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# Introduction to Led Based Solar Farming

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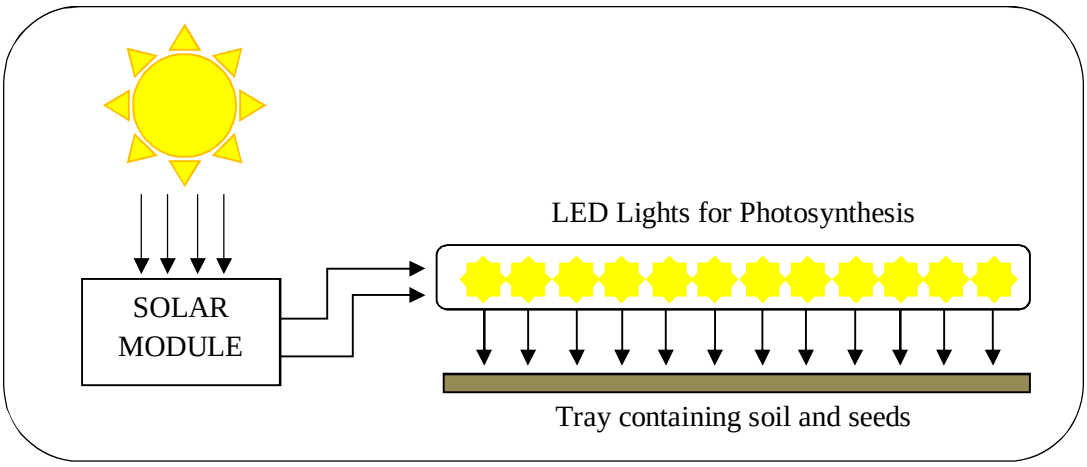
***Abstract: the solar energy is traditional and proven source of photosynthesis in farming. But it has some limitations like the source is not available throughout the day and in rainy season. Use of led lights for photosynthesis is productive alternative to solar energy. This technique has overcome all the limitations of solar energy source***.

## I. INTRODUCTION

The use of LED lighting in agriculture is becoming increasingly widespread. LED lighting uses significantly less energy than the traditional fluorescent fittings used throughout the agricultural industry. Research has found that LED lighting is not only suitable for horticulture and livestock but has even been attributed to increased production! This is thought to be due to the fact that LEDs offer a more 'natural' light than incandescent or fluorescent lights.

Soil moisture sensor base irrigation system ensures proper moisture level in the soil for growing plants in all season. In this system, sensor is sensing the moisture content of soil and accordingly switches the pump motor on or off. Soil moisture sensor is find the soil condition whether the soil is wet or dry. If soil is dry the pump motor will pump the water till the field is wet which is continuously monitored by the microcontroller.

### *A. Layout Of System*




### *B. Components of the system*

1) *Solar Modules:* Solar Panels are the devices for capturing the energy in sunlight. Solar photovoltaic panels contain arrays of solar cells that convert light into electricity. The solar cells sometimes called photovoltaic cells, photovoltaic meaning literally .light-electricity. Solar cells or PV cells rely on the photovoltaic effect to absorb the energy of the sun and cause current to flow between two oppositely charged layers. Crystalline silicon and Gallium arsenide are typical choices of materials for solar cells. When exposed to sunlight, a 6 cm diameter silicon cell can produce a current of about 0.5 A at 0.5 V.
2) *Storage Battery:*-The batteries in the system provide to store the electricity that is generated from the wind or the solar power. Any required capacity can be obtained by serial or parallel connections of the batteries. The battery that provides the most advantageous operation in the solar and wind power systems are maintenance free dry type and utilizes the special electrolytes. These batteries provide a perfect performance for long discharges
3) *Automatic irrigation system:* Components of automatic irrigation system

a) *Moisture Sensor:* This is an Electrical resistance Sensor. The sensor is made up of two electrodes. This soil moisture sensor reads the moisture content around it. A current is passed across the electrodes through the soil and the resistance to the current in the soil determines the soil moisture. If the soil has more water resistance will be low and thus more current will pass

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through. On the other hand when the soil moisture is low the sensor module outputs a high level of resistance. This sensor has both digital and analogue outputs. Digital output is simple to use but is not as accurate as the analogue output.

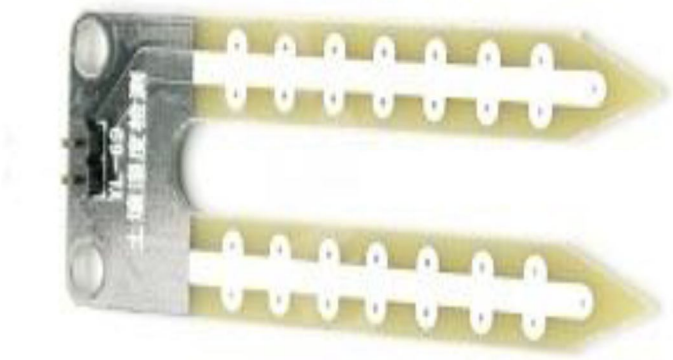

Fig.: Moisture Sensor [5]

Soil moisture sensor has the following specifications

Table 1 Soil Moisture specifications

| | |
|---|---|
| Vcc power supply | 3.3V or 5V |
| Current | 35mA |
| Signal output voltage | 0-4.2V |
| Digital Outputs | 0 or 1 |
| Analog | Resistance (Ω) |
| Panel Dimension | 3.0cm by 1.6cm |
| Probe Dimension | 6.0cm by 3.0cm |
| GND | Connected to ground |

*b)* *Software design:* To be able to interpret the different states of the soil as prompted by the soil sensor the microcontroller was programmed. The Arduino integrated development environment (IDE) was used. The idea is based on C++ and thus can be extended using C++ libraries. Arduino programs (sketches) are cross platform, Simple, clear and at the same time flexible for advanced programmers.

*4) Artificial lighting*

*a)* LED lights are a low heat, energy-efficient artificial light source. Because LED technology is so customizable, every bulb is different, so make sure your bulbs produce the blues and reds necessary for plants. Horticultural LED grow-lights produce only the wavelengths most utilized by plants, so you may want to look for these bulbs rather than buying ones for general use.

*b)* Fluorescent tubes and bulbs are higher in blue wavelengths, so look for “full-spectrum” or include a mix of “cool” and “warm” bulbs. When in doubt, buy “cool white” products, since white light contains the full spectrum of wavelengths.

*c)* Incandescent lights give off a lot of heat and should be placed farther away from plant foliage. Incandescent bulbs give off more red wavelengths, so they can be used to supplement fluorescent light and balance out the spectrum.

*d)* Halogen lights can also provide full-spectrum light, but like incandescent they put off a lot of heat and are less energy-efficient than fluorescents.

*e)* Horticultural grow lights are generally packaged in tubes for fluorescent fixtures. They contain the full spectrum of wavelengths needed for blooming plants such as African violets.

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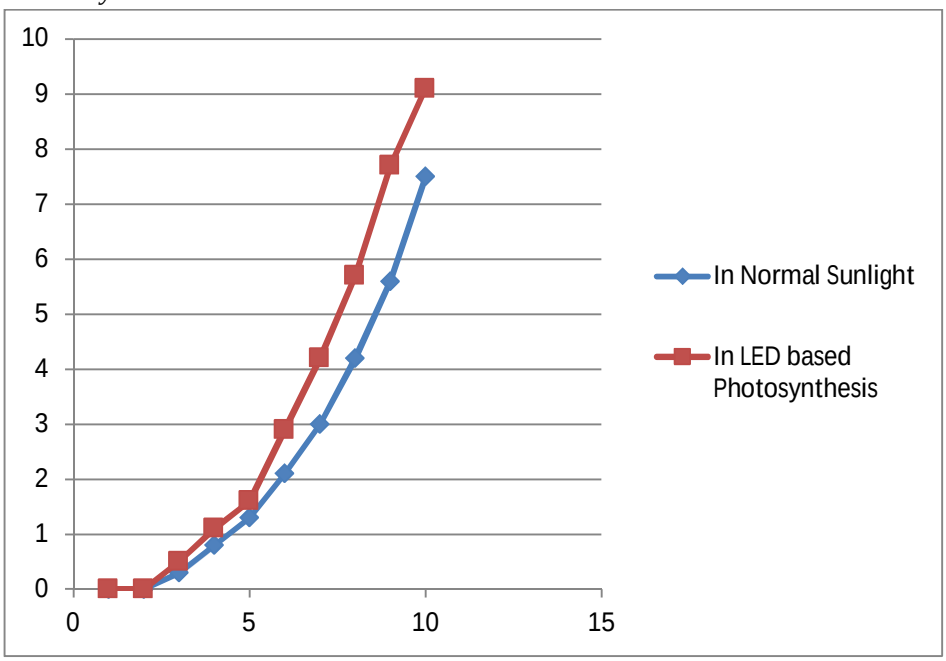
*C. Ffect Of Led Based Photosynthesis*




Graph 6.1: Effect of LED based Photosynthesis on Plant Growth

Average Height of plant for 10 Days in Natural Sunlight: 2.48 cm
Average Height of plant for 10 Days in LED Photosynthesis: 3.28 cm
Percentage increase in Height of Plant = (2.48/3.28) =32.25%

## II. CONCLUSION

*A.* Improved crop life is observed with LED based photosynthesis
*B.* Increase in harvest of crops in less time. Since space utilized is less, hence suitable for farming in cities as well as for farmers with small land
*C.* Energy efficient system for environment simulation
*D.* Less investment, with higher returns assured. Thus Solar Farm can prove to be the next phase of modern farming. Since it utilizes the most trusted and commonly used mechanical equipment it turns out to be more economical
*E.* Solar farm truly is the future of farming collaborated with the ingenuity of Mechanical Engineering. This smart irrigation system can be adjusted and modified according to the changing environment.

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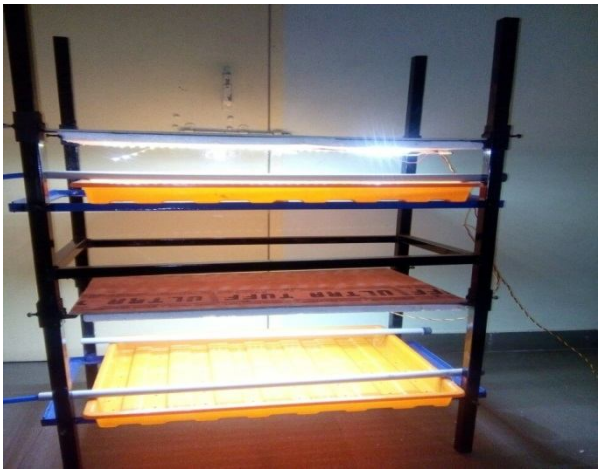
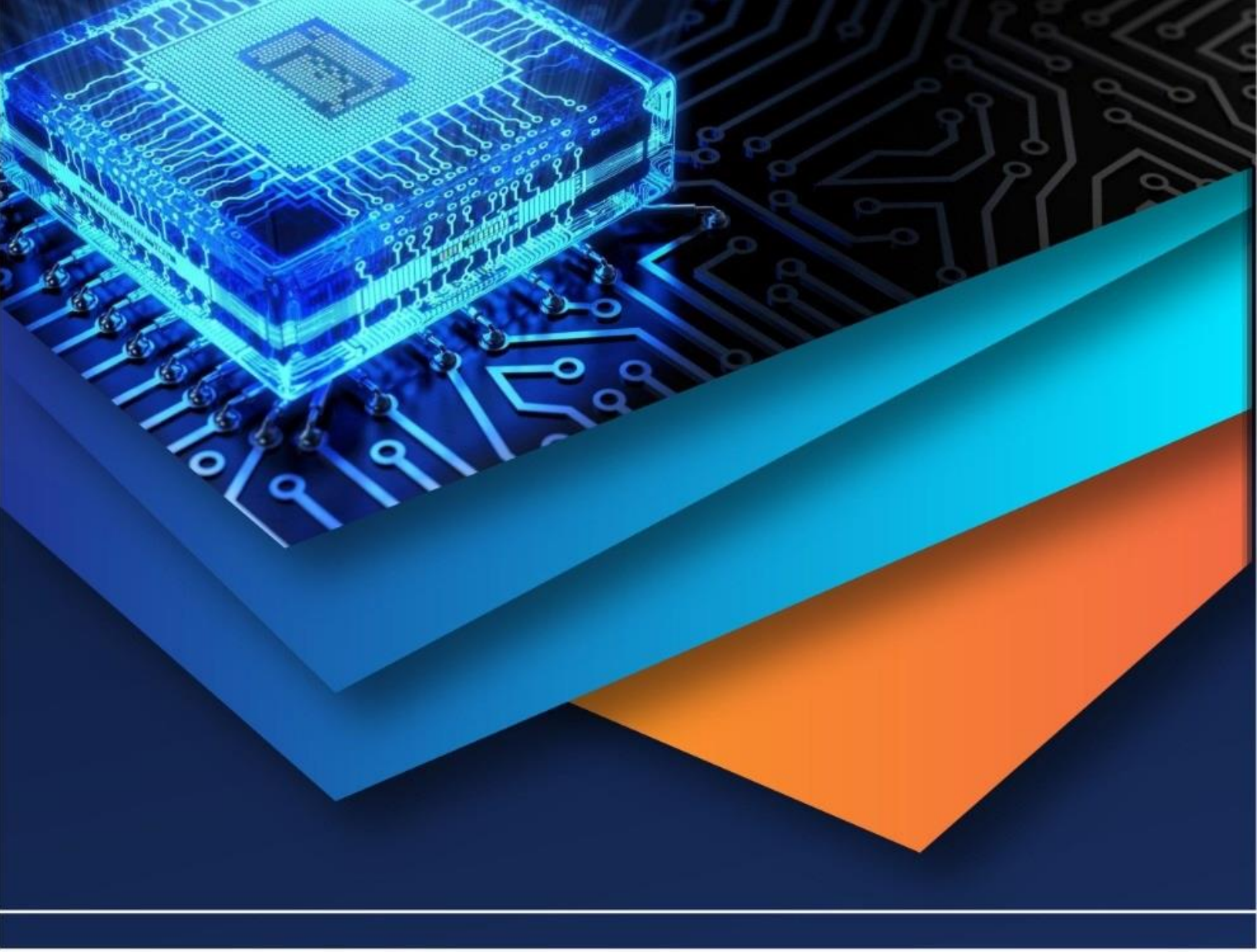
**PHOTO GALLERY**





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