International Journal of Innovative Research in Engineering
Volume 4, Issue 2 (March-April 2023), PP: 348-349.
www.theijire.com ***ISSN No: 2582-8746***

Energy: Generation of Electricity from Soil

Jack Ningthoujam
Department of Agriculture Engineering, Pandit Deen Dayal Upadhyay Institute of Agricultural Sciences, Utlou and Kameng Village, Manipur, India.

How to cite this paper:
Jack Ningthoujam, "Energy: Generation of Electricity from Soil", IJIRE-V4I02-348-349.

Abstract: *Bioscience appears to point to a method of producing power from plants and bacteria found in the soil. We create electricity using hydroelectric plants, coal, fossil fuels, and nuclear power plants. Each approach has drawbacks such as water scarcity, inter-state conflicts, and pollution of the environment. Therefore the approach to produce power from bacteria that dwells under the soil is pollution-free and environmentally benign. Plants use sunlight and carbon dioxide from the environment to produce food in the form of carbohydrates and oxygen for human breathing. Microbes in the soil metabolise part of the organic materials that plants expel into the soil to produce hydrogen ions and electrons. Plants above the soil do photochemistry, whereas microbes below the soil perform electrochemistry, creating positive and negative ions. The goal of this research is to create electricity from soil utilising plant microbial fuel cells [PMFC] or bio-battery, which transform chemical energy from organic components in soil into electricity.*

There are various sources of energy we have gone through in day to day life and as a source of electricity we consider drilling rigs and smokestacks, windmills and solar panels, and perhaps even lithium-ion battery packs spring to mind. What we generally don't consider are the farms, which cover more than one-third of the Earth's total land area. Yet, it has been discovered that they may also be used as an energy source. Soil may create electricity by forming biological batteries that can power agricultural sensors, reducing the need for single-use chemical batteries. The soil is actually incredibly rich in fuels, and we are simply collecting that fuel in this situation.

This bio-tech process is to create a battery that generates power from soil bacteria. The battery will be installed in the ground and the nutrients and bacteria present in the soil seep into the battery when it is watered or rains. As a result Protons and electrons are produced of their feeding activity. When paired with oxygen pouring into the battery through holes, the process produces enough electricity to operate lights, displays or tiny appliances. Soil bacteria, unlike solar panels or wind turbines, never cease producing energy. As a result, even when the sun isn't shining or the wind isn't blowing, the flow of electricity will remains steady. Eventually, our lawns and plants may be able to power our lights, TVs, music, and even Wi-Fi. We could eventually power our entire homes with this affordable source of renewable energy and if the soil is consistently watered, this battery will always generate electricity.

Chemical processes are used in standard batteries. With a lithium-ion battery, for example, lithium ions flow from the battery's negatively charged anode to its positively charged cathode. This will produces free electrons that travel through a separate wire, transferring an electric current from the anode to the cathode via the device being powered. Instead of utilising an element like lithium as fuel, this battery will employs organic materials. Microorganisms in the soil consume organic materials, breaking it down in a process that produces hydrogen ions as well as electrons. A wire is required within the gadget that carries free electrons from the anode to the cathode, energising the sensor in the process.

For years, scientists have been working on bio batteries that use enzymes to break down carbs, fatty acids, and alcohol. In elementary school, many students are exposed to the popular potato battery demonstration, which demonstrates how the acids in a potato may be used to power little lights or clocks. A number of studies have also been conducted to generate energy from organic debris present in wastewater and utilise it to cleanse the wastewater. Yet, the technique has yet to scale.

Professor Shelley Minteer's research group at the University of Utah is researching on putting DNA into bio batteries to boost energy density. She believes that the pricing and operational efficiency of biosensor technology will determine its broad adoption.

At this stage, it's time to consider the cost of the materials that will need to construct electrodes, how to connect everything and how to make those systems efficiently.

Most of biotech is composed of graphite, which is abundant and inexpensive, even less costly than the materials used to construct solar panels, which can also be used to power sensors but take up more area and can only provide energy when the sun is shining. While single-use chemical batteries may need to be replaced several times each year but this biotechnology will

generate energy on a continuous basis, both during the day and at night. They will create electricity regardless of whether it is raining or overcast.

According to some scientists, these sensors may last up to ten years and cost less than one euro, compared to four to ten euro for chemical battery-powered sensors. This is what will genuinely make or break the situation.

These panels will one day aid to power future biotech cities. Imagine farmers using their own fields not simply to produce food, but also to sustain not just humans, but also cities' energy demands. In the next years, this biotech will be able to significantly enhance the energy density of its batteries.

References

1. *Lu, Y., Liu, L., Wu, S. et al. Electricity generation from paddy soil for powering an electronic timer and an analysis of active exoelectrogenic bacteria. AMB Expr 9, 57 (2019).*
2. *Khiem Van Nguyen and Shelley D. Minteer et al. DNA-FuncitonalizedPt nanoparticles as catalyst for chemically powered micromotor: Toward signal-on motion-based DNA biosensor. Royal science chemistry, 1-3, 2012*
3. *D.Balasubramanina, Electricity from soil bacteria and reading lights from plants. March 10, 2018 05:16 pm*