GSJ: Volume 8, Issue 12, December 2020, Online: ISSN 2320-9186
www.globalscientificjournal.com

Recycable Materials and Solar Power as Hydroponic setup in Glowing Plants

Renz Chester R. Gumaru, Hernando L. Bernal Journal

Introduction

Plant production nowadays requires a lot of things like healthy soil and good type of fertilizer. There are also problems associated with the production techniques. One example is the conventional soil culture problems such as poor soil structure, poor drainage, non-uniform texture, as well as weeds and soil-borne pathogens. One way of an effective healthy plant production is Hydroponics. Hydroponics is a method used by people where in there is an apparatus that will develop the plants without the use of soil; instead the plants will receive nutrients from other sources such as water, direct sunlight, organic and non-organic fertilizer and oxygen. But this will need an expensive apparatus that make use of electricity. The researcher aims to make his own design of a solar-powered hydroponics using recycled materials, it should be original and pioneer. The researcher just also has a small garden so he will build his own design of hydroponic apparatus. With this, the researcher can raise more and more plants with eco-friendly techniques and saving energy. Also, the use of soil is unnecessary, so the plants are free in the Soil borne pests (fungi) and diseases can be eliminated. Hydroponics is also a way to improve and develop a cultivating technique for plants with much comfortable results and affordable price. There are other

techniques to use like aquaponics, aeroponics, grafting, uprooting and many more but hydroponics is more effective and easy to apply.

Ebb and Flow Hydroponic System Also known as “Flood and Drain” system is a much more advanced and complicated system. A pump is placed into the reservoir to regularly flood the grow tray with the nutrient solution and then drain it back into the reservoir. The pump floods the tray or bucket at regular intervals for a set period of time by using a timer. Every hydroponics system has a hydroponic pump that could be said as its heart. Provision of automation and delivery of water and nutrient solution are done by the hydroponic pump. It could be submersible or air-powered. (Horizen Hydroponics, n.d.) Hydroponic pump must be supplied by electrical energy for it to function, that is why a hydroponics set up make use of solar panel as the source of energy.

Statement of the Problem

The purpose of this study is to determine the feasibility of recyclable materials and solar power as hydroponic set up in growing plants.

Specifically, the study aims to answer the following questions:

1.) Is there a significant effect on the time to supply energy (hr) using the designed solar panel set up?

2.) Is there a significant effect on the circulation of the water using the designed solar panel set up?

Statement of the Hypothesis

The study will also test the following hypothesis:

1.) There is no effect on the time to supply energy (hr) using the designed solar panel set up?

2.) There is no effect on the circulation of the water using the designed solar panel set up?

Significance of the Study

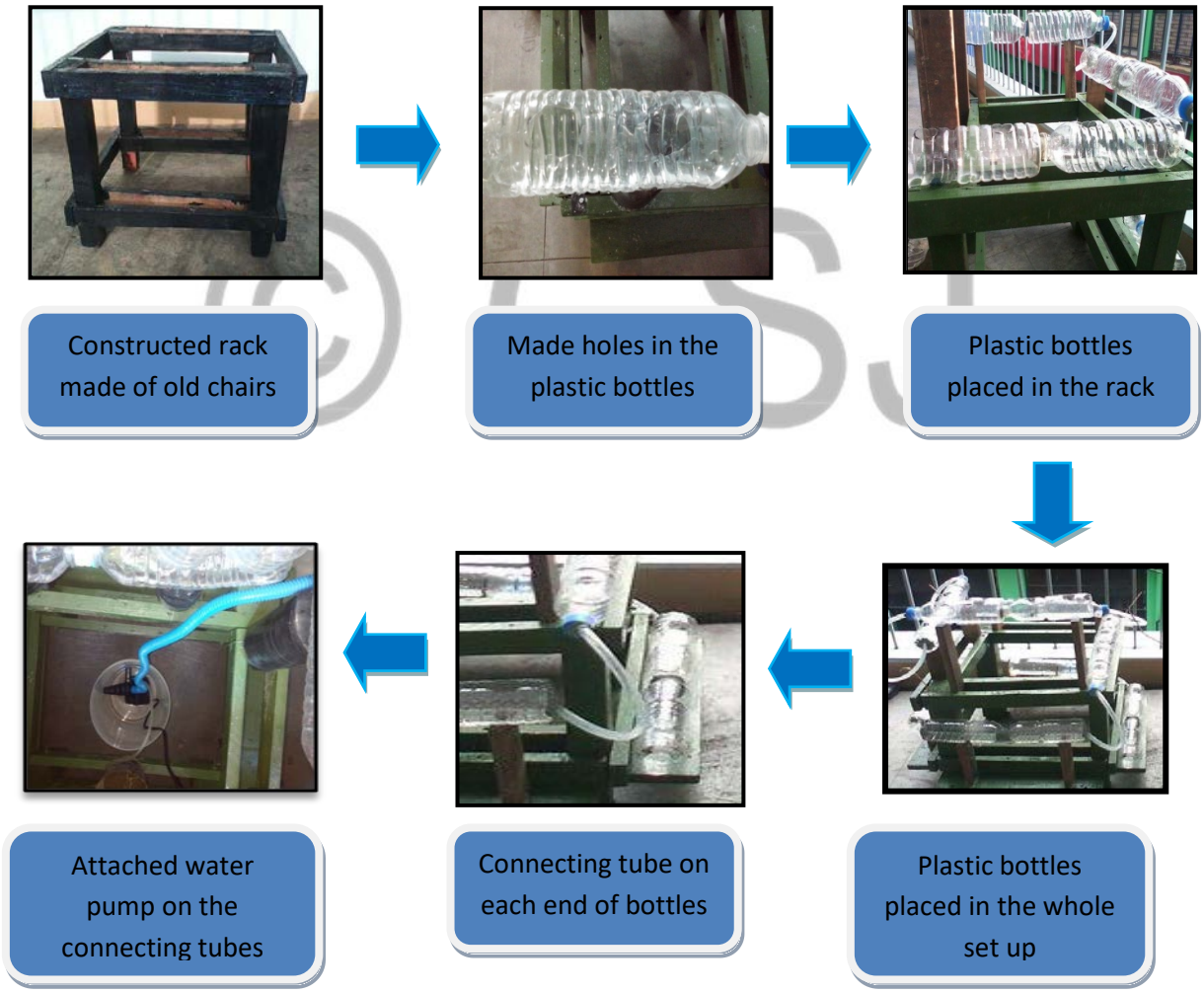
The significance of this study is to improve and develop the usage of hydroponic technique using only the recycled materials. In the field of Science, this study will be new information added to the knowledge of science for the next generation. It would be less energy consuming in using solar panels instead of electricity as source of power. The materials needed came from almost recycled materials in order to help in preserving the nature. This study may contribute to farmers, for faster and convenient growing of plants, and also for ordinary citizens who want to plant in their homes. This study may produce fresh raw materials, may improve its quality for the needs of vegetarians, chefs, and the whole country itself.

Materials and Methods

The materials needed in assembling the hydroponics apparatus are five to seven pieces connecting tubes of any type (PVC tubes will be more convenient) used to connect the bottles, 50 plastic bottles (500 mL) as the container of plants, old chair as rack, pail, 20-watts solar panel for the electricity, water, and water pump for the circulation of the water.

Step 1: Construction of Hydroponics Apparatus

The researcher prepared all of the materials and equipment needed for the hydroponics apparatus. The researcher first constructed the 1 meter rack made of old chairs for the plastic bottles; it has 3 layers, the height interval of each layer was based on the maximum height of the pechay plant. Then the researcher made holes between the plastic bottles based on the length of roots of the pechay plant, if the length of the root is 7cm the distance between the holes should be also 7cm. After that, the researcher placed the plastic bottles with holes in the constructed rack made of old chairs and now attached the connecting tubes at the end of each plastic bottles then finally connected it to the tube of the pump.



Step 2: Construction of Energy Source

For the energy source of the hydroponics set up, the researcher used the 12 watts solar panel. The electricity that is created by the solar panel is DC or direct current electricity, this direct current electricity must be changed or inverted into AC or alternating current which is the type of electricity that is use by the pump, this is done with the use of an inverter, a battery was attached to an inverter to store excess power that can be use when there is no sun. Then the researcher chose the water pump based on its total head.

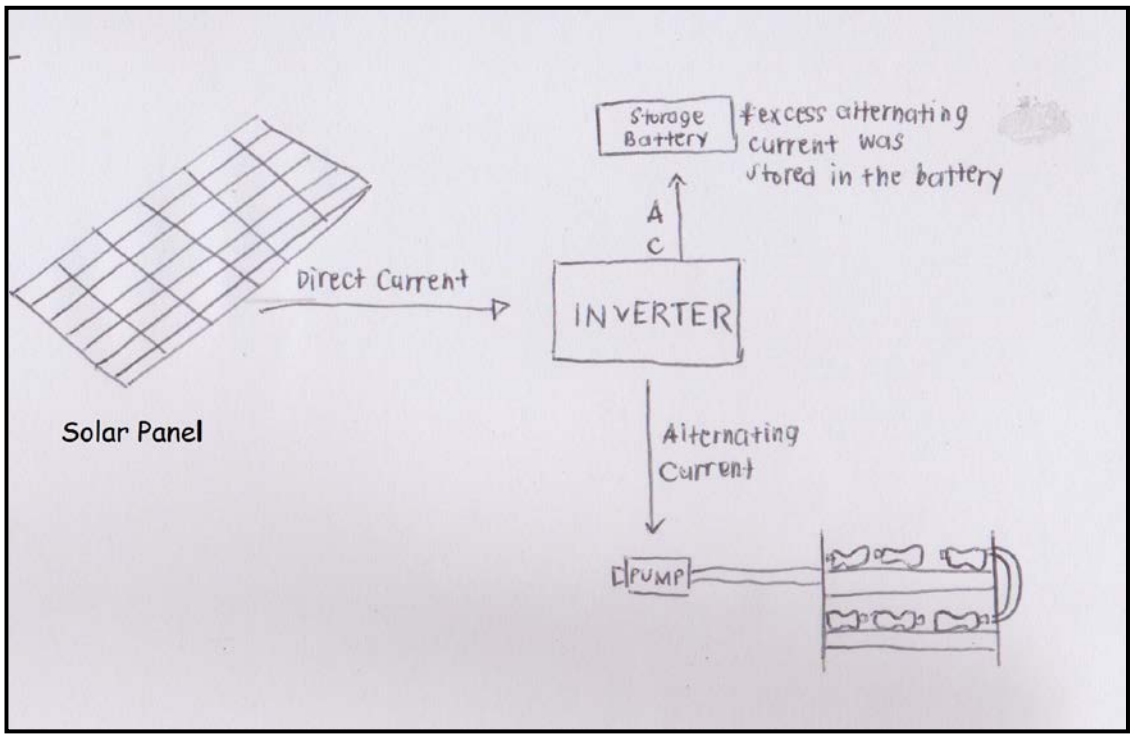


Figure 1: Flow of energy from the solar panel

Results

Table 1.1 Length of Time to Supply Energy

	Time to supply energy (hr)		
Trials	Week 1	Week 2	Week 3
1	7.8	8.5	9.0
2	8.0	8.5	8.7
3	7.9	8.8	8.9

The table above shows the length of time of stored energy in the battery to supply energy in the hydroponics apparatus. The mean number of the length of time in week 1, 2, and 3 are 7.9, 8.6 and 8.9, respectively. Week 3 has the highest length of time to supply energy even without sunlight because the solar panel in this week was longer exposed to sun in daytime. Also week 3, trial 1 was the maximum time that the stored energy in the battery can supply energy.

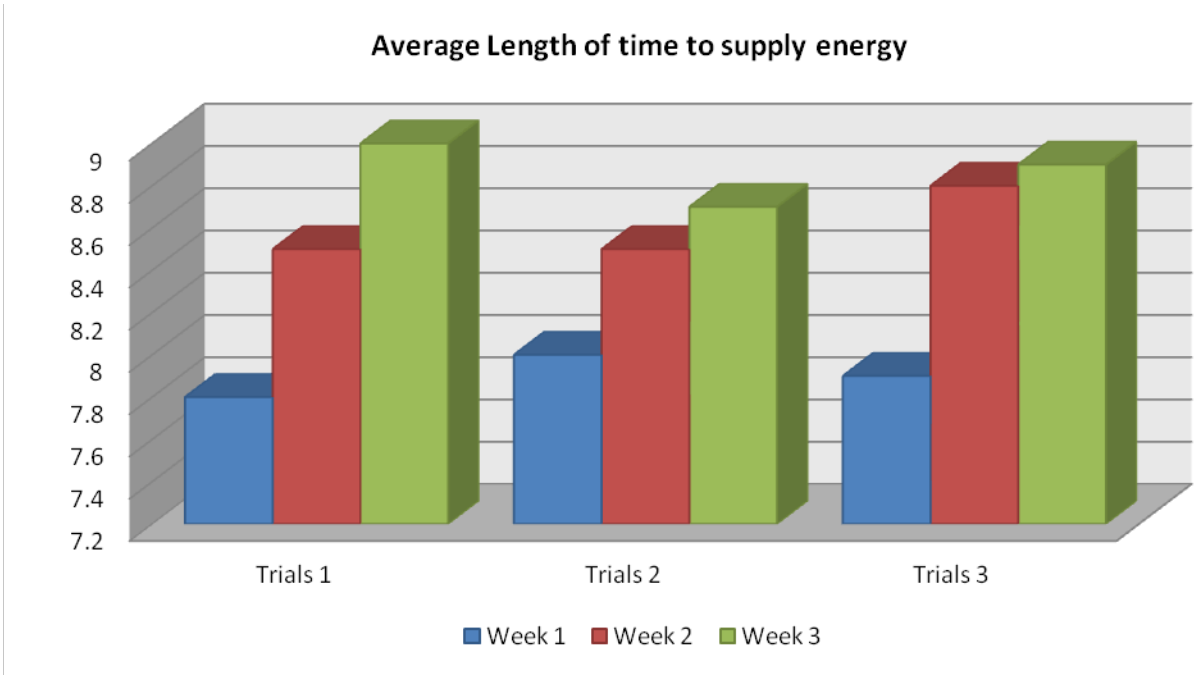


Figure 4.1 The graph shows the trend of the average length of time to supply energy using only the stored energy in battery. As the solar panel exposed in sunlight, the longer it can store energy in the battery and the longer also it can supply energy during night time.

Statistical Analysis

X_1	X_2	X_3
7.8	8.5	9.0
8.0	8.5	8.7
7.9	8.8	8.9

X= Week

Discussion

The presented table and graph above shows that the designed hydroponics apparatus is still working even in night time. The energy stored in the battery supplied the needed energy of the pump to make the hydroponics still be available even without the exposure to sunlight. It supplied energy in the hydroponics for a long time. Compared also to the cost of a regular pump in the hydroponics that makes use of electricity, the pump in the designed hydroponics set-up is more inexpensive because its energy used was only from the solar panel, this is also more eco-friendly. And for further improvement and development of this study, the researchers suggest to maximize the height of the hydroponics apparatus and of course the pressure of the pump so that the water will still flow continuously, with this more plants can be planted. The use of more recycled materials will help to develop the apparatus.

Conclusion

The researcher noticed that the average time the pump in the designed hydroponics apparatus is working depends on the time exposure of the solar panel in sunlight. The estimated time gathered in the first week is 7.9, in second week is 8.6 and in the last week is 8.9. Week 3 has the highest time supplied energy, it's because the solar panel in week 3 was longer exposed in sun during day time. The longer the exposure of solar panel to sunlight the longer also the battery can supply energy in the hydroponics apparatus during night time.

Although the solar panel is a little expensive, it is more efficient than using the usual hydroponics that used electricity because it can be use for a long time.

BIBLIOGRAPHY

Gericke, W. (1996). So What Exactly is Hydroponics?. Powering Plants to Growth through Hydroponics. Retrieved May 2, 2013, from http://lurnq.com/mobile/lesson/Powering-Plants-To-Growth-Through-Hydroponics/#

Ocampo, T., & Santos, J. (2005, August). Snap Hydroponics: Development & Potential For Urban Vegetable Production. Philippine Journal of Crop Science. Retrieved June 19, 2005, from http://www.cabi.org/gara/FullTextPDF/2005/20053176287.pdf

Gopal, V., et al. (2011). Hydroponics - A Novel Alternative for Geoponic Cultivation of Medical Plants and Food Crops. International Journal Pharma and Bio Sciences Vol. 2, pp. 287.

Rathod, J. (2013). Hydroponics – An Effective Way to Grow Plants. Retrieved March 22, 2013, from full URL http://suite101.com/article/hydroponics-an-effective-way-to-grow-plants-a131599

Getsinger, K.D & Luu, K.T (1990) J.Aquatic Plant Manage. Retrieved August 21, 2013, from http://www.apms.org/japm/vol28/v28p3.pdf

Mahmood, Q. (2005). Journal of Zheijiang University Science B. Retrieved August 21, 2013, from http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1390441/

Bhattacharya, A. & Kumar, P. Electronic Journal of Environmental, Agricultural and Food Chemistry. Retrieved August 21, 2013, from http://www.cabi.org/isc/fulltextpdf/2010/20103065885.pdf

Appendix B

Materials and Methods

Unused chairs used as stand for the whole setup

Solar panel

Inverter

Battery (Storage of energy)

Recycled plastic bottles with holes as container of plants

Tube used to connect the water pump and the tracks

Solar-powered Hydroponics Apparatus