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The Enhancement of Space Function as Ecofarming at the Underpass of Becakayu Toll Road (Bekasi Cawang Kampung Melayu)

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A B S T R A C T

The existence of the becakayu toll road overpass creates open space under the road that needs to be managed because it makes the environment dirty, dusty, irregularly planted, and useless. This research aims to identify open space under the becakayu toll road as a basis for determining the eco-farming zone. The research method used is descriptive qualitative using field observations, interviews, literature studies, and documentation. The results showed that the current utilization of the becakayu toll road is not well organized (70%). Used as greening (50%), used as parking (20%), used as a sidewalk for skateboarding and cycling activities (17%), used as a fish pond (10%), and used as a place to sell (20%). From this study, the becakayu toll road can be utilized as an eco-farming area (93%). The benefit of this research is that the space under the becakayu toll road will be organized and efficiently used for the needs of the community and the surrounding environment.

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INTRODUCTION

The Bekasi-Cawang-Kampung Melayu Toll Road is a toll road built along the Kalimalang Canal on an arterial road 9.5 kilometers long. The condition of the space under the Becakayu toll road is currently being used for various activities that are less efficient ecologically and productively. Ecologically, this space involves land, air/sunlight, and vegetation, while land productivity is related to the potential of land to produce in a unit area (Suwarto, 2005). Under the Becakayu toll road, which is currently used as a car storage area, buildings and several locations remain empty. Some locations are also planted with wild plants, but there are also those planted with valuable plants, although they ignore the ecological elements for the life of these plants.

The importance of maintaining urban agriculture is not only limited to its economic function as a livelihood for some residents but also involves ecological, aesthetic, and health functions (Rifqi Fauzi et al., 2016). One idea for filling the outer space under the Becakayu toll road is to create an eco-farming, sustainable farming system. Before carrying out eco-farming planting, it is necessary to identify the spaces under the Becakayu toll road.

The potential diversity of existing local businesses and resources, if managed well, can create integrated urban agriculture, produce a sustainable environment, and improve the welfare of its managers (Budiarjono & Wardiningsih, 2013) (Salim, M.N., 2020). Space, which involves land, sea, and air space, including space inside the earth, is a unified area where humans and other creatures live, carry out activities, and maintain their survival (Peraturan Presiden Nomor 60, 2020). Minister of Public Works Regulation No. 05/PRT/M of 2008 emphasizes that managing green open space (Ruang Terbuka Hijau) in urban areas must be carried out collaboratively

Eco-farming is an integrated agricultural system that focuses on efforts to protect and preserve effective and efficient agricultural media. Through a sustainable cycle, eco-farming produces quality and economical agricultural processes and products and helps protect and preserve the environment (Nurcholis, M. and G., 2011). This research will identify spaces formed under the Becakayu Bridge that can be used as spaces for eco-farming.

The character of open space formed under the Becakayu toll road can be categorized based on area, as well as the characteristics of the surrounding environment. The purpose of this research: a. Identify the outdoor space formed under the Becakayu toll road b. Determine the zones that have the potential to be used as eco-farming areas according to the area, environmental conditions and whether or not the space is covered from sunlight.

LITERATURE REVIEW

As the human population grows, urban areas are expanding. By 2030, around 60% of the human population is estimated to live in urban areas (Kompas, 2022). Millions of agricultural lands will be displaced for housing and other purposes. Meanwhile, the human population is growing exponentially, and global food demand will increase. So, there will be a decrease in land availability per capita. Environmentally friendly solutions to meet food demand are of serious concern (Programme, 2007). Land degradation due to

mismanagement, shrinking agricultural land due to land conversion to non-agriculture, limited land for agricultural intensification, and high production input needs, especially on sub-optimal lands, add to the length of the problem that must be overcome and have an impact on reducing agricultural productivity (Suyamto, 2010)(Mulyani et al., 2019)(Hidayati et al., 2019).

Specialized landscape management such as eco-farming needs to fulfill three objectives, namely conserving biodiversity and ecosystem services, providing agricultural products, and supporting livelihood viability for local communities (Denier, L., Scherr, S., Shames, S., Chatterton, P., Hovani, L. and Stam, 2015). Implementing eco-farming landscape management can show the collaboration of activities, conservation, agriculture, and development that go together and are mutually beneficial (Denier, L., Scherr, S., Shames, S., Chatterton, P., Hovani, L. and Stam, 2015). The most widely practiced urban agriculture system is urban gardening. The crops that are cultivated are vegetable crops. The characteristic of urban gardening is planting in containers with various types of vegetable crops. The use of containers characterizes urban agriculture for the following reasons:

a. Allows intensive plant maintenance within limited space
b. Facilitates the implementation of compound cropping in one container (intercropping)
c. It allows for soil and water savings because irrigation is quickly regulated, and soil use is only 1/3 the volume of the planting medium
d. Allows for the utilization of idle land. Allows the utilization of idle land in urban areas
e. Increase the work of people with limited skills and need formal education
f. Planting becomes cheap because it can utilize goods unavailable in the city. Planting becomes cheap because it can utilize unused items
g. Creates creativity in utilizing used items to grow vegetables. h. can be used as psychological therapy by growing vegetables. Gardening can be used as psychological therapy (Konyut, 2018).

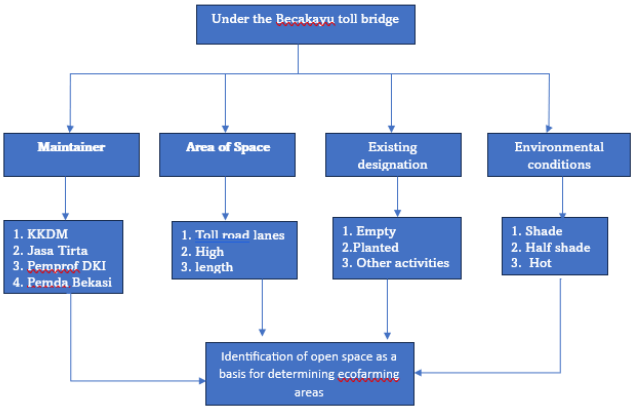

Figure 1. The Criteria Chart of Becakayu Underpass Space Division
Source: Research Documentation, 2023

Field observations were made by following the Becakayu toll road underpass (the space between the poles). It can be categorized into 20 spaces with criteria for width, length, and height of spaces that allow it to be utilized for eco-farming, urban farming, or other activities related to environmental improvement (Figure 1).

METHODOLOGY

This research was carried out for nine (9) months, from October 2022 to July 2023, along the Becakayu toll road section 1A-1B, with a length of 12.5 kilometers. The research method used to prepare this writing is the analytical-descriptive method 1. Observation of the sections in the underpass is a data collection technique carried out systematically through observation and recording of conditions in the field. Observations were conducted by inspecting the spaces under the Becakayu toll road, and 20 became observation areas (Figure 2). The length of the space or section is calculated as the length between columns, while the column width depends on the width of the road above, consisting of one lane, two lanes, three lanes, and four lanes. The width of each lane is 10 meters.

Meanwhile, the height of the space under the Becakayu toll road is 6 meters. The condition of the road is above the Tarumbarat River (Kalimalang). Each space is observed for its current use, management, and the environment around that section. The length of the Becakayu toll road, which is being observed, is 12.5 kilometers. Several segments cannot be observed because they do not form space or the space is too low (Figure 3).

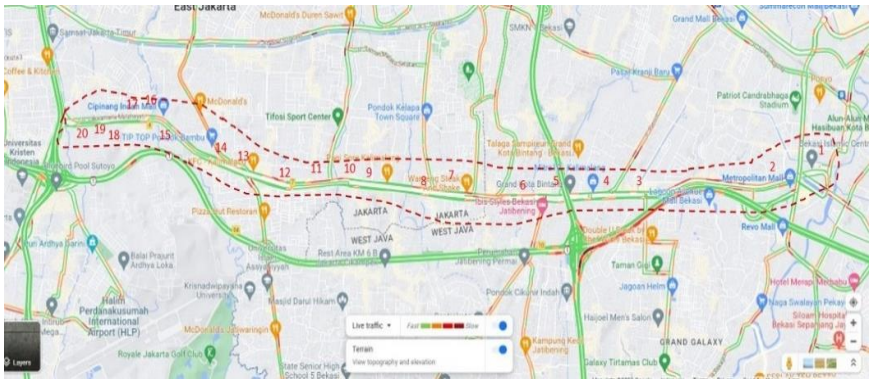

Figure 2. The Observation Area Consisting of 20 Spaces Under the Becakayu
Source: Google Map, Modification by Researcher, Research Documentation, 2023

(a) (b)

Figure 3 (a) Becakayu's elevated toll road (b) Becakayu's underpass

Source: Research Documentation, 2023

According to (Sugiono, 2013), observation is a complex process consisting of the observation activities of an object to be investigated. 2. Interviews were conducted with Becakayu toll road managers (2 people); Makasar and Cipinang sub-district officers (2 people); Public Infrastructure and Management Handling PPSU (*Penanganan Prasarana dan Sarana Umum* - Public Infrastructure and Management Handling Program) officers (15 people); the general public (7 people); and green open space experts (4 people). According to Sugiono (2018), an interview is a meeting of two people to exchange information and ideas through questions and answers so that meaning can be formulated on a particular topic. 3. A literature study is a data collection technique carried out by studying various pieces of literature related to the problem being researched. This was done to obtain secondary data (Mohamad, 2011). 4. According to Sugiono (2013), documentation is a record of past events. Documents can be in the form of writing, images, or monumental works by someone.

RESULT AND DISCUSSION

Field observations were made by following the Becakayu toll road underpass (the space between the poles). It can be categorized into 20 spaces with criteria for width, length, and height of spaces that allow it to be utilized as eco-farming, urban farming, or other activities related to environmental improvement.

The results of the analysis of space in each segment under the Becakayu toll road, based on existing conditions, managers, the size of the space from the width of the segment and its height, the spaces that are possible to create are spaces no. 1, 14, 19 and 20. Space 1 is the entrance area from Bekasi, which is full of sunlight. Space No. 14 is quite spacious, and there is no full sunlight, only in the middle of Kalimalang, so water sources are acceptable. Room No. 19 has been utilized for catfish farming activities using tarpaulins as ponds, and this is one of the activities or part of eco-farming. This area still has much vacant land that can be developed again by planting various vegetables. In room no. 20, various gardening activities exist, such as growing vegetables conventionally or hydroponically. These spaces are possible to be used for eco-farming because of their area, the height of the ground floor to the base of the toll road (to see the sunlight received by the area under the Becakayu toll road.

Table 1. Identification of Space Under the Becakayu Toll Road and Designation of Environmental Improvements

Space Number	Space Criteria	Existing Space Allocation	Potential Space Allocation
1	Circular and wide field	Wild plants (Not yet utilized)	Eco-farming
2	One road section 10 meters wide, 6 meters high, ½ shade	Not yet utilized	Urban Farming
3	Two road sections 10 meters wide, 6 meters high, ½ shade	Truck parking	Parking
4	Two roads, in the middle of Kalimalang, each under the toll road, 10 meters wide, 6 meters high, ½ shaded, dredged soil	There are only a few ornamental plant sellers	Selling ornamental plants
5	Two roads, in the middle of Kalimalang, each under the toll road 10 meters wide, 6 meters high, ½ shaded, dredged soil	Ornamental plant sellers, organized	Selling ornamental plants
6	Two roads, in the middle of Kalimalang, each under the toll road 10 meters wide, 6 meters high, ½ shaded,	Disposal of building waste	Urban Farming

	dredged soil		
7	Two roads, in the middle of Kalimalang, each under the toll road 10 meters wide & 6 meters high, ½ shaded, dredged soil	Disposal of building waste	Eco-farming
8	Two roads, in the middle of Kalimalang, each under the toll road 10 meters wide, 6 meters high. Full sunlight, part soil and part pavement.	Land has been landscaped, dominated by banana trees, used for cycling activities	Eco-farming
9	Two roads, in the middle of Kalimalang, each under the toll road is 10 meters wide & 6 meters high, full sunlight, land has been cultivated.	Land has been cultivated for cultivation.	Eco-farming
10	Two roads, in the middle of Kalimalang, each under the toll road is 10 meters wide & 6 meters high, full sunlight, land has been cultivated.	Land has been cultivated for cultivation,	Eco-farming
11	Two roads, in the middle of Kalimalang, each under the toll road is 10 meters wide & 6 meters high, sunlight ½ shade, land has been cultivated	Planted with ornamental plants	Urban Farming
12	Two roads, in the middle of Kalimalang, each under the toll road is 10 meters wide, 6 meters high, sunlight ½ shade, land has been cultivated	Planted with various vegetable plants	Eco-farming
13	Two roads, in the middle of Kalimalang, each under the toll road is 10 meters wide, 6 meters high, sunlight ½ shade, land has been cultivated	Planted with various vegetable plants	Eco-farming
14	Two roads, in the middle of Kalimalang, each under the toll road is 10 meters wide,	Planted with various vegetable plants	Eco-farming

	6 meters high, sunlight ½ shade, land has been cultivated		
15	Two roads, in the middle of Kalimalang, each under the toll road is 10 meters wide, 6 meters high, sunlight ½ shade, land has been cultivated	Land used for disposal	Urban farming
16	Two roads, in the middle of Kalimalang, each under the toll road is 10 meters wide,6 meters high, sunlight ½ shade, land has been cultivated	The land has been planted with shade and ornamental trees.	Eco-farming
17	Two roads, in the middle of Kalimalang, entrance under 2x10 meters wide, 0.5-6 meters high. sunlight ½ shade	The land has been planted with ornamental plants but not maintained,	Eco-farming
18	Two roads, in the middle of Kalimalang, each under the toll road is 10 meters wide, 6 meters high, full sunlight, land has been cultivated.	The land has been filled with fertile soil, not yet replanted.	Urban Farming
19	Two roads, in the middle of Kalimalang, each under the toll road is 10 meters wide, 6 meters high, shaded by sunlight.	Land used to store fish ponds Shaded sunlight	Eco-farming
20	Two roads, in the middle of Kalimalang, entrance under 2x10 meters wide, 0.5-6 meters high. sunlight ½ shade	Conventional farming and hydroponic farming. The crops grown are various types of vegetables.	Eco-farming

Source: Research Documentation, 2023

The results of interviews with managers, local village officers, village PPSU officers, green open space experts and local communities. The number of 30 respondents is listed in table 1 and figure 4

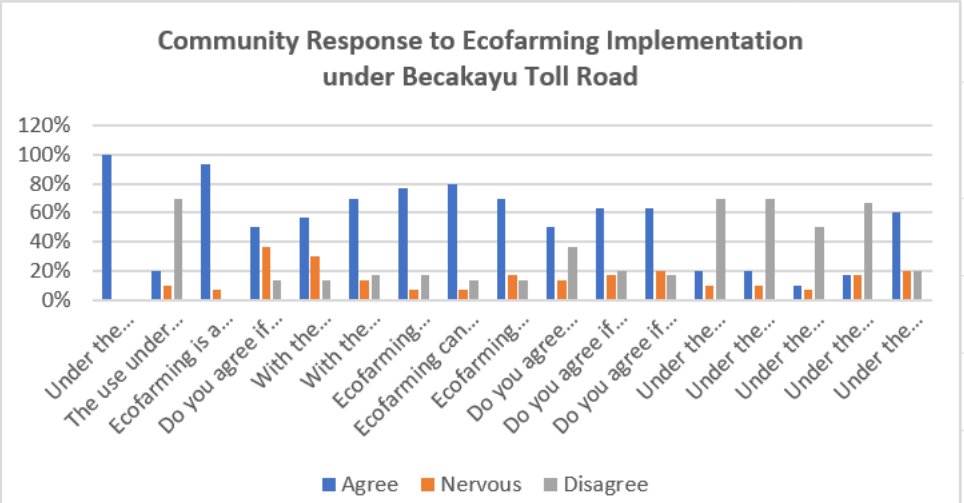

Figure 4. The questionnaire results on the space function under the Becakayu toll road

Source: Research Documentation, 2023

The graph above shows that the current use of the Becakayu toll road is not well organized (70%). The various benefits that exist now under the Becakayu toll road include being used as greenery (50%) used as parking (20%) made pavement for skateboarding/bicycle activities (17%), used as a fish pond (10%), and used as a place to sell (20%). Respondents understand what is meant by ecofarming which is a sustainable agricultural system (93%). With the creation of eco-farming under the Becakayu toll road, respondents understand the benefits of eco-farming, namely that it can reduce air pollution (70%), it is easier to get food ingredients (70%), with an eco-farming system it can increase income (77%), maintain biodiversity (80%), reduce air pollution (70) and the land under the Becakayu toll road is more protected and soil fertility in the area will be maintained.

Eco-farming is one of the concepts in crop cultivation or farming strategies made to increase crop productivity by paying attention to harmonization between humans and the environment and is economical (Dewi, 2021). Eco-farming is a sustainable agricultural system that is seen as a holistic farming system, economically profitable, friendly and harmonious with the environment, and acceptable to the community.

The World Health Organization (WHO) recommends that a city should provide 9.5 m2 of green open space for healthy living (Anguluri & Narayanan, 2017). The existence of green spaces is an important factor in supporting the ecological sustainability of a city, affecting natural air comfort. The air comfort of green spaces is influenced by temperature and humidity which are described in the thermal comfort index. A 5.86% decrease in air temperature and a 4% increase in humidity resulted from green spaces with good conditions (Asiani, 2007). The role of green spaces lies not only in improving temperature and humidity but also in reducing CO2 emissions. According to (Rawung, 2015), the absorption capacity of existing green spaces in reducing actual CO2 emissions

is around 119.73 to 271.18 tons/year. The existence of urban green spaces can play a role in maintaining human health physically, emotionally, and psychologically (Mantler. Annemarie, 2015); (Richardson et al., 2010); (Triguero-Mas et al., 2015).

CONCLUSIONS AND RECOMMENDATIONS

The section under the Becakayu toll road is an open space formed due to the construction of the 21-kilometer-long Becakayu toll road, which has been operating for around 12.5 kilometers. The sample sections for the research study were selected as 20 spaces with the criteria of space that could be used as a planting area. The function of the open space could be more optimal and better organized. The research results show that the current use of the Becakayu toll road needs to be better organized (70%). The various benefits currently available under the Becakayu toll road include making it green (50%), making it parking (20%), making it a pavement for skateboarding and biking activities (17%), making it a fish pond (10%), and making it a place to sell (20%). the utilization of eco-farming, which is a sustainable agricultural system (93%). With the creation of eco-farming under the Becakayu toll road, research results show that eco-farming can reduce air pollution (70%), make it easier to get food (70%), increase income (77%), maintain biodiversity (80%), reduce air pollution (70%), and make land under the Becakayu toll road more protected. Soil fertility in each area will be maintained. Of the twenty selected spaces, 11 can be used for eco-farming, six can be used for urban farming, two can be used for plant sellers, and one can be used as a parking area.

ADVANCED RESEARCH

This research is a preliminary study, the application of ecofarming on land under the Becakayu toll road needs further research involving the local community and the local sub-district.

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