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Introducing and Promoting Hydroponics Gardening Through Gulayan sa Paaralan Program (GPP) in Public Schools

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Abstract— *This study aimed to determine the status of the Gulayan sa Paaralan Program (GPP) or Vegetable Garden Program in public schools in the Division of Tanauan City, Batangas Philippines. Specifically, it sought to assess the implementation status concerning objectives, gardening practices, tools and materials, types of vegetables, and garden area/land area for gardening. It also aimed to evaluate the level of awareness of hydroponic gardening among TLE teachers or the GPP implementers with the end view of introducing and promoting hydroponic gardening system. The study likewise identified issues and challenges in implementing hydroponic gardening. This study employed a mixed-method approach, utilizing a questionnaire as the primary tool for data collection and focus group discussions to explore the issues and challenges in hydroponic gardening. The study was participated by TLE teachers from public schools in Tanauan City. The study revealed that the implementation of the GPP in public schools in Tanauan City effectively met its objectives. GPP implementers generally exhibited a higher level of awareness and understanding of hydroponics gardening. The study also revealed recognition among respondents of the potential benefits of integrating hydroponic gardening into the GPP to enhance student learning experiences. Based on the results, it was recommended to develop an instructional manual to address the identified challenges in hydroponics gardening in public schools within the Tanauan City Division.*

Keywords— *Hydroponic gardening; implementation status; Vegetable Garden Program; public schools.*

I. INTRODUCTION

Hydroponics, a soilless farming technique that utilizes nutrient-rich water instead of soil, is revolutionizing modern agriculture with its efficiency and sustainability. Unlike traditional methods, hydroponics requires minimal labor, land, and water while offering numerous benefits such as improved plant nutrition, faster growth, and year-round cultivation. The system conserves water by reusing nutrient solutions, making it ideal for water-scarce areas. Hydroponics also reduces the need for chemical weed and pest control, producing healthier crops. These features make it particularly suitable for urban and challenging environments where traditional farming is not viable. Research indicates that hydroponic systems can yield up to ten times more crops than conventional farming while using 90% less water, though energy demands are higher.

Historical evidence of hydroponics dates back to Babylon's Hanging Gardens, and today, it is utilized by commercial ventures, small-scale farmers, and organizations addressing food scarcity, such as the United Nations. In the Philippines, SNAP hydroponics, developed by Dr. Primitivo Jose Santos and Eureka Teresa Ocampo of UPLB, provides a cost-effective solution for growing vegetables like lettuce, cucumber, and pepper. This simplified method has made hydroponic farming accessible to more people, with support from initiatives like the Urban Agri Hydro Hub Learning Center in Quezon City, Philippines. Hydroponics has great potential to transform farming in areas facing environmental challenges. In the Division of Tanauan City, traditional farming under the Gulayan sa Paaralan Program (GPP) faces significant issues, including limited land, teacher workload, and environmental threats such as fumes from the Taal Volcano. The volcanic activity has led to polluted air and soil, negatively impacting the crops grown under the program. GPP aims to address malnutrition and promote vegetable cultivation in schools by providing a sustainable supply of produce for school-based feeding programs. However, these challenges have hindered its effectiveness in some schools.

Hydroponics presents a viable alternative for GPP schools in Tanauan City, Batangas. The system's ability to function in controlled environments allows crops to grow even under adverse conditions like volcanic emissions. Moreover, hydroponic farming aligns well with the objectives of the GPP by providing a consistent and high-quality supply of vegetables for feeding programs. Implementing hydroponics in schools can overcome land and water shortages, enabling sustainable farming practices despite environmental constraints. Beyond its practical advantages, hydroponics offers educational, social, and environmental benefits. Introducing students to this innovative farming method fosters creativity and scientific curiosity. Students and teachers can explore modern agricultural techniques, enhancing their understanding of sustainable food production. The use of hydroponics in school gardens can also serve as a model for the community, encouraging local stakeholders to adopt the technology and contribute to food security.

The Department of Education (DepEd) supports farming initiatives through its GPP program, established under DepEd Memorandum No. 223 series of 2016. This program

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emphasizes the importance of vegetable gardening in addressing malnutrition and promoting healthy eating among schoolchildren. It also supports the Department of Agriculture's efforts to reduce hunger by ensuring a steady supply of produce for school feeding programs. GPP implementation extends to 44 public elementary schools and 16 public high schools in Tanauan City. However, resource limitations, such as a lack of water, manpower, and materials, have made it challenging to sustain GPP gardens in certain schools. In some cases, the heavy workload of teachers further complicates the program's implementation.

Hydroponics can help mitigate these challenges by requiring less physical labor and making efficient use of limited resources. Additionally, hydroponic gardening provides a solution for schools with restricted space, as the system allows for closer plant spacing and vertical farming. This makes it a particularly effective strategy for urban schools and those with small plots of land. The integration of hydroponics into the GPP can also enhance its impact on school-based feeding programs. The program targets "wasted and severely wasted" students, aiming to improve their nutrition and overall health. Vegetables grown in school gardens are used in feeding programs, supplemented by funding from school canteens and other sources. Hydroponics can ensure a steady supply of nutritious vegetables, such as moringa (malunggay), lady finger (okra), tomatoes, and eggplant, meeting the dietary needs of students more effectively.

Schools in Tanauan City that adopt hydroponics can expect numerous benefits. The technology promotes sustainability by reducing water usage and minimizing the environmental impact of farming. It also creates opportunities for collaboration between students, teachers, and the community, fostering a culture of innovation and resilience. By addressing the limitations of traditional farming methods, hydroponics enables schools to maintain productive gardens despite adverse conditions. The adoption of hydroponics also aligns with DepEd's vision of sustainable and inclusive education. By incorporating modern agricultural practices into the curriculum, schools can prepare students for future challenges in food security and environmental conservation. Hydroponic gardening can serve as a hands-on learning tool, enhancing students' understanding of biology, chemistry, and environmental science.

Furthermore, it promotes awareness of sustainable practices, encouraging students to apply these principles in their communities. Despite its numerous advantages, hydroponics has some limitations, particularly its high initial cost and energy requirements. However, initiatives like SNAP hydroponics address these barriers by offering an affordable and user-friendly alternative. Schools and communities can adopt such systems with minimal investment, making hydroponics accessible to a wider audience. Partnerships with government agencies, educational institutions, and private organizations can further support the adoption of hydroponics in schools. Collaborative efforts can provide training, resources, and technical assistance, ensuring the successful implementation of the system. For instance, the collaboration between the Department of Agriculture, UP Diliman Institute of Biology, and other organizations has demonstrated the potential of hydroponics to transform urban agriculture in the Philippines.

In conclusion, hydroponics offers a sustainable and innovative solution to the challenges faced by the GPP in Tanauan City. Its ability to produce high-quality crops with minimal resources makes it an ideal alternative for schools dealing with land scarcity, environmental issues, and limited manpower. By integrating hydroponics into school gardens, the GPP can enhance its effectiveness in addressing malnutrition, promoting vegetable production, and fostering educational opportunities. This modern farming method not only supports the goals of the GPP but also contributes to the broader vision of sustainable food production and environmental stewardship.

II. Objectives

This research aimed to determine the introduction and promotion of hydroponics gardening in secondary schools in the Division of Tanauan City, Batangas, Philippines through Gulayan sa Paaralan Program (school vegetable program) with the intent of proposing an instructional manual about hydroponics gardening to aid TLE teachers who would endeavor to apply hydroponics gardening in their schools as part of the curriculum and instruction.

1. Determine the implementation of gulayan sa paaralan program in public schools in division of Tanauan in terms of objectives, gardening practices, tools and materials, types of vegetables, garden area/ land area for gardening.
2. Determine the level of awareness on hydroponics gardening of TLE teacher or the GPP implementer.
3. Identify the challenges and constraints in hydroponics gardening.
4. Propose instructional manual on school-based hydroponics gardening.

III. Review of Literature

Hydroponic gardening has gained attention as a sustainable solution for food production, particularly in urban and resource-constrained areas. Unlike traditional agriculture, hydroponics allows plants to grow in nutrient-rich water solutions, optimizing crop yields while conserving resources (Dabral et al., 2022). Research highlights the importance of spreading awareness of hydroponics to enhance food security and encourage environmentally friendly farming methods (Werner, 2018). However, studies by Pascual et al. (2018) reveal that misconceptions regarding the complexity and feasibility of hydroponics hinder its widespread adoption. Targeted educational initiatives and technical training are essential in dispelling these misconceptions and increasing knowledge, allowing hydroponic gardening to become a viable practice for urban communities, small-scale farmers, and schools.

Despite its advantages, hydroponic gardening faces several challenges, particularly regarding resource accessibility, financial constraints, and technical knowledge. Solis et al. (2020) emphasize that mastering nutrient management techniques and acquiring reliable information are key challenges for hydroponics practitioners. Additionally, financial constraints can limit access to necessary equipment, making it difficult to set up and maintain hydroponic systems

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(Mugambi, 2020). Regulatory complexities also pose obstacles, as compliance with agricultural laws and safety standards often requires significant time and resources (Kannan et al., 2022). Addressing these barriers requires collaboration among researchers, educators, policymakers, and local communities to develop strategies that facilitate hydroponic integration and long-term sustainability.

Educational institutions play a crucial role in advancing hydroponic gardening by incorporating it into school curricula and training programs. The Gulayan sa Paaralan Program (GPP) in the Philippines serves as an example of how gardening initiatives enhance student learning, promote environmental awareness, and encourage sustainable agricultural practices (Ibañez et al., 2023). However, logistical challenges, inadequate funding, and limited training for educators hinder its full implementation (Bautista, 2020). To overcome these barriers, schools can adopt innovative solutions such as repurposing materials for hydroponic setups and forming partnerships with local organizations (Ramirez, 2020). Providing well-trained educators and sufficient resources ensures that hydroponics becomes an integral part of agricultural education and contributes to sustainable food production.

Ultimately, hydroponic gardening presents a viable approach to addressing food security and sustainability challenges, but its adoption requires overcoming various obstacles. Encouraging community involvement, supporting educators, and implementing clear policies are crucial steps in promoting hydroponic systems. Research by Velasquez-Gonzales et al. (2022) highlights the importance of community-based educational initiatives in fostering acceptance and participation in hydroponic methods. Schools, local governments, and private organizations must collaborate to provide necessary resources and training. By addressing these challenges, hydroponics can contribute to a more resilient and sustainable agricultural future.

IV. Methodology

This study employed a mixed-method research design to examine hydroponic gardening in Tanauan Division schools, involving 157 TLE/EPP teachers, 51 of whom implemented the GPP. A validated researcher-made questionnaire along with surveys was utilized to collect the necessary data and was supplemented with focus groups discussion and informal interview to substantiate the analysis and interpretation of the data.

V. Findings

1. Implementation of Gulayan sa Paaralan Program

This study aims to evaluate the implementation of the GPP in public schools within the Tanauan division. The study covers various indicators such as objectives, gardening practices, tools and materials, types of vegetables, and garden area or land allocation. Data are presented in Tables 1 to 5.

Objectives. The implementation of the GPP in public schools within the Tanauan Division was assessed based on program's objectives. Table 1 presents the assessment of teacher respondents in terms of objectives. GPP implementers viewed the program positively, with implementers highlighting its role in fostering values like responsibility and teamwork, while non-implementers emphasized its health benefits. The assessment revealed their level of agreement on the program's objectives and some challenges in small-scale food production but showed strong overall support for the program's objectives.

TABLE 1. Implementation of GPP in terms of Objectives

Indicators	WM	VI
1. Instills values such as responsibility, care for the environment, and teamwork among students.	3.78	SA
2. Inculcates among the learners the values of gardening, good health and nutrition, love of labor, and caring of others.	3.69	SA
3. Promotes vegetable production in public elementary and secondary schools.	3.69	SA
4. Nurtures students' appreciation on the process of gardening.	3.69	SA
5. Produces vegetables in schools that are rich sources of protein, vitamins, and minerals, ultimately increasing vegetable consumption and improving learners' nutrition.	3.65	SA
6. Creates opportunities for students to apply theoretical knowledge gained in the classroom to real-life gardening experiences.	3.73	SA
7. Promotes vegetable consumption and production among students and their families to improve overall nutrition.	3.63	SA
8. Contributes in addressing malnutrition issues among students and pupils by supplying crop or vegetable in feeding program of school.	3.63	SA
9. Establishes and maintain school gardens as a reliable source of vegetables to sustain food supplies.	3.61	SA
10. Showcases small-scale food production.	3.53	SA
Composite Mean	**3.66**	**SA**

Legend: WM= Weighted Mean; VI= Verbal Interpretation; SA= Strong Agree; A= Agree

Gardening Practices. Table 2 presents the assessment of program's implementation regarding gardening practices. The data on gardening practices in the Gulayan sa Paaralan Program (GPP) indicates a strong commitment to sustainable and resource-efficient techniques, as evidenced by the overall "Strongly Agree" (SA) composite mean of 3.50. The most widely practiced method is the use of reusable materials such as pots, empty containers, tin cans, and tires for planting (WM = 3.61), reflecting a proactive approach to waste reduction and environmental conservation, which aligns with the principles of urban agriculture and sustainable resource use (Mok et al., 2014). Similarly, the preference for soil or agricultural bags as alternatives to traditional pots (WM = 3.57) highlights adaptability in maximizing available resources for gardening. The avoidance of synthetic fertilizers and pesticides (WM = 3.55) and the adoption of an organic gardening model (WM = 3.53) further emphasize the program's alignment with eco-friendly agricultural practices that promote soil health and food safety (Reganold & Wachter, 2016). Moreover, the integration of biodiversity through multi-cropping (WM = 3.53) and vertical gardening systems (WM = 3.51) showcases efforts to optimize limited gardening spaces while enhancing productivity and ecological balance. These findings suggest that the GPP effectively fosters sustainable gardening practices that not only address environmental concerns but also provide

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students with practical knowledge in organic farming, waste management, and biodiversity conservation.

TABLE 2. Implementation of GPP in terms of Gardening Practices

Indicator	WM	VI
1. Employ pots or any reusable materials such as empty containers, tin cans, or tires for planting.	3.61	SA
2. Utilizes soil bags or agricultural bags as an alternative to traditional pots.	3.57	SA
3. Refrains from using synthetic fertilizers and pesticides	3.55	SA
4. Establish and apply an organic gardening model.	3.53	SA
5. Grows a variety of different crops in one area, promoting biodiversity.	3.53	SA
6. Utilize a vertical garden system, where plants are arranged vertically and supported by structures like stakes, trellises, cages, or fences.	3.51	SA
7. Creates soil beds or garden beds using materials such as wood, timbers, bricks, or mounds, elevating the soil above its original level.	3.49	A
8. Uses square frames and dividers for planting.	3.49	A
9. Cultivates plants in fertile ground, nurturing them in nutrient-rich soil.	3.45	A
10. Composting, recycling yard waste and using natural fertilizers and pesticides were actively embraced.	3.45	A
11. Establish and utilize a hydroponic gardening system.	3.37	A
Composite Mean	**3.50**	**SA**

Legend: WM= Weighted Mean; VI= Verbal Interpretation; SA= Strong Agree; A= Agree

Tools and Materials. GPP implementers rated the use of adequate and suitable gardening tools highest, emphasizing the program's focus on effective and secure equipment, while long-lasting tools ranked second, highlighting safety and quality. However, challenges in tool maintenance and storage, particularly noted by non-implementers, indicated the need for improvement to sustain school gardening projects.

TABLE 3. Implementation of GPP in terms of tools and materials

Indicators	WM	VI
1. Uses suitable and appropriate gardening tools and materials.	3.82	SA
2. Uses tools and materials that are durable and safe to use.	3.71	SA
3. Provides tools in correct sizes that are appropriate for the user.	3.67	SA
4. Replace or repair gardening tools and materials that is defected or broken to avoid accidents.	3.67	SA
5. Cleans and sterilizes tools and materials before storing them.	3.63	SA
6. Gardening tools and materials in the school have an existing storage room.	3.63	SA
7. Use tools that can withstand the toughest jobs in the garden.	3.61	SA
8. Gardening tools and materials are complete and readily available	3.55	SA
9. Performs regular maintenance routines for gardening tools and materials	3.51	SA
10. Utilizes high-quality gardening tools and materials in good working condition	3.47	A
Composite Mean	**3.63**	**SA**

Legend: WM= Weighted Mean; VI= Verbal Interpretation; SA= Strong Agree; A= Agree

Types of Vegetables. The data on the types of vegetables planted in the Gulayan sa Paaralan Program (GPP) highlights a preference for nutrient-rich and easy-to-cultivate crops, ensuring sustainability and productivity in school gardens. Among leafy vegetables, moringa (76.5%) and pechay (66.7%) are the most commonly grown, likely due to their high nutritional value and adaptability to various growing conditions. Meanwhile, root crops such as ginger (35.3%) and cassava (33.3%) are cultivated to a lesser extent, possibly due to their longer growing periods and space requirements.

For podded vegetables, okra (72.5%) and string beans (51.0%) dominate, reflecting their resilience and high yield potential. Additionally, vegetables from the nightshade family, particularly eggplant (80.4%), papaya (66.7%), and tomato (60.8%), are widely grown, emphasizing their popularity and versatility in local diets. Less commonly planted crops, such as cabbage (3.9%), lima beans (3.9%), and chayote (7.8%), suggest possible challenges in their cultivation or lower demand.

The selection of vegetables indicates a strategic focus on high-yield, nutritious, and climate-resilient crops, which are essential for promoting food security, sustainability, and student nutrition within the GPP framework. Table 4 presents the assessment of GPP implementation regarding types of vegetables available in the garden.

TABLE 4. Types of Vegetables planted in GPP

Types of Vegetables	Frequency	Percentage
Contains leafy vegetable		
1 Moringa	39	76.5
2 Pechay	34	66.7
3 Mustard	23	45.1
4 Alug bati	14	27.5
5 Spinach	13	26.0
6 Cabbage	2	3.9
Root Crops		
1 Ginger	18	35.3
2 Cassava	17	33.3
3 Gabi	10	19.6
4 Onion	7	13.7
Contains podded vegetables		
1 Okra	37	72.5
2 String Beans	26	51.0
3 Sigarilyas	6	11.8
4 Lima Beans	2	3.9
Features fruits and vegetable in night shade family		
1 Eggplant	41	80.4
2 Papaya	34	66.7
3 Tomato	31	60.8
4 Loofa (Patola)	16	31.4
5 Bitter Gourd	15	29.4
6 Squash	8	15.7
7 Chayote	4	7.8

Garden Area or Land Area for Gardening. The results indicate that the most crucial factors for the successful implementation of the Gulayan sa Paaralan Program (GPP) in terms of garden area/land area are adequate sunlight WM = 3.57) and freedom from toxic contaminants (WM = 3.57). These findings align with the fundamental requirements for plant growth, as sunlight is essential for photosynthesis, while soil free from harmful substances ensures plant health and food safety.

Following these, the next two most important factors identified by respondents are ensuring the garden is not in a flood-risk area (WM = 3.55) and accessibility for those in

charge (WM = 3.53). A flood-free location prevents damage to plants and soil erosion, which could negatively affect crop productivity. Meanwhile, accessibility ensures that garden caretakers, such as teachers and students, can efficiently manage and maintain the garden, facilitating regular monitoring and care. Overall, these findings highlight that physical and environmental conditions play a significant role in optimizing the school garden's productivity and sustainability. Schools must prioritize these aspects when selecting or improving their garden areas to maximize success in implementing the GPP. Table 5 presents the assessment of GPP implementation regarding garden area or land area for gardening.

TABLE 5. Implementation of GPP in terms of garden area/ land area of gardening

Indicator	WM	VI
1. Gardening area receives sufficient sunlight, with a minimum of eight full hours of sun each day.	3.57	SA
2. Garden area is free from lead or any other toxic contaminants.	3.57	SA
3. Garden area is not a flood-risk area.	3.55	SA
4. Accessible for the people in charge.	3.53	SA
5. Features enough water supply.	3.43	A
6. Features efficient drainage and adequate air circulation.	3.41	A
7. Remains free from hazard and secured for students and teacher.	3.41	A
8. Possesses healthy soil capable of supporting the growth of various plant types.	3.39	A
9. Land area is not rocky and easy to cultivate.	3.37	A
10. Covers a minimum of 200 square meters	3.35	A
Composite Mean	**3.46**	**A**

Legend: WM= Weighted Mean; VI= Verbal Interpretation; SA= Strong Agree; A= Agree

2. Awareness on hydroponics Gardening. In the realm of GPP implementation, comprehending the level of awareness of hydroponics gardening among TLE teachers is pivotal for assessing the program's effectiveness and identifying areas for enhancement. Table 6 revealed the awareness level in hydroponics gardening among both implementers and non-implementers of TLE teachers.

GPP implementers showed higher awareness of hydroponics, valuing its space efficiency and ability to grow more vegetables, crucial for schools with limited garden areas. Non-implementers rated their awareness lower, emphasizing recyclable materials but perceiving hydroponics as less cost-effective. This highlighted a need for education on its long-term benefits, as implementers demonstrated stronger familiarity overall.

3. Challenges and Constraints in Hydroponics Gardening. The findings reveal that the implementation of hydroponic gardening in schools faces several challenges, primarily revolving around space limitations, financial constraints, knowledge gaps, and resource accessibility. Many schools struggle to allocate dedicated areas for hydroponics, as some spaces are repurposed for other priorities like classrooms. Additionally, teachers, already burdened with heavy workloads, find it difficult to manage gardening activities without additional workforce support. The lack of structured training and accessible materials further complicates the adoption of hydroponics, forcing educators to rely on self-directed learning and resourceful problem-solving. Financial limitations also play a critical role, as the high cost of hydroponic systems requires schools to strategically allocate limited resources or seek alternative funding, such as grants and partnerships. Moreover, external factors such as unpredictable weather conditions and volcanic fumes pose additional risks to crop productivity, necessitating protective measures to ensure plant survival.

TABLE 6. Awareness on Hydroponics Gardening

Indicator	WM	VI
1. Hydroponics allows us to grow and produce more vegetables in an efficient way.	3.88	HA
2. Hydroponics requires less space therefore it allows for a high density of plants in the same area.	3.88	HA
3. Through hydroponics non-arable land may easily be facilitated.	3.86	HA
4. Hydroponics have better nutritional value.	3.86	HA
5. Hydroponics is less expensive.	3.86	HA
6. Hydroponics have the ability to produce higher yields than traditional, soil-based agriculture.	3.84	HA
7. In hydroponic system, the vegetables produced are pesticide free products through biological pest control.	3.84	HA
8. Hydroponics allows food to be grown and consumed in areas of the world that cannot support crops in the soil.	3.84	HA
9. Hydroponic nutrients contain elements like Nitrogen (N), Potassium (K), Phosphorus (P), and other important elements that are vital to the survival of any living plant.	3.84	HA
10. Some vegetables like spinach, mustard, lettuce and cabbage can be grown through hydroponics.	3.84	HA
11. Hydroponics eliminates the need for massive pesticide use (considering most pests live in the soil), effectively making our air, water, soil, and food cleaner.	3.82	HA
12. Hydroponics eliminates consumption of artificial ripening agents and pesticides used on imported produce.	3.82	HA
13. Hydroponic plants have a higher pest resistance.	3.82	HA
14. Hydroponics can be done with accessible and recyclable materials like Styrofoam box, plastic cups and coco pit.	3.80	HA
15. Hydroponics is environmentally friendly on which it can help to conserve water, time and energy.	3.80	HA
16. In a hydroponics system, nutrient solutions may be recycled or re-used in other areas such as potted plants and turf management.	3.80	HA
17. Based on studies crops from hydroponics are healthier and nutritious than soil-based crops.	3.80	HA
18. In hydroponics system, nutrient solution is added in the water and used as the fertilizer	3.80	HA
19. Production from hydroponics increases from 3-5% with same space from other method.	3.76	HA
20. Hydroponic systems don't require crop rotation, which makes them ideal for larger scale fruit or vegetable production.	3.76	HA
Composite Mean	**3.83**	**HA**

Legend: WM= Weighted Mean; VI= Verbal Interpretation; HA= Highly Aware; MA= Moderately Aware

Despite these challenges, the study highlights promising opportunities for sustainability and market integration**.** Some schools have successfully collaborated with local businesses to supply hydroponic produce, demonstrating the potential of hydroponics as an income-generating initiative. However, concerns about food safety standards and market awareness

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suggest the need for further education and regulatory compliance. Engaging the community in hydroponic projects could enhance access to resources and foster shared learning, yet participation remains limited. Sustainability also extends to long-term system maintenance, requiring consistent funding and environmentally conscious practices. Encouragingly, students show strong enthusiasm for modern gardening techniques, indicating that hydroponics could serve as an effective tool for promoting agricultural innovation and sustainability awareness in schools. Moving forward, addressing these challenges through training programs, financial support, and collaborative efforts can enhance the viability and long-term success of hydroponic gardening in educational institutions.

5. Proposed Instructional Manual. The proposed instructional manual, Beginners Guide, was created to help TLE teachers integrate hydroponic gardening into their lessons. It provided a clear, step-by-step approach for setting up and maintaining a hydroponic system in schools, focusing on hands-on learning, sustainability, and interdisciplinary connections. The guide showed how hydroponics could enhance subjects like science, math, and environmental studies while fostering life skills such as teamwork and problem-solving. It covered plant selection, nutrient management, and troubleshooting, while emphasizing safety, accessibility, and collaboration among teachers, students, and the community to promote sustainable practices and enrich the educational experience.

IV. Conclusion

Based on the findings, the researchers have drawn the following conclusions:

1. The GPP implementation in Tanauan public schools successfully met its objectives by addressing gardening practices, tools, vegetable types, and designated gardening areas.
2. GPP implementers demonstrated greater awareness and understanding of hydroponics gardening compared to non-implementers, as reflected in their higher weighted means across various indicators.
3. Key challenges identified included limited space, production process difficulties, knowledge gaps, financial constraints, and weather conditions, with additional issues related to limited hydroponics information, budget constraints, market demand, and community collaboration.
4. The proposed "Beginners Guide" manual will provide the TLE teachers with practical guidance on incorporating hydroponic gardening into their curricula, promoting hands-on learning, subject understanding, and life skills while emphasizing safety, accessibility, and sustainability.

Recommendations

Based on the findings and conclusions, the following recommendations are endorsed:

1. The proposed instructional manual may be reviewed and implemented to establish understanding of hydroponics gardening practices and its incorporation into the Gulayan sa Paaralan Program within the public schools in the Division of Tanauan City.
2. The integration of hydroponics into the Gulayan sa Paaralan Program across the division may be enhanced, fostering widespread adoption and effectiveness.
3. A study may be conducted to facilitate the successful implementation of hydroponics gardening within the Gulayan sa Paaralan Program in the Tanauan City Division, providing insights and strategies for optimal outcomes and a mechanism to regularly evaluate the implementation of the GPP and hydroponics projects may be established to measure progress, identify issues, and provide timely interventions.

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References

[1] Bautista, M. (2020). Challenges in implementing school-based gardening programs: A case study of the Gulayan sa Paaralan program. *Journal of Agricultural Education, 45*(2), 112-125.

[2] Dabral, H., Sharma, R., & Meena, R. S. (2022). Hydroponic farming: A sustainable alternative to traditional agriculture. *Advances in Agricultural Research, 12*(4), 87-102.

[3] Ibañez, L. P., Cruz, R. T., & Delgado, M. J. (2023). Gulayan sa Paaralan program: Impact on student awareness and agricultural literacy. *Philippine Journal of Agricultural Extension, 17*(1), 56-70.

[4] Kannan, S., Patel, R., & Jadhav, A. (2022). Regulatory challenges in urban hydroponics: Compliance and standardization issues. *International Journal of Agribusiness Studies, 29*(3), 205-219.

[5] Mok, H. F., Tan, P. Y., Bai, X., & Lal, R. (2014). Urban agriculture and ecosystem services: A review. *Agriculture, Ecosystems & Environment, 198*, 123-136. https://doi.org/10.1016/j.agee.2014.06.013

[6] Mugambi, E. (2020). Financial barriers to hydroponic farming adoption in developing countries. *African Journal of Sustainable Agriculture, 8*(1), 33-48.

[7] Pascual, M. F., Reyes, D. G., & Santos, B. P. (2018). Misconceptions in hydroponic gardening: Barriers to adoption and possible solutions. *Asian Journal of Agricultural Innovation, 6*(2), 75-91.

[8] Ramirez, J. R. (2020). Innovative approaches to school-based hydroponic gardening: A review of best practices. *International Journal of Agricultural Education, 14*(1), 92-105.

[9] Reganold, J. P., & Wachter, J. M. (2016). Organic agriculture in the twenty-first century. *Nature Plants, 2*(2), 15221. https://doi.org/10.1038/nplants.2015.221
[10] Solis, P., Kim, Y. J., & Thompson, A. (2020). Nutrient management challenges in hydroponic systems: Best practices and solutions. *Journal of Plant Science and Technology, 21*(4), 142-158.
[11] Velasquez-Gonzales, J., Torres, L. R., & Mendoza, C. P. (2022). Community-based approaches to hydroponic gardening: Case studies and lessons learned. *Sustainable Agriculture Journal, 19*(2), 120-137.
[12] Werner, R. (2018). Urban hydroponics and food security: A review of potential and challenges. *Journal of Sustainable Food Systems, 9*(3)