

Introduction to Hydroponic Cultivation using the Dutch Bucket System Method using Husk Charcoal and Cocopeat for School Students at SMAN 4Samarinda Seberang

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Abstract:- Population growth which increases every year results in increasing demand for food. However, the availability of land for agriculture is decreasing, making it a challenge for farmers to meet market demand. Therefore, hydroponic farming is one solution to meet food needs in urban areas. Hydroponic education for school students is an educational way to introduce and teach about hydroponic farming. One hydroponic method that can be used is the Dutch Bucket System using husk charcoal and cocopeat as a planting medium. The aim of the community service activities carried out at schools is to explain the basic concept of Dutch Bucket System hydroponics and introduce it to middle school students to increase their awareness of the potential of urban agriculture. Increasing students' knowledge about hydroponic cultivation using the Dutch bucket system method using husk charcoal and cocopeat through community service activities. **Research Method:** This research will use a descriptive method with a qualitative approach. Data will be collected through literature study, observation and interviews. The results and benefits of learning hydroponics are that it can improve students' skills in the fields of science and technology. In an era of increasingly advanced technology, skills in the fields of science and technology are very important. Learning hydroponics is a new way to introduce science and technology concepts to students. Students will learn science concepts such as photosynthesis and plant nutrition in hydroponics.

Keywords:- hydroponics, dutch bucket system, husk charcoal, cocopeat, school students.

I. INTRODUCTION

Population growth is increasing every year resulting in increasing demand for food. However, the availability of land for agriculture is decreasing, making it a challenge for farmers to meet market demand. Therefore, hydroponic farming is one solution to meet food needs in urban areas. Hydroponic education for school students is an educational way to introduce and teach about hydroponic farming. One hydroponic method that can be used is the Dutch bucket system using husk charcoal and cocopeat as a planting medium. The Dutch bucket system is an effective hydroponic method for plants with large roots such as chilies, tomatoes and cucumbers. The way the Dutch bucket system works is through a water droplet watering system

that is regulated through a hose. This system is effective because it minimizes water loss and provides nutrients directly to plant roots. Husk charcoal is biomass produced from plant residues and waste such as rice husks, straw and dry leaves. Husk charcoal functions as a hydroponic planting medium because it has up to 60% pores which allows oxygen and water to flow properly and is able to support plant root growth. Cocopeat is a hydroponic planting medium made from coconut fiber which has been processed in such a way by adding lime and fertilizer. Cocopeat has the ability to absorb water up to 8 times its dry weight and is able to expand 3-4 times its original volume. Cocopeat is also good for plant root growth because it can hold soil moisture well.

The Dutch bucket system method using husk charcoal and cocopeat as a planting medium is very suitable to be applied to school students because this method is simple and easy to learn. Students can start from making a dutch bucket system, preparing planting media, to planting and maintaining plants. In the DBS hydroponic system technique, nutrient water flows from the nutrient reservoir to the planting medium continuously and some of the nutrient water returns to the reservoir. The nutritional water is flowed periodically for a certain time and adjusted according to wishes. The way the DB system works is similar to the NFT System, it's just that the installation is different. The main component of drip irrigation is paralon pipes of different sizes. The larger pipe is used as the main pipe, while the smaller pipe is used as the drip pipe. The advantages of drip hydroponics include that plants receive a continuous supply of nutrient water, saving water and nutrients because they are given little by little. Disadvantages of drip hydroponics include that it is difficult to get oxygen if the media is too dense. Hydroponic growing media can come from natural materials such as gravel, sand, coconut fiber, husk charcoal, pumice, peat, and pieces of wood or artificial materials such as broken bricks. (Suhardiyo, 2011).

Hydroponic education using the Dutch bucket system method using husk charcoal and cocopeat planting media for school students can be an effective way to introduce hydroponic farming to students. This method is very suitable for students because it is simple and easy to learn. Apart from that, this method also has a positive impact on the environment, so that hydroponic education can provide wider benefits to society. The research objective of the

community service activities carried out at the school is to explain the basic concept of the Dutch Bucket System hydroponics and introduce it to middle school students to increase their awareness of the potential of urban agriculture. Increasing students' knowledge about hydroponic cultivation using the Dutch bucket system method using husk charcoal and cocopeat through community service activities.

II. RESEARCH METHODS

Research Method: This research will use a descriptive method with a qualitative approach. Data will be collected through literature study, observation and interviews. **Research Process Stages:** Problem identification and proposal preparation, literature study and observation, interviews with students, preparation of research reports.

III. RESULTS AND DISCUSSION

The community service work program (PKM) is a program that aims to produce real work that can help the community in various areas of life. One form of PKM that has been carried out is through the introduction of Dutch Bucket hydroponics to students at SMAN 4 in Samarinda Oppo as follows:

Introducing the basic concept of Dutch Bucket System hydroponics to middle school students (SMAN 4). Dutch Bucket hydroponics is a soilless farming method that is currently popular among farmers and farming groups in Indonesia. This method uses a plastic tub taken from an old bucket as a planting container. School students can utilize this method to gain knowledge about farming and practical skills related to the introduction of Dutch Bucket hydroponics. The Dutch Bucket hydroponics introduction program can be carried out by involving school students in practicum activities, workshops and coaching programs so that the results produced can be exhibited at certain events, such as product exhibitions, festivals or social events in the community. The following is an example of the hydroponic Dutch Bucket System which has been socialized.



Picture1: DBS Hydroponic Cucumber Cultivation

There are several basic theories that need to be understood to implement Dutch bucket hydroponics. First, the concept of hydroponics itself, namely planting plants without using soil but using other, more effective media such as water containing nutrients. Second, use a water pump such as a circulating water pump to continuously supply nutrients to plant roots. Third, gravity pressure and the difference in height between the nutrient tank and the plant tank to ensure a smooth and regular flow of nutrients. Dutch bucket hydroponics has several advantages when compared to other hydroponic techniques. One of the advantages is the efficient use of nutrients and water, so making it very suitable for use in limited land or dry areas. In addition, dutch bucket hydroponics allows for easier and more precise regulation of nutrients and pH, thereby increasing productivity and quality of harvest. To implement dutch bucket hydroponics, precise regulation of pH and nutrient concentration is needed so that plants can grow optimally. Nutrients are macro and micro nutrients that must be present for plant growth. Each type of nutrient has a different composition (Perwitasari, et al, 2012). The food or nutrients needed are dissolved in water, so that the concentration of fertilizer used can be carefully calculated and regulated as much as is needed (Anjeliza, et al., 2013). Apart from that, it is necessary to carry out regular monitoring and maintenance on the water pump and hose installation so that the nutrient flow system can run

smoothly. The introduction of Dutch Bucket hydroponics to school students provides many benefits including:

Develop practical skills: Students will acquire Dutch Bucket hydroponic farming and maintenance skills. **Teaching sustainable values:** Students will learn how to appreciate and use natural resources more wisely and sustainably. **Increase creativity and innovation:** Students are expected to be able to develop and apply creative and innovative ideas in farming. **Increase environmental awareness:** Students will learn about the importance of protecting and properly caring for the environment. **Instilling the value of togetherness:** Farming activities will increase the sense of togetherness and family among school students. **Improve understanding of modern technology:** Students will become acquainted with modern technology that supports future agricultural development. **Provides potential additional source of income:** Harvested crops from Dutch Bucket hydroponics can be sold and become a source of income for students and the community. Activities to introduce Dutch Bucket hydroponics at SMAN 4 School took place smoothly and was very active because this hydroponic socialization activity was held for the first time at SMAN 4 School, the following participants were SMAN 4 school students who participated in community service activities.



Picture 2: SMAN 4 School Students

Through the activity of introducing Dutch Bucket hydroponics, school students, especially SMAN 4 school students, can develop creativity and innovation in finding more efficient, effective and environmentally friendly farming methods. Apart from that, students will also learn to appreciate and utilize natural resources more wisely and sustainably. Apart from providing educational benefits for school students, the Dutch Bucket hydroponics introduction program also has the potential to be a source of additional income for the community. The harvest from Dutch Bucket hydroponics can be sold to local markets, or even sold online via e-commerce platforms or social media.

Increasing students' knowledge about hydroponic cultivation using the Dutch bucket system method using husk charcoal and cocopeat through community service activities. The Dutch bucket system method using husk charcoal and cocopeat planting media is very suitable to be applied to school students because this method is simple and easy to learn. Drip irrigation hydroponics or Dutch Bucket System (DBS) is a type of hydroponics that uses the drip or shower principle to flow nutrient solution to the plant root area (Hendra and Andoko, 2014). Students can start from making a dutch bucket system, preparing planting media, to planting and maintaining plants. The use of husk charcoal as

a planting medium in hydroponics provides the best results when compared to other treatments for each parameter of kailan plant yield which includes number of leaves, leaf area, total fresh weight of the plant, fresh weight of plant consumption, dry weight of plant roots and total dry weight of the plant (Wibowo, 2017). Hydroponic education using the Dutch bucket system method using husk charcoal and cocopeat planting media for school students can be an effective way to introduce hydroponic farming to students. The planting medium also functions as a support for the plant so that it can stand upright and not easily collapse.

According to Indrawati, et al, (2012), the requirements for planting media for hydroponics are that it is able to absorb and conduct water, does not rot easily, does not affect pH, is free from pests and disease seeds, is easy for light water to pass through, does not contain toxins, and is cheap. This method is very suitable for students because it is simple to make. Apart from that, this method also has a positive impact on the environment, so that hydroponic education can provide wider benefits to society. The following is an example of husk and coconut charcoal used in the Dutch bucket hydroponic system.



Picture 3: Charcoal husk in organic hydroponic media



Picture 4: Cocopeat organic hydroponic media

Learning hydroponics can also improve students' skills in the fields of science and technology. In an era of increasingly advanced technology, skills in the fields of science and technology are very important. Hydroponic learning is a new way to introduce science and technology concepts to students. Students will learn science concepts such as photosynthesis and plant nutrition in hydroponics. In addition, by using various technologies such as air humidity sensors and plant nutrition, students will learn to understand various new technologies related to agriculture.

Measuring the success of increasing students' knowledge of Dutch Bucket hydroponic cultivation in schools can be done in several ways, including: Student Participation: The participation of SMAN 4 school students is very high in the activity of introducing Dutch Bucket hydroponics. The more students involved in this project, the higher the environmental awareness and the value of togetherness that is instilled. How to measure student participation through observation and evaluation. Participant Satisfaction Level: The satisfaction level of SMAN 4 school student participants based on interviews is very high, both students, teachers and the local community, which can also be a benchmark for the success of this community service activity. Participant satisfaction can be measured by interviews to assess overall the Dutch Bucket hydroponic introduction program. Learning hydroponics is a new way and introduces science and technology concepts to students. Students can learn hydroponic cultivation using the Dutch Bucket System method which uses husk charcoal and cocopeat as planting media. In addition to learning to become more independent, students will also deepen their understanding of the environment and agriculture and improve their skills in the field of science and technology.

IV. CONCLUSION

Creating a community service work program through the Dutch Bucket hydroponics introduction program for school students is a program that aims to build togetherness and creativity among school students and improve the quality of life in the community through the development of modern, sustainable agriculture. Hopefully this program can continue to be developed and provide real benefits for the Indonesian people.

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