by the Agriculture and Food Office (3.23) and member participation in program socialization (3.26), indicate that stakeholder coordination and grassroots engagement remain areas that need improvement. This suggests that while structural support exists at the government level, communication and participatory processes have not yet been optimized. The involvement of extension officers in recommending planning (3.48) and the process of commodity selection (3.56) being categorized as Good also shows that decision-making is functioning but may not yet be fully participatory or data driven. These findings imply that increasing community involvement, strengthening advisory roles, and improving alignment between organizational planning and community needs could further enhance program effectiveness.

Overall, the data illustrates that the planning process for the Vegetable Alley program is functioning effectively, forming a solid foundation for implementation. However, improvements in socialization, collaboration mechanisms, and participatory planning are needed to ensure long-term sustainability, community ownership, and adaptive management in response to changing environmental and social conditions. Strengthening these aspects will allow the program to evolve beyond structural implementation toward becoming a fully integrated model of participatory urban agriculture [15].

3.2.2 Organizing Functions

The organizing function is the process of meeting the vegetable alley needs of each available resource to execute the plan and achieve the goals associated with the success of the vegetable alley.

Table 3. Scores and Categories of the Organizing Function for Vegetable Alleys

No	Indicator	Score	Average	Category
1.	The head of the farmer group helps organize tasks and responsibilities for the Vegetable Alley activities	1 - 5	4.27	Very Good
2.	Task division for the Vegetable Alley activities is organized based on assigned roles and responsibilities	1 - 5	3.56	Good
3.	All members of the farmer group can work according to their assigned tasks and responsibilities.	1 - 5	3.78	Very Good
4.	All members of the farmer group can work efficiently by minimizing.	1 - 5	3.68	Very Good
5.	Task assignments for the Vegetable Alley activities are carried out according to the schedule.	1 - 5	3.53	Good
Total			**18.82**	
Average			**3.76**	**Very Good**

Score Categories: Not Good = 1 – 2.33; Good = 2.34 – 3.66; Very Good = 3.67 – 5

Based on Table 3, it can be seen that the criteria for the head of the farmer group involved in the preparation of tasks and responsibilities is included in the category of very good, it is because all the heads of the farmer group are involved in the preparation of tasks and responsibilities. These duties and responsibilities are discussed according to the agreement with the members of the farmer group.

In the criteria for the division of tasks in the implementation of vegetable alley activities, it is made with the grouping of tasks and responsibilities included in the good category, this is because most farmer groups distribute tasks to their members by grouping tasks and responsibilities [11]. For example, in the manufacturing of fertilizer using agricultural residues to make quality compost can significantly increase nitrogen mineralization and soil fertility [1]. Therefore, within the framework of urban agriculture — including models such as 'vegetable alleys', the application of organic compost from local waste can support crop productivity, maintain soil fertility despite land cramps, and sustainably strengthen urban food security. Based on the results presented in Table 3, the organizing function within the Vegetable Alley activities demonstrates a "Very Good" category with an overall average score of 3.76. This result reflects that the processes of task allocation, role determination, and coordination among members of the farmer group have been implemented effectively, although opportunities for improvement still exist. The highest-scoring indicator is the role of the group leader in organizing tasks and responsibilities with a score of 4.27, indicating that leadership plays a central role in ensuring clarity of structure and smooth execution of activities. Furthermore, members' ability to perform their assigned duties and work efficiently also falls under the Very Good category, suggesting that discipline, role understanding, and commitment among participants are well established.

However, two indicators fall into the good category, namely task division based on roles (3.56) and adherence to scheduled task assignments (3.53). These scores imply that although the organizing mechanism is functioning well, there is still room to strengthen the alignment of responsibilities and scheduling consistency within the program. The variation in scores across indicators suggests that the organizing function is relatively solid but would benefit from enhanced systematization, clearer documentation of roles, and improved time management strategies. Therefore, the success of the organizing function in the Vegetable Alley Program is shaped not only by strong leadership but also by the optimization of collective work systems that support efficiency, member participation, and long-term program sustainability [12].

3.2.3 Driving Function

The driving function is the task of the management to guide the members of the farmer group in accordance with the goals of the farmer group.

Table 4. Scores and Categories of the Driving Function in Managing Vegetable Alleys

No	Indicator	Score	Average	Category
1.	Members of the farmer group attend meetings related to the Vegetable Alley activities.	1 - 5	3.94	Very Good
2.	Members of the farmer group are always active in participating in Vegetable Alley activities	1 - 5	3.83	Good
3.	Extension officers are able to mobilize all farmer group members in carrying out activities.	1 - 5	3.13	Good
4.	The head of the farmer group provides direction by motivating each member to actively participate in the Vegetable Alley activities.	1 - 5	3.99	Very Good
5.	The farmer group attends meetings with the extension officer.	1 - 5	3.58	Good
6.	The farmer group conducts discussions regarding the Vegetable Alley activities.	1 - 5	3.99	Very Good
7.	here is a fee-contribution system for Vegetable Alley activities.	1 - 5	2.25	Not Good
Total			**24.71**	
Average			**3.53**	**Good**

Score Categories: Not Good = 1 – 2.33; Good = 2.34 – 3.66; Very Good = 3.67 – 5

Based on Table 4, it can be seen that the criteria for farmer group members to participate in vegetable alley activity meetings are included in the very good category, this is because farmer group members always attend activity meetings or regular meetings of farmer groups, which are usually done once a month.

The driving function in the management of the Vegetable Alley program demonstrates generally positive performance, with an overall average score of 3.53, categorized as Good. However, the variation across indicators provides important analytical insights. High scores for members' attendance at meetings (3.94, Very Good), motivation and guidance provided by the group leader (3.99, Very Good), and regular group discussions related to program activities (3.99, Very Good) indicate strong internal communication and effective local leadership. These findings suggest that the farmer group operates within a supportive organizational climate, where members actively participate, receive clear direction, and engage in collective decision-making—factors that are essential for sustaining community-based urban agriculture initiatives.

Despite these strengths, two indicators reveal notable weaknesses: the ability of extension officers to mobilize all farmer group members (3.13, Good but relatively low compared to other items) and the implementation of a financial contribution system (2.25, Not Good). The relatively low mobilization score suggests a disconnect between institutional support and field-level engagement. This gap may be attributed to limited time availability, insufficient participatory communication skills, or coordination challenges between extension services and community members. The low score for financial contributions indicates vulnerability in the program's financial sustainability. Without a consistent internal funding mechanism, the initiative may become highly dependent on external support, which can limit its long-term continuity.

The combination of strong leadership commitment and gaps in institutional mobilization and funding has clear managerial implications. Strengthening the capacity of extension officers, particularly in participatory facilitation, communication strategies, and member engagement would allow for more effective alignment between program objectives and member involvement. Additionally, developing a transparent and flexible contribution system is crucial. This could include tiered payments, revolving funds, or productivity-based contributions supported by clear financial reporting to build trust and participation [13].

From a program evaluation and policy perspective, these findings suggest that sustaining the Vegetable Alley initiative requires a balanced approach: not only focusing on technical agricultural operations but also reinforcing local institutional capacity and financial resilience. Practical recommendations include: (1) training extension officers in participatory mobilization methods; (2) facilitating member-driven design of a fair contribution mechanism; (3) establishing a simple financial management structure at the group level; and (4) conducting periodic monitoring of member engagement and the effectiveness of financial systems. Future research may benefit from qualitative exploration of barriers faced by extension officers in mobilizing farmer groups and experimental evaluation of alternative financing models to assess their impact on participation and program sustainability[11].

3.2.4 Controlling Function

The controlling function is part of the management systematics of the implementation of certain tasks.

Table 5. Scores and categories of functions operating the vegetable alley

No	Indicator	Score	Average	Category
1.	Extension officers conduct regular monitoring during the implementation of the Vegetable Alley activities.	1 - 5	3.10	Good
2.	There is periodic evaluation of the activities	1 - 5	3.45	Good
3.	Activity reports are prepared for each Vegetable Alley activity	1 - 5	3.63	Good
4.	Financial expenditure reports are prepared for the Vegetable Alley activities.	1 - 5	4.09	Very Good
5.	The head of the farmer group supervises members to prevent errors in carrying out their respective tasks.	1 - 5	3.79	Very Good
6.	Corrections are made if there are mistakes or deviations in the Vegetable Alley activities	1 - 5	3.79	Very Good
Total			**21.83**	**Good**
Average			**3.64**	

Score Categories: Not Good = 1 – 2.33; Good = 2.34 – 3.66; Very Good = 3.67 – 5

Based on Table 5, it can be seen that for the criteria for Extension Workers to carry out regular monitoring during the Vegetable Alley activities are included in the good category, this is because some extension workers often visit and monitor regularly to farmer groups.

The operating function in the management of the Vegetable Alley program demonstrates a stable level of implementation, with an overall average score of 3.64, classified as Good. This indicates that operational procedures are being carried out adequately, although certain elements show opportunities for further strengthening. Indicators receiving "Very Good" scores, such as financial expenditure reporting (4.09), supervision from the head of the farmer group (3.79), and implementation of corrective actions when deviations occur (3.79), reflect a structured and accountable managerial environment. These findings suggest that the program prioritizes financial transparency and operational discipline, both of which are essential for community trust and long-term program continuity. The strong supervisory role implies that responsibilities are taken seriously at the group leadership level, ensuring that activities align with established guidelines and expected standards.

In contrast, the lower-scoring indicators highlight areas that require improvement. Regular monitoring by extension officers received a relatively modest score of 3.10, marking it as one of the weakest points in the operating function. This may indicate limitations in personnel capacity, scheduling challenges, or insufficient coordination between the extension services and farmer groups. Similarly, the periodic evaluation of activities (3.45) and preparation of activity reports (3.63) received "Good" but not "Very Good" classifications, suggesting that these procedures are implemented but not yet optimized or consistently executed. These gaps may hinder the program’s ability to systematically measure performance, document learning, and support adaptive management.

Overall, the data indicate that while operational mechanisms are functioning, their effectiveness still relies heavily on internal group leadership rather than external institutional guidance. Strengthening the monitoring and evaluation system particularly through enhanced involvement of extension officers, could improve program accountability, facilitate knowledge transfer, and ensure standardization across participating communities. Strategies such as digital monitoring tools, scheduled evaluation cycles, and structured reporting templates could support more effective implementation. Furthermore, increased collaboration between farmer groups and institutional stakeholders may contribute to a more integrated operational framework [14].

In conclusion, the operating function of the Vegetable Alley program is performing adequately, but further refinement is needed to enhance systematic monitoring, evaluation, and documentation practices. Addressing these gaps is essential to ensure that the program not only functions efficiently at the implementation stage but also accumulates knowledge, maintains transparency, and supports ongoing program improvement and scalability.

3.3 Farmers' Group Members' Perceptions of Vegetable Alley Management

The perception of farmer group members towards the management of the vegetable alley is the view of the farmer group members in the management of vegetable alley activities in planning, organizing, mobilizing, and controlling. The following is a table conclusion from the perception of farmer group members towards the management of vegetable alleys in planning, organizing, mobilizing, and controlling.

Based on Figure 2, it can be seen that the perception of farmer group members towards planning is included in the good category, this is because the vegetable alley is well planned, starting from the selection of commodities to be planted in the vegetable alley, the selection of planting media, the preparation of the needs of the tools to be used, and making a schedule of activities. For the perception of farmer group members towards organizing is included in the very good category, this is because most of the vegetable alleys in the farmer group are well organized, with the division of duties and responsibilities of the vegetable alley activities well organized and the chairman of the farmer group is involved in the preparation of these tasks and responsibilities. Members of the farmer group who are given duties and responsibilities also carry out in accordance with their respective duties and responsibilities and are carried out according to the predetermined schedule [15].

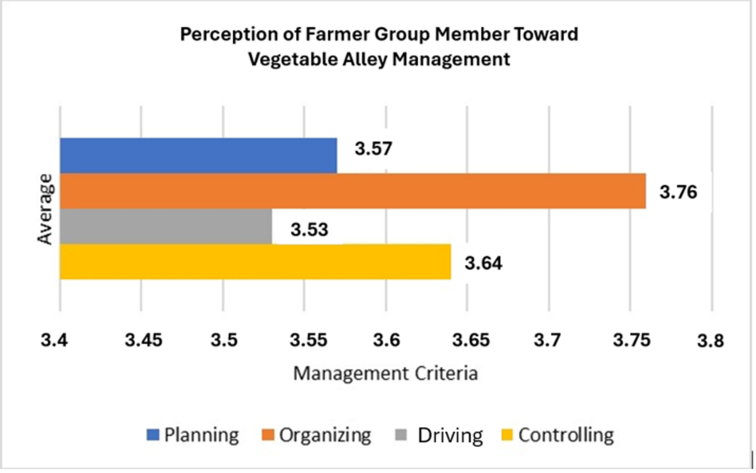

Fig. 2. Perception of Farmer Group Member Toward Vegetable Alley Management
Score Categories: Not Good = 1-1.8; Fairly Good = 1.81-2.6; Good enough = 2.61-3.4; Good = 3.41-4.2; Very Good = 4.21-5

For the perception of farmer group members on mobilizing is included in the good category, this is because the chairman of the farmer group provides direction by motivating each member of the farmer group to be active in the vegetable alley activities, so that the members are active in the vegetable alley, participate in regular meetings, discuss about the vegetable alley, and also participate in meetings with extension workers. For the perception of farmer group members towards controlling is included in the good category, this is because there is monitoring from the farmer group and extension workers often monitor by visiting farmer groups.

3.4 Factors Correlated with Urban Agricultural Management Activities Through Vegetable Alley Activities

Factors that correlate with urban agricultural management activities through vegetable alleys in group members can be calculated using the Sperm Rank Correlations. Urban agricultural management activities through Vegetable Alley can be influenced by educational factors, farming experience, the role of extension workers, the role of the chairman, the role of members and the role of knowledge. This factor is important to know because it can help to find out things that have a relationship or correlation, both positive and negative. Here is the table below.

Based on Table 6, the results of the analysis of each factor correlated with urban agricultural management activities through vegetable alleys in group members.

The results of the Spearman Rank correlation analysis reveal varying levels of association between the assessed factors and the four management functions—planning, organizing, mobilizing, and controlling—within the Vegetable Alley program. The analysis shows that education does not have a statistically significant relationship with any management function, as indicated by significance values greater than 0.05 across all categories. This suggests that participation and role performance in the program are not strongly influenced by formal educational background, implying that experience-based learning and practical engagement may be more relevant in community-based agricultural initiatives.

Farming experience also demonstrates limited correlation across management functions, with only one significant negative relationship observed with the controlling function (rs = -0.230; p = 0.040). This negative association may indicate that individuals with longer farming experience tend to rely on habitual practices rather than structured monitoring, reporting, or evaluation activities typically required in formal program implementation. Similarly, no significant correlations were found between farming experience and the planning, organizing, or mobilizing functions, underscoring that experience alone does not guarantee alignment with structured program management.

Table 6. Results of Spearman Rank Correlation Analysis

Criteria	Planning	Organizing	Mobilizing	Controlling
Education Rs Sig.	 -0.129 0.256	 0.196 0.082	 0.178 0.114	 0.157 0.145
Farming Experience Rs Sig.	 -0.143 0.206	 -0.132 0.242	 -0.201 0.074	 -0.230* 0.040
Extension role factors Rs Sig.	0.289** 0.009	0.382** 0.000	0.185 0.100	0.383** 0.000
Chairman role factors Rs Sig.	0.289** 0.009	0.382** 0.000	0.185 0.100	0.383** 0.000

Member Activity factors Rs Sig.	 0.343** 0.002	 0.298** 0.007	 0.155 0.170	 0.167 1.140
Knowledge Factor Rs Sig.	 0.164 0.145	 0.227* 0.145	 0.114 0.314	 0.186 0.199

Descriptions: *= significant at 0.05; **= significant at 0.01

The most influential variables in this study are the extension role factors and the chairman role factors, both of which show highly significant correlations with the planning, organizing, and controlling functions at the 0.01 confidence level. These results highlight the critical importance of leadership and extension support in ensuring effective program management. The strong correlations with controlling function (rs = 0.383; p = 0.000) suggest that structured guidance and leadership supervision play a vital role in ensuring accountability, implementation consistency, and adherence to planned procedures. Interestingly, neither factor showed a significant correlation with the mobilizing function, indicating that motivation and active participation of members may depend on other influences, such as social cohesion or internal dynamics rather than leadership direction.

Member activity factors also significantly influence planning and organizing functions (rs = 0.343 and 0.298; $p < 0.01$), reflecting that active participation contributes to more effective coordination and allocation of program responsibilities. However, no significant relationships were found with mobilizing or controlling functions, suggesting that while member involvement contributes to the structural stages of management, it does not automatically translate to sustained motivation or monitoring capacity.

Knowledge also plays a partial role, showing a significant relationship only with organizing function (rs = 0.227; $p < 0.05$). This indicates that members with greater understanding of program objectives and cultivation techniques are more likely to participate effectively in structured task allocation and administration. However, its lack of association with other functions suggests that knowledge alone is insufficient without accompanying leadership, motivation, or external support.

Overall, the correlation results emphasize that the success of urban agricultural programs such as Vegetable Alley is strongly influenced by leadership roles and extension support rather than formal education or farming experience. Strengthening member motivation, continuous mentoring, and knowledge-building initiatives may further enhance the operational and participatory aspects of program implementation [6].

4 Conclusions and Recommendations

4.1 Conclusions

This study aimed to analyze the management of urban agriculture through vegetable alley activities in Yogyakarta City. The findings show that the management of the program is categorized as good and effectively implemented through planning, organizing, mobilizing, and controlling functions. The correlation results reveal that formal education and farming experience have little influence on management performance. Instead, the roles of extension officers, group leaders, member participation, and knowledge are the key factors driving successful management.

These results highlight that the strength of the vegetable alley program lies in leadership, institutional support, and community engagement rather than technical background alone.

However, motivation and sustained involvement remain challenges that require continuous support and improved monitoring.

Beyond contributing to food security and community empowerment, the vegetable alley model also supports climate action by increasing green spaces, enhancing carbon sequestration, and reducing reliance on long-distance food supply chains. Therefore, strengthening participation, leadership capacity, and extension support is essential to sustain and scale the vegetable alley as a resilient and climate-responsive model of urban agriculture.

4.2 Recommendation

To enhance the sustainability and effectiveness of the Vegetable Alley program, it is recommended to: 1) strengthen extension support through continuous mentoring and technical guidance; 2) improve leadership capacity among farmer group leaders; 3) increase member motivation through incentive and engagement strategies; 4) optimize monitoring and evaluation mechanisms to ensure accountability; and 5) expand knowledge-sharing activities to improve skills and program performance.

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