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## Article Review: The Potential of Hydroponics as a Tourist and Educational Object

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**Abstract:** Hydroponics has various potentials to be developed as a means of education and tourism. The potential of hydroponics has not been fully understood by the public. The purpose of writing this article is to examine hydroponic opportunities as a tourist attraction and education based on the results of research and community service. The method of compiling this article review is done by conducting a literature study with primary data sourced from journals. The results of the article review show that the potential of hydroponics lies in the education of hydroponic systems, the use of electronic media and technology, modification of hydroponic installations, environmentally friendly plant care and the use of organic pesticides, education on hydroponic farming calculations, and vegetable picking tours and culinary tours. Research related to the use of renewable and environmentally friendly technologies needs to be investigated further and continuous community assistance activities are carried out to support the sustainability of hydroponics.

**Keywords:** hydroponics; education; tourist

### INTRODUCTION

Hydroponics is a plant cultivation technique that uses water as a growth medium. Many modern farmers in Indonesia apply hydroponic techniques as an alternative to plant cultivation. The community considers that the hydroponic technique provides benefits for consumers because the vegetables are harvested in fresh and healthy conditions without pesticides Sengkey et. al. [1]. Hydroponic techniques also have advantages, including: (a) simultaneously watering and applying fertilizer can save time and effort Setiawan et. al. [2], (b) easy plant care Harjanto et. al. [3], (c) low pest attack Mubarak et. al. [3], (d) good quality harvest Kilmanun [4]. Massive application of hydroponics to the household level can provide benefits to the community, especially in the consumption of clean, fresh and healthy harvests. However, not a few people are reluctant to cultivate plants because it requires high capital/cost, difficult marketing, and concerns about pests and diseases. It should be noted that the agricultural sector does not only offer crops as a source of income. Income in the agricultural sector also lies in its potential as a tourist attraction Mahardika et. al.[5], Franjaya et. al. [6]. In this case, hydroponic gardens have the potential to be developed into tourist and educational destinations. The purpose of writing this article is to examine hydroponic opportunities as a tourist attraction and education based on the results of research and community service

### METHOD

The method of compiling this article review is done by conducting a literature study with primary data sourced from national and international journals for the last 10 years (year range: 2012 to 2022). The stages of compiling an article review are as follows: 1) determining the topic and purpose of writing articles, 2) searching for scientific articles through the Google Scholar page with

relevant keywords according to the discussion, 3) selecting articles according to the topic and purpose of writing articles, 4) preparation of article review manuscripts.

## RESULTS AND DISCUSSION

The Indonesian nation is known as an agricultural country, which means that most of the community's activities are supported by the agricultural sector. Agriculture is now not limited to farming activities on the ground. Soilless cultivation techniques are becoming more and more popular as agricultural land decreases. One of the rapidly growing soilless cultivation techniques is hydroponics. Many researches related to hydroponics have been carried out. According to Subandi et al. [7], the most widely conducted research topics discussed hydroponic nutrition and sensors/microcontrollers, which were 38.06% and 20.07%, respectively, of 289 hydroponic themed research. Sensor/Microcontroller research on hydroponic systems is part of research in engineering and information technology. This shows that hydroponic research is not only limited to agricultural science but is also closely related to other disciplines. Submission of research results related to hydroponic systems can be an opportunity for hydroponic educational materials.

The development of science makes it easier for people to apply hydroponics in accordance with the resources they have and adapt to local environmental conditions. In addition to research, academics and related parties also provide assistance in cultivation activities through community service so that there is an increase in community skills. The capabilities in question are not only about cultivation, but also marketing capabilities and the use of electronic media and the internet. Some examples of community service include: a) Zero Waste-based hydroponic assistance Wahyu et. al. [8], b) empowering Papuan women to grow hydroponic and marketing hydroponic crops Panga dan Ginting [9], c) hydroponics using sugarcane waste Mardina et.al. [10], d) Cultivating healthy vegetables with eco-friendly cultivation techniques Rahmah et.al. [11]. Thus it can be said that the benefits obtained by the community from the assistance of hydroponic activities are not only limited to the harvest, but also the application of electronic media and internet technology.

Hydroponics is synonymous with cultivation on narrow land. Hydroponics is usually applied to unproductive land. People don't have to have a large area of land to apply hydroponics. Hydroponics can be done in the yard of the house MD dan Nel [12]. In addition, hydroponics can be built on rooftops (roofs of houses/buildings) Daryono et. al. [13]. Hydroponics does not have to use pipes as a place of planting. Hydroponics can also be grown using vertical techniques [14] to take advantage of the walls of the house or hallway. Based on this, the types of modified hydroponics have the potential as a community learning medium.

Hydroponic crops are often called organic vegetables or healthy vegetables. Most hydroponic farmers do not use pesticides because there are no pests and diseases. This opinion is not entirely correct. The gardens or hydroponic installations that have just been built have not seen pests and diseases attack. However, pests and diseases begin to appear after 4-5 times of the growing season. Pests caterpillars, aphids, and leaf-mining caterpillars usually attack mustard plants. Pest control should use organic pesticides to maintain product quality. Controlling caterpillar pests on mustard greens can use vegetable pesticides such as onion extract Mulyati [15], papaya leaf extract Fajri et. al. [16], and neem leaves Tarigan et.al. [17]. Assistance related to pest and disease control is given to the community to support the sustainability of hydroponics and as an object of hydroponic educa-

tion. The assistance provided refers to the results of research related to the application of organic pesticides.

Hydroponics can be applied massively if people understand the income opportunities that will be obtained. The provision of farming analysis calculations is expected to attract people's interest in hydroponic business. Kilmanun and Ndaru [18] reported that the R/C ratio was 1.47, which means that hydroponic farming is feasible as a source of income for hydroponic farmers. However, the monthly income obtained by hydroponic farmers from the harvest is not always fixed, which is around Rp. 200,000.00 – Rp. 4,000,000.00 Putra et.al. [19]. Therefore, it is important for academics and local government to educate the public that the income earned is not limited to the sale of crops. The low consumption of hydroponic crops is closely related to people's purchasing power. According to Savira dan Prihtanti [20], demand for hydroponic vegetables is influenced by family income.

One of the factors is the low income of hydroponic farmers is influenced by high operational costs. These costs include the cost of making or maintaining hydroponic installations, AB Mix fertilizer, and electricity. Basically, hydroponic installations are very easy to make yourself and can be modified. Installation materials are divided into low, medium and high quality categories. However, the installation of low quality materials has no impact on the success of hydroponic farming. The success of hydroponic cultivation is determined by whether or not installation maintenance is good, such as pipe washing, installation of pipe support arrangements, and so on. Washing pipes regularly can reduce the risk of pipes being damaged due to blocked water flow by moss or plant root residues. The installation support functions in supporting the hydroponic pipe. The pipe is at risk of breaking if the distance between the supports is tenuous. In other words, making the installation does not have to use expensive materials. In addition, hydroponic installations are not only in the form of tables, but can be in the form of a pond or using pots. AB Mix fertilizer is an expensive fertilizer when compared to fertilizers for conventionally cultivated plants. This is because the AB Mix fertilizer material has a good solubility level. A soluble fertilizer indicates that the nutrients contained in it are easily absorbed by plants. Hydroponics is identical to the use of a water pump or air pump for circulating water and nutrients. Water pumps and air pumps require electric power and generally operate 24 hours a day. Therefore, the cost of electricity is considered not small. The use of renewable energy, namely (solar electricity) has been widely studied [21]. The fulfillment of solar panel equipment requires large costs at the beginning of manufacture, but can reduce electricity operational costs. Analysis of solar hydroponic farming needs to be investigated further.

Picking vegetables in a hydroponic garden is an attraction for the community. Hydroponic vegetable picking tourism has the potential to be a source of income for hydroponic farmers in addition to selling their crops. Hydroponic gardens in several places offer culinary tours as well as providing cafes so that visitors can enjoy fresh vegetables harvested from the garden directly Sutamto and Anggoro [22].

## CONCLUSION

Based on the facts and research results mentioned above, hydroponic opportunities that can be developed into tourism and educational objects include: (1) hydroponic system education based on the development of research results, (2) education on the use of electronic media and technology in the hydroponic field, (3) education on hydroponic installation modifications, (4) environmentally friendly plant care and the use of organic pesticides in hydroponic systems, (5) education on hydro-



ponic farming calculations, (6) vegetable picking tours and culinary tours. The author suggests that research related to the use of renewable and environmentally friendly technologies needs to be investigated further and continuous community assistance activities are carried out to support the sustainability of hydroponics.

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