

Utilization of Yard for Vegetable Hydroponics in Serut Village, Panti Sub-District, Jember District

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ABSTRACT

Vegetables as a horticultural product is a food source that is always consumed by humans daily, including in urban areas. Assorted Vegetables can be eaten raw or processed and it takes as a decoration on the food. Needs vegetables including lettuce, green pakcoy and other vegetables from day to day continues to increase. Therefore, it needs supply of vegetables from the area around the town of Jember including Serut Village, District Panti Sub-District, Jember District. Serut village has the potential of non-agricultural land could be developed into a producer of vegetables. Empowerment yard area for the cultivation of vegetables will be achieved if supported by an efficient hydroponic cultivation techniques and the empowerment of human resources are adequate. Empowerment of rural communities is expected to increase the quantity and quality of vegetable production of lettuce, cabbage, and other vegetables as well as to support sustainable vegetable production. Through this hydroponic cultivation of fresh vegetables will be produced continuously, scheduled and able to add value to the revenue for the community.

Keywords: Hydroponics, lettuce, mustard green, yard, Serut village, Vegetables

1. Introduction

Vegetables are a source of food that is always consumed by society every day. Vegetables have many nutrients needed by humans, but the national vegetable production is fluctuating until 2015. The national vegetable production reached 1,543,849 tons [1] and the *Food and Agriculture Organization* (FAO) recommends that the minimum requirement of vegetable consumption 73 kg/capita/year [4]. Vegetable needs in urban areas, especially in Jember continue to increase, but not supported by adequate production. Therefore, vegetable cultivation is required with agricultural extensification efforts. Based on data from the development of agricultural land suitability in eastern Java, [1] states that the non-agricultural land area in 2012 to 2014 continued to increase to reach 1,148,466 ha. Utilization of non-agricultural land can be used as an attempt to agricultural extension activities.

Non-agricultural land that can be utilized for extensification is yard area. Large yards can be found in rural areas. Serut Village, Panti Sub-district, Jember District is one of the potential villages to be developed into vegetable production field. An agricultural extensification effort with hydroponics technology will result in optimal vegetable production.

Hydroponics is a solution to the problem of the availability of agricultural land so that it can be used for cultivation on a narrow field [9]. The combination of Wick Systems and Nutrient film technique (NFT) hydroponics can be utilized in an effort to empower the village community easily and cheaply. Utilization of hydroponics technology is expected to improve the quantity and quality of vegetable production [8].

Vegetables that are easy to produce with hydroponics are Lettuce (*Lactuca sativa* L) and green pakcoy (*Brassica juncea*). Lettuce is a vegetable that has a calcium content of 56

mg / 100 grams, easy to obtain, cheap, and easy to eat [6]. Similarly Sawi (*Brassica juncea*), Sawi is rich in pro-vitamin A and ascorbic acid. According to [11], in a hydroponic cultivation system needs to be given enough nutrients, water, and oxygen in plant roots for good plant growth.

Utilization of hydroponic technology in the yard can be developed by optimizing the provision of nutrients in plants. According to [12], one of the factors that affect crop production in hydroponic systems is the nutrient solution. Nutrition became one of the most important deciding factor in determining the yield and quality of crops. During the process of cultivation, nutrient concentration given must be tailored to the needs of the plant. The increasing age of the plant, the concentration of which is applied must also be increased. It is expected that the appropriate concentrations for each plant can provide optimal growth and yield.

The purpose of this community empowerment is to maximize the function of the narrow land of yard, yard, and micro farmland located near the settlement. This land can be used to produce farm products that can be consumed by themselves so as to have a positive impact on health quality. If

over the product then it can be sold to the people around the needy and the wider community. Community empowerment in the yard of Serut Village, Panti Subdistrict, Jember District is a means for hydroponic cultivation of lettuce and is a solution to overcome the increasing demand of vegetables in urban areas. Continuous vegetable production is the main target for vegetable demand in urban areas of Jember.

2. Methodology

Plant materials: vegetable seeds: lettuce and green pakcoy, seed sowing on rockwool, until become seeds, after 7 days transplanted to hydroponics installation. Nutrition is given daily with EC 300 ppm.

Preparation of Hydroponics Installation: installations designed and made using paralon equipped with pumps for nutrient circulation. Hydroponic installation required for 5 units. Installation can be seen in Figure 1.

Nutrition: nutrients used are given nutrient mi x AB in accordance with the age of the plant. The concentration of administration can be seen in Table 1.

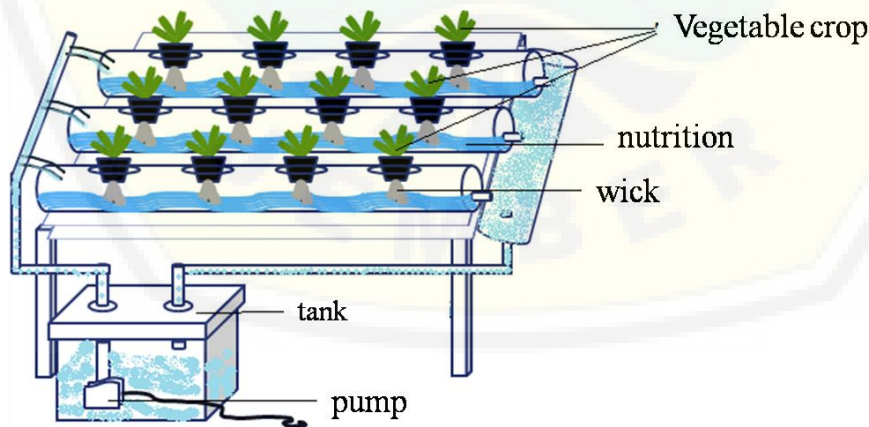


Figure 1. Installing Hydroponics Wick System circulates

Table 1. Concentrations of nutrients used in hydroponics vegetable

Nutrition	week			
	2	4	6	8
Nutrition Concentration (ppm)	950	1150	1350	1550

Maintenance: Filling up the hydroponic installation with water and nutrients then circulating it. Seedlings ready for transplanting are inserted into the netpot and placed in the planting hole on the hydroponic installation. The nutrient solution is measured by EC meters daily according to the concentration required. Hydroponic scedule can be seen in table 2.

Harvest: Harvesting is done after the plant meets the harvest criteria. The harvest criteria for lettuce and mustard greens are already of considerable size but not yet flowering [2]. According to [10] the lettuce can be harvested as soon as the plant has the desired size and firmness.

3. Results and Discussions

The utilization of the yard in Serut Village, Panti Sub-district, Jember District is

done to supply hydroponics vegetables in a sustainable manner in urban areas. Hydroponic vegetables allow to be produced continuously, even within a year can produce uninterrupted by the season. Planting timetable becomes an important factor for planting and production to proceed continuously. Hydroponic vegetable planting schedule can be seen in Table 2.

Seeding and planting for each installation is done every week. Similarly in harvest and marketing can be done every day after five weeks of cultivation. Total vegetable supply for urban areas can be done daily with the production of lettuce and mustard vegetables of 17 kg and 25 kg per week.

Production of vegetables per week and selling prices that can generated through community empowerment with land use yard in the village can be seen from the table 2.

Table 2. Schedule Plant hydroponic vegetables in Serut Village, Panti Sub-district, Jember District

Events	Schedule											
	Month 1				Month 2				Month 3			
	1	2	3	4	1	2	3	4	1	2	3	4
Nurseries	█	█	█	█	█	█	█	█	█	█	█	█
Transplanting		█	█	█		█	█	█		█	█	█
Harvest						█	█	█		█	█	█
Marketing						█	█	█		█	█	█

Table 3. Production and Income per Month on Hydroponics Vegetable Cultivation.

No.	Name of Vegetable	Production per Week (Kg)	Selling Price per Kg (Rp)	Income (IDR)	Income per month (IDR)
1	Lettuce	17	25,000.00	425,000.00	1,700,000.00
2	Green Pakcoy	25	20,000.00	500,000.00	2,000,000.00
Total Income (IDR)					3,700,000.00

Table 4. Effect of different nutrient concentrations on the production of Green Pakchoy and Lettuce.

Nutrition Concentration (ppm)	Fresh Weight (g)		Height of Plant (cm)		Number of leaves (leaf)	
	Green mustard	Lettuce	Green mustard	Lettuce	Green mustard	Lettuce
950 ppm	65.33c	171.78c	24.00b	26.60b	11,33b	a20:33
1250 ppm	86.33b	193.89 ab	24.67b	28.37 ab	13.67b	21:33a
1550 ppm	139.67a	205.22 a	26.67a	29.67 a	18.00a	23:00 a

This vegetable production can be obtained if assumed using 100 planting holes. With 100 planting holes will produce an average of 17 kg lettuce and 25 kg of mustard greens. The selling price of hydroponics vegetables in Jember can reach 20,000 - 25,000 IDR so the turnover generated with the utilization of yard land for the production of hydroponic vegetables Rp 3,700,000 per month.

The nutritional levels of different plant life will improve the quality and production of the resulting hydroponic vegetables. At 1550 ppm concentration will yield fresh weight of mustard 139.67 g, plant height 26.67 cm and number of leaves 18 strands. Data on each treatment can be seen in table 4. Proper nutrition is expected to increase the quantity and quality of vegetable production.

Increased concentrations of nutrients will increase the production of green pakchoy. Green pakchoy showed the best growth results with a nutrient concentration of ab mix of 1550 ppm (K3). These results are shown in green pakchoy with plant height (26.67 cm), number of leaves (18 pieces), leaf area (128.19 cm²), and fresh weight of plant (139.67 grams). The rate of plant growth is increasing with the higher concentration of nutrients 1550 ppm. If the plant growth rate is optimal then the crop production will be better.

Proper nutrient concentration will increase the number of leaves so that the absorbed light more optimal. The results of [13], showed that the rate of growth is influenced by the absorption of light by the leaves. The number of leaves will increase when offset by a high net assimilation rate, resulting in a high growth rate.

Leaf vegetables are used in the leaves and stems in fresh condition, so fresh weight becomes the basis for determining quality. Increased biomass caused by plants absorb water and more nutrients. Nutrition stimulates the development of organs in plants, thereby increasing the activity of photosynthesis and influencing the increase of wet weight and dry weight of plants. [5] said that the availability of nutrients plays an important role as an energy source so that the level of nutritional adequacy plays a role in influencing the biomass of a plant..



Figure 2. Seedling and vegetables ready for harvest. (A)Ready for transplanting, (B) green pakchoy, (C) Pagoda mustard and (D) Lettuce at a concentration of 1550 ppm nutrients

4. Conclusions

The nutritional concentration of 1550 ppm will produce the optimal quantity and quality of vegetable production. The utilization of yard land for the production of hydroponic vegetables can continuously meet vegetable needs in urban areas.

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