

Improving Visual Quality and Economic Resilience through the Utilization of Used Goods with *Hydroponic Vertical Garden*

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Abstract

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Kelurahan Meruya Selatan in West Jakarta is a densely populated area with limited Green Open Space (RTH). South Meruya Village is the second smallest kelurahan in terms of area, at 2.8 km². Problems in some areas of the region include poor environmental quality, limited open area, and residents' economic constraints. These challenges necessitate green area efforts that will impact the residents' economy. There are several ways to greenery, but in limited areas, vertical hydroponic gardens are a potential solution. The advantages of vertical hydroponic planting include efficient land use and economic value. Cultivating plants using this technique is very profitable for those who use it, such as faster, healthier harvests, with maximum added value. Plastic waste can be utilized as a growing medium, including converting used bottles into hydroponic growing media. Green methods and hydroponic planting techniques can improve the environment while also providing economic value. Utilizing yard and roadside land is one way to improve food security on a community scale. Furthermore, it is hoped that community groups will be created that can participate in developing hydroponic plants to create a green environment and improve the residents' economy.

INTRODUCTION

South Meruya is a village located in Kembangan sub-district, West Jakarta, Special Capital Region of Jakarta, Indonesia. This village is bordered by North Meruya Village to the north, Karang Tengah District to the west, Srengseng Village to the east and Joglo Village to the south. In 2019, this village was inhabited by 50,735 residents divided into 25,281 males and 25,454 females (www.bps.go.id, 2019). The South Meruya Village area is a densely populated area with conditions in every resident's house where there is very little Green Open Space (RTH). The definition of RTH itself in article 1 of Law No. 26/2007 concerning Spatial Planning is an elongated area / path and/or grouping, whose use is more open, a place to grow plants, both naturally grown and deliberately planted (Prihandono, 2010).

Green open space (RTH) is the main element to the quality of the urban environment, this is because plants during the day can absorb the heat of sunlight in the process of photosynthesis and then evaporate it back into the air in the process of evapotranspiration which has a cooling effect. South Meruya Village is the second smallest urban village with an area of 2.8 km². The problems in some areas of the region are poor environmental quality, limited open land and economic limitations of residents. An area that has good visual quality and has a distinctive character will give an attraction to the area (Lynch, 1960).

METHOD

The team conducted a survey in South Meruya sub-district, West Jakarta, which is willing to be an implementation partner. The discussions conducted with partners aim to formulate solutions that can be implemented in the implementation of targeted community service programs. Based on the discussion, the following stages of implementation were obtained:

1. Survei untuk observasi dan wawancara agar mengetahui kondisi lingkungan atau wilayah kelurahan Meruya Selatan.
2. Identifying problems in South Meruya sub-district
3. Socialization with South Meruya Village Head and its staff and South Meruya residents
4. Ordering the required tools and supplies
5. Opening of community service program activities, presentation of program materials and training by Instructors
6. Practice / Work on making hydroponic vertical gardens and planting seedlings.
7. Maintenance and monitoring until harvest.
8. Handover of activities and closure of programs in South Meruya sub-district

The partners in this case are the South Meruya Village Head and its staff and residents participate in supporting this Community Service activity. Partners will follow all directions from the PkM TEAM. Partners will take part in training, socialization and implement hydroponic vertical gardens because this will be beneficial for partners. The target achievement is shown in Table 1.

Table 1. Target Achievement

Step 1	Step 2	Step 3	Step 4	Step 5	Step 6
Capable partners understand guide About how to cultivate plants with hydroponic vertical garden and Entrepreneur ship	Partner can Applying plant cultivation methods with hydroponic vertical gardens and Entrepreneur rship	Application by Continues and consistency from partners on the cultivation of hydroponic vertical garden plants	Analyze Scarcity /debilitation On the Application of Vertical Garden Hydroponic Plant Cultivation	Improving the shortcomings /weaknesses of the application of hydroponic vertical garden plant cultivation	Developing vegetable production to be sold to people outside South Meruya Village

RESULTS AND DISCUSSION

The implementation of community service activities was carried out at RPTRA Mahkota and RPTRA Meruya Selatan South Meruya Village with two sessions, namely the delivery of materials and practices/training on hydroponic planting methods, socialization of vertical gardens and the use of used plastic bottles and financial socialization of making hydroponics using used plastic bottles.

Community service activities are carried out as follows.

1. Making Hydroponic iron frames, and preparing used bottles as planting medium. From July 11 to July 18, 2024, the manufacture of iron frames, the installation of paralon pipes and bottles of used *hydroponic vertical garden* located at RPTRA Manunggal Meruya Selatan. This activity was carried out by all team members and assisted by welders. There is a division of duties, some are painting, iron frames, modifying used bottles so that they can be used as planting mediums, painting modified bottles, assembling paralon pipes, installing paralon pipes, and electrical installations for water pumps. An overview of hydroponic installation activities is shown in Figure 1 below.



Figure 1. Hydroponic Installation Activities

2. Training Session 1

The 1st session of training took place at the RPTRA Mahkota, South Meruya Village on Friday, July 12, 2024 at 08.00 WIB until it was finished. The event was attended by the Vice Chancellor Mrs. Dr. Erna, Mr. M. Ghufri Fatchani, S.M., Dean of the Faculty of Economics and Business, Mrs. Dr. Nurul Hidayah, SE., Ak. M.Si, Chief Executive Dr. Ir. Tin Budi Utami, MT., all Team members, External Speakers and students. The opening of the activity and remarks from the Vice Rector and the Village. Furthermore, the presentation of material by external resource persons, namely Mr. Ahmad Sugiarto and the second material was the socialization of *vertical gardens* and the use of used plastic bottles by Dr. Ir. Tin. The number of participants who attended from Mitra representatives was 30 people. The activity is shown in Figure 2.



Figure 2. Hydroponics and *Vertical Garden Training*

3. Seed Transfer to Hydroponic Media

After 1 week of seedlings, on July 30, 2024, to be precise, the seedbeds are ready to be transferred to hydroponic media, namely paralon pipes and used plastic bottles. The transfer was carried out in the morning and was attended by the South Meruya Village Head M. Ghufri Fatchani, S.M and the PkM Team.



Figure 3. Seed Transfer Activities to Hydroponic Media

4. Training Session 2

The training session 2 took place at RPTRA South Meruya, South Meruya Village on Friday, August 2, 2024 at 08.00 WIB until it was finished. The second session of training was attended by South Meruya Village Head M. Ghufri Fatchani, S.M, Vice Chancellor Dr. Erna, Chief Executive Dr. Ir. Tin Budi Utami, MT., all Team members, and Partner participants, namely the South Meruya PKK. The opening of the activity and remarks by the Village Head. Furthermore, the delivery of socialization material on the cost of making hydroponics using bottles/used goods. And the last event was a question and answer session.



Figure 4. Session 2 Activities at RPTRA South Meruya

5. Hydroponic Vegetable Harvesting

On August 22, 2024 in the morning, we harvested pakcoy vegetables which were attended by the entire PkM team.



Figure 5. Harvest Activities

Vertical garden is a method of growing crops using narrow and limited land using walls or spaces vertically covered with plants in the planting medium (Harahap, 2023). Hydroponics from the Greek word *Hydro* means water and *ponos* means power. So hydroponic plants are plants that are grown by using water without the use of soil as a planting medium. Hydroponic vertical garden can be said to be farming on narrow land vertically with the use of water and without the use of soil as a planting medium.

The hydroponic system used in this PkM activity uses a DFT (*Deep Flow Technique*) system for those who use a paralon pipe and a *wick* system (wick) for those who use used bottles. A DFT (*Deep Flow Technique*) hydroponic system is a hydroponic floating system in which plants are placed in a pipe hole with a netpot and nutrient solutions translocated around the roots either by gravity or using a pump.

While *the wick* (wick) system of plants gets this system, the supply of nutrients to the plant medium is carried out by the intermediary of the axe. The way it works is similar to a kerosene stove where the nutrient solution flows from a container to the roots of the plant by utilizing the principle of water capillarity. This hydroponic can use used plastic bottles as its growing medium, shown in Figure 6.

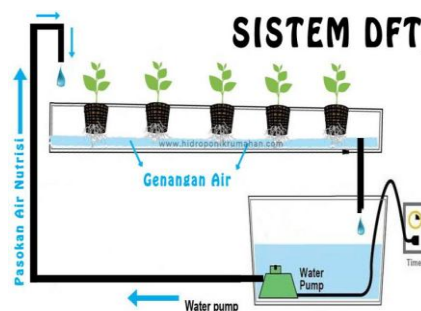


Figure 6. Hydroponic DFT System



Figure 7. Technology Products

The vertical garden is in the form of an iron frame whose roof uses a rectangular hollow iron Nok with iron strip and *silent fiberglass*. The main frame is round iron, the foundation of the cast concrete pillars. *The wiremesh* where used bottles hang is made of an iron frame. And for paralon pipes, use good quality ones with their specifications, each pipe length is 4 meters with a diameter of 3 inches. The used plastic bottle used is 1.5 liters. An overview of technology products is shown in Figure 7.

This PkM activity is carried out in accordance with the situation and conditions of the southern Meruya partners in terms of regional and community potential and their problems. The South Meruya area has limited and densely populated land. This makes the visual quality decrease caused by less controlled development and limited land. Hydroponic vertical garden is one of the solutions to this problem. Where plant cultivation using this technique is very beneficial for the perpetrators such as it does not require a large amount of land, plant harvesting can be faster, healthier, with maximum yields, and can utilize plastic waste by turning used bottles into hydroponic media.

South Meruya residents actively participated from the beginning of the activity, namely from the process of planning, implementing activities, evaluating and sustainability of this PkM activity. Participants were very enthusiastic about participating in every socialization activity of this hydroponic vertical garden, this can be seen from the number of participants who attended. Public interest is increasing along with increasing awareness of the importance of green open spaces to improve visual quality and reduce air pollution, the use of used goods can reduce plastic waste and plant products can be consumed so as to meet the needs of residents for food in the form of vegetables.

Hydroponic vertical gardens are very beneficial for the environment and residents. Training in making plants in the form of *vertical* hydroponic gardens is one of the solutions for green open spaces that can improve visual quality, reduce air pollution and besides that the plant products can be consumed by local residents to meet the needs of residents for food in the form of vegetables and can also be sold to people outside South Meruya Village and become a source of additional income for housewives. And by using used bottles, it will reduce waste that makes the environment cleaner and more comfortable.

The use of yard land is one way to increase food security on a household scale. Thus, it is hoped that every community that participates in developing hydroponics will be helped, their economic system will be helped. Where the current condition of the Indonesian economy where all basic necessities have soared prices, but not accompanied by an increase in income. There are many types of vegetables and fruits that can be cultivated hydroponically such as kale, spinach, celery, pokcoi, lettuce, chili, tomato, melon, cherry tomatoes and others.

CONCLUSION

Conclusions and Suggestions

The problem in some areas of the South Meruya area is the lack of green open space and the economic limitations of residents. A potential solution to overcome the problem of limited land is a *vertical garden*. The UMB Community Service Team provides training on *hydroponic vertical gardens* by planting various types of vegetables, using plastic bottle waste and calculating the cost of making hydroponics using bottles/used items. This counseling was held at RPTRA MAHKOTA South Meruya on July 12, 2024 and RPTRA MERUYA SELATAN on August 2, 2024. This activity has a positive impact, especially for the South Meruya Mitra community group for the implementation of hydroponic vertical gardens while improving the residents' economy. The achievement

of the target from community service shows that in its entirety the activities can be accepted by the Partners, then to get maximum results, it is necessary to carry out monitoring, evaluation, and continuous mentoring.

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