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Introduction of Verticulture to Society in Pesawaran District, Lampung: a Community Empowerment

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Abstract − The problem of agricultural land use is compounded by rising housing demand. Potential development locations, such as Pesawaran District, attract visitors with their natural landscapes, which further increase housing demand while reducing available farmland. To address the issue of limited land use, verticulture—an urban agriculture technology—offers a promising solution. Verticulture is essentially a method of growing plants vertically. However, within the Pesawaran community, experience with verticulture remains limited. Therefore, introducing verticulture to society in Pesawaran is an important step toward achieving sustainable food production. In this study, verticulture knowledge was introduced to the Pesawaran community through presentations and demonstrations. A qualitative approach was employed, and data were analyzed using a pre-test/post-test design. The results indicate that verticulture knowledge was successfully conveyed to the community in Pesawaran District.

Keywords: Verticulture, Hydroponic, Agriculture, Vegetable, KKN

Abstrak *− Masalah penggunaan lahan pertanian semakin diperparah oleh meningkatnya kebutuhan akan perumahan. Lokasi-lokasi yang berpotensi untuk pengembangan, seperti Kabupaten Pesawaran, menarik perhatian masyarakat karena keindahan bentang alamnya, yang pada akhirnya turut meningkatkan permintaan perumahan sekaligus mengurangi ketersediaan lahan pertanian. Untuk mengatasi permasalahan keterbatasan pemanfaatan lahan, vertikultur—sebagai salah satu teknologi pertanian perkotaan—menawarkan solusi yang menjanjikan. Vertikultur pada dasarnya merupakan metode bercocok tanam secara vertikal. Namun, di kalangan masyarakat Pesawaran, pengalaman dalam menerapkan vertikultur masih terbatas. Oleh karena itu, memperkenalkan vertikultur kepada masyarakat di Pesawaran merupakan langkah penting dalam mewujudkan produksi pangan yang berkelanjutan. Dalam penelitian ini, pengetahuan tentang vertikultur diperkenalkan kepada masyarakat Pesawaran melalui presentasi dan demonstrasi. Pendekatan kualitatif digunakan, dan data dianalisis dengan desain pre-test/post-test. Hasil penelitian menunjukkan bahwa pengetahuan tentang vertikultur berhasil disampaikan kepada masyarakat di Kabupaten Pesawaran.*

Kata Kunci: *Vertikultur, Hidroponik, Pertanian, Sayuran, KKN*

1. INTRODUCTION

The development of agriculture dates back approximately 10,000 years and emerged independently in various regions across the world. It spread rapidly to nearly every society, offering improved living conditions to those who adopted it. Agricultural activity for food production requires land as its primary medium. At the same time, the human population—estimated at around one million in early history—has continued to grow, increasing the demand for housing. This expansion has driven urban migration and heightened the need for housing, health and sanitation facilities, employment, and transportation. In addition to these pressures, the growth of urban communities has intensified the demand for safe, affordable, and nutritious food sources [1]. For people living in urban areas, crop cultivation is constrained by limited land availability. As populations increase, the amount of land available for farming decreases. Urban agriculture seeks to address this challenge by utilizing minimal space to meet food needs, improve quality of life amid urban air pollution, and enhance the aesthetic value of urban environments.

Verticulture is one of the technologies applied in urban agriculture. It involves growing plants in vertically arranged or layered containers. Although a few vertical farms have been established, many of them commercially viable [2], the concept remains relatively new. For example, Sky Greens in Singapore is the world's first low-carbon, hydraulically driven vertical farm. It employs sustainable urban approaches to produce healthy, fresh food while minimizing the use of land, water,

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and energy. Nevertheless, despite such high-tech innovations, verticulture is still too novel to assume that technology-driven agricultural projects can succeed globally in both economic and social terms.

Pesawaran, a district near Lampung's capital city, offers numerous tourism destinations not found elsewhere in Lampung. The district is divided into seven subdistricts: Padang Cermin, Punduh Pidada, Kedondong, Way Lima, Gedong Tataan, Negeri Katon, and Tegineneng. Padang Cermin, the largest subdistrict, covers 31,763 hectares and is known for its mountain scenery. Way Ratai, at 1,681 meters above sea level, is the highest mountain in Pesawaran. The district also features island tourism, including Legundi Island, Pahawang Island, and Kelagian Island [3]. While these natural attractions have increased housing demand, they have simultaneously reduced agricultural land use. According to the Statistics Center of Pesawaran Regency, agricultural wetlands in the district have decreased by 3.62 percent annually [4].

To address the problem of land reduction, verticulture offers a potential solution. Beyond its agricultural benefits, verticulture can also enhance housing aesthetics, thereby increasing public interest. However, verticulture remains uncommon in the Pesawaran community. Therefore, this study aims to introduce verticulture techniques to the people of Pesawaran.

2. METHODS

This work has been carried out using qualitative methods and analyzed with the study of pre-test post-test layout [5]. The observation and service activities are performed between June and July 2019. This research was carried out in two villages in the Pesawaran district, the village of Hanura and the village of Sungai Langka. The location map of the district of Pesawaran was shown in fig 1. The participant involved in this community service program, mainly farmer community and housewife. The Participant will fill out the test form before and after the activity to understand the knowledge improvement of verticulture technique. The scope for this activity for socialization and workshop how verticulture technique are create. Limitation for this activity mainly about introducting definition of verticulture and motivation to made verticulture systems in their area.

Figure 1. Location of Pesawaran District

3. RESULT AND DISCCUSION

This research is carried out by KKN ITERA students in two villages in Pesawaran Regency, namely Hanura Village and Sungai Langka Village. The introduction of verticulture systems to participant is carried out by presentations and direct practice of making verticulture systems using plastic waste as pots. Total 46 participants involved in this study, and the detail was shown fig 2.

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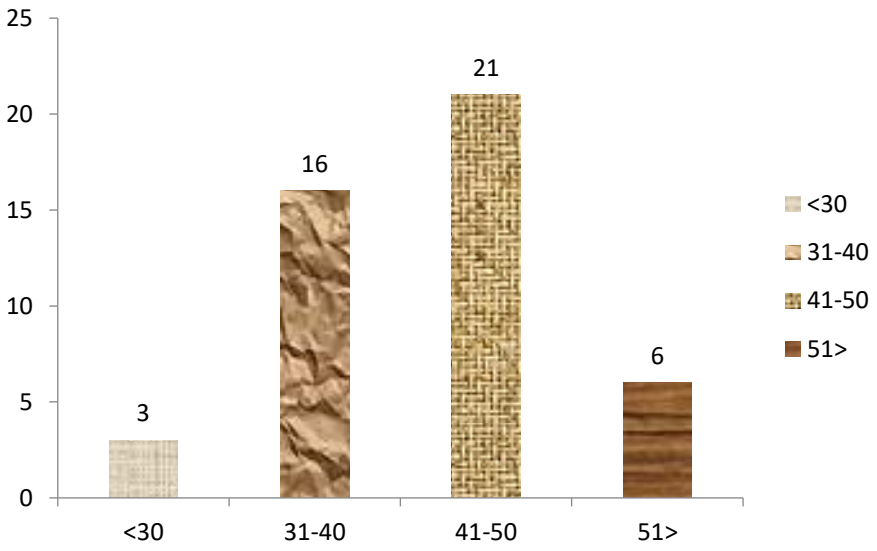

Figure 2. Age Distribution

For the observation result about human resources, we can say that almost 45% of participants that participated in socialization and workshop this activity was a 41-50 years old. As shown in figure 3, 91.3% are female participants, which most of them are housewives. The large number of female respondents was due to the time of research activity during work time, so the research activity is dominated by housewives.

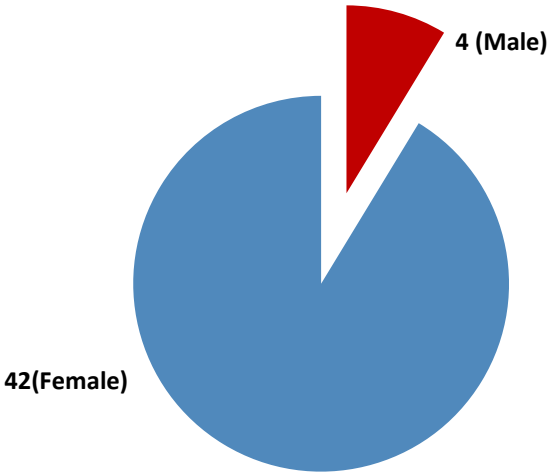

Figure 3. Gender Distribution

This activity started with the introduction of the idea of sustainable food domains, the implementation of the verticultural definition and the value of recycling plastic waste and the use of plastic waste as pots in the process of verticulture. The introduction of verticulture to society in Pesawaran was shown in fig 4.

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Figure 4. Introduction of Verticulture

A verticulture system is the right way to develop an sustainable food area because of the limited land in the region, particularly in the houses of the people living in Pesawaran Regency. The participant was invited to create a verticulture process with the use of plastic bottles as a pot after explaining the theory of verticulture (fig 5). Many of them were excited to join this activity because the process is easily applied in their homes and the materials are easily available.

Figure 5. Production of Verticulture Systems

To understand the participant's understanding of vertical culture, the questioner was distributed to the participant. The questioner was distributed before and after presentation. The questioner raised 7 issues related to the concept of verticulture. The test results are then analyzed using the normality test to determine whether or not the data is normally distributed. After the data is normally distributed, the data are then analyzed by pair t test to determine whether there is a statistically significant difference in the mean of the dependent variable between two related groups.

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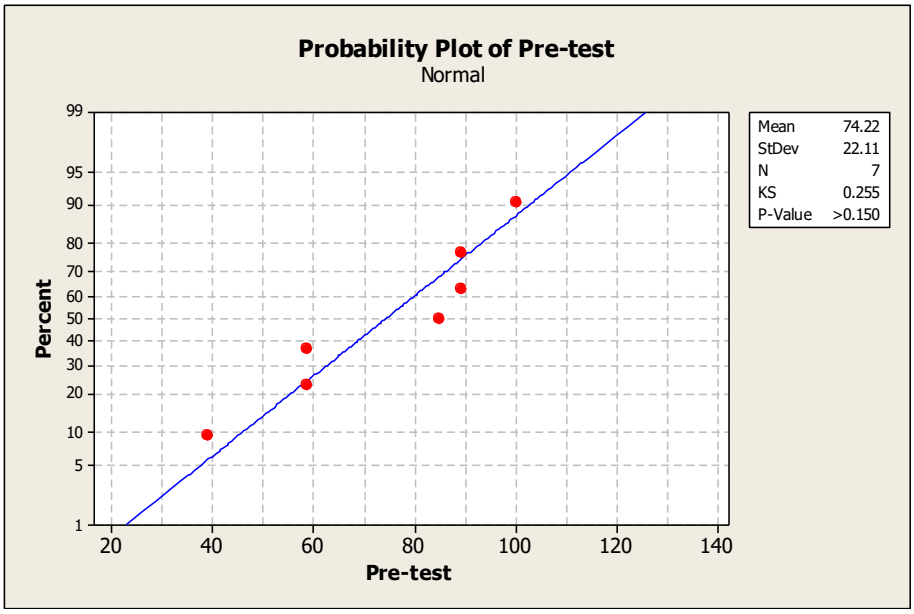

Figure 6. Normality data of pre-test in understanding participant about verticulture concept

According to fig 6, the p-value from the Kolmogorov-Smirnov test (0.150) assesses the probability that the data are from a normally distributed sample. Using an α-level of 0.05, there is insufficient evidence to suggest the data are not from a normally distributed population. Similar results found that post-test was also normality distributed. The p-value from the post-test Kolmogorov-Smirnov was 0.110, the value is over 0.05 (fig 7).

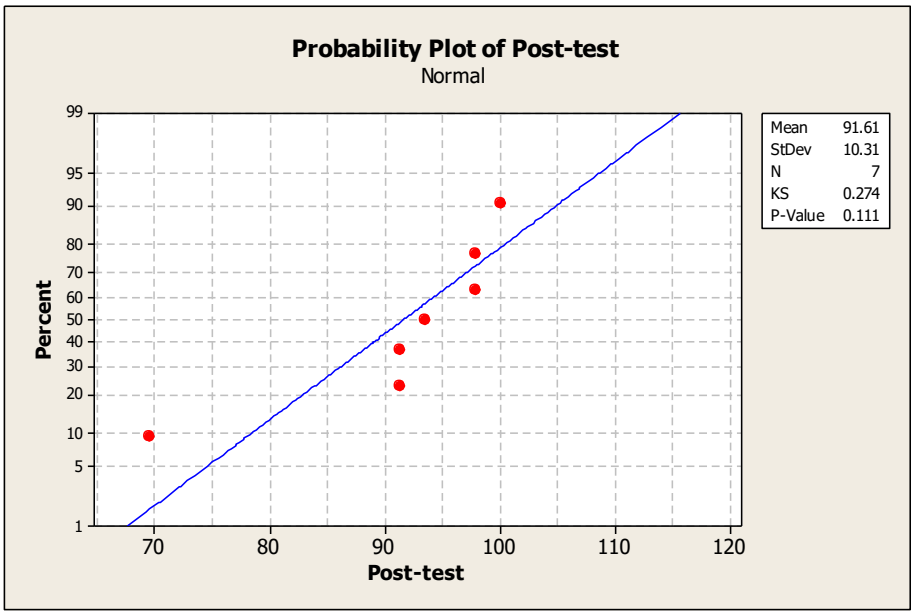

Figure 7. Normality data of post-test in understanding participant about verticulture concept

After the data is normally distributed, the data is analyzed using a t-test pair. A two-sample t-test helps determine whether two population means are different. The p-value is below 0.05 (0.028 <0.05) (fig 8), concluded that there is a statistically significant difference between before and after introducing the verticulture concept. In other words, the difference between mean of pre-test and post-test of presentation about verticulture concept is not equal to zero.

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Paired T for Pre-test - Post-test

            N      Mean    StDev  SE Mean
Pre-test    7   74.2214  22.1149   8.3586
Post-test   7   91.6100  10.3068   3.8956
Difference  7  -17.3886  16.0254   6.0570


95% CI for mean difference: (-32.2096, -2.5676)
T-Test of mean difference = 0 (vs not = 0): T-Value = -2.87  P-Value = 0.028
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Figure 8. Pair T-test between pre-test and post-test of understanding participant to verticulture concept

Another variable in order to know the improvement of understanding in verticulture concept is intention of people in Pesawaran district to make verticulture. Based on observation, people in the Hanura villages begin to create a verticulture from plastic bottle in town garden (fig 9). Despommier [6] said that, the development of an urban environment in which people produce the most part of their food and reuse all freshwater is not a technical challenge because of the technologies available to us. Compared to traditional farming, a vertical farm may reduce the need for fossil fuel required for tractors, plows or shipments [7].

Figure 9. Verticulture in the middle of Hanura town garden

In addition, some farmer community also begin to create verticulture pot from used paralon pipes (fig 10). Implementation of Verticulture to improve care behavior has already been done in SMP Negeri 1 Jember, Indonesia [8]. The success of a verticulture will depend not only on innovation in technology but also on local conditions, including the demand for certain products by population, the availability of labor and the conditions of farming [7]. Future work for building more verticulture is very important, not only for vegetable house harvesting, but also could raise the village popularity, as well as known as verticulture village.

Figure 10. Verticulture pot from used paralon pipes

4. CONCLUSION

The results showed that many people understood the concept of verticulture after it had been presented. The idea for the vertical farm came about following the insufficient roof garden design. Vertical farming has a number of advantages over rural farming, which are observed within the three pillars of sustainability: environmental, social and economic. The eco-city of the future could be accomplished sooner rather than later with the necessary economic incentives and enough social pressure.

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