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OPTIMAL USE OF FRUIT AND VEGETABLE WASTE BY GENERATING ELECTRICITY AND SOIL FERTILIZER– A REVIEW

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ABSTRACT

In recent years, the world has witnessed an alarming increase in environmental concerns, including the depletion of fossil fuel reserves, escalating greenhouse gas emissions, and the accumulation of organic waste. In light of these challenges, there is a growing need to explore alternative and sustainable energy sources. One such promising avenue is the utilization of vegetable waste to generate electricity. This innovative approach not only addresses the issue of waste management but also offers a renewable and eco-friendly solution to meet our energy demands.

This project aims to investigate and demonstrate the feasibility of converting vegetable waste into electricity through various processes such as anaerobic digestion, microbial fuel cells, and thermal conversion technologies. The project will involve Detailed research, experimentation, and analysis of different vegetable waste materials, including kitchen scraps, agricultural residues, and food processing by-products.

INTODUCTIONS

The rising demand for energy and need for sustainable solutions drive interest in alternative sources like vegetable waste for electricity generation. This project explores using vegetable waste to produce and store electricity in batteries, providing a green solution for charging mobile devices and other appliances.

With traditional energy sources depleting and their environmental harm, renewable methods like vegetable waste utilization present a dual benefit: addressing waste management and energy needs. Household, restaurant, and industrial vegetable waste often ends up in landfills, releasing greenhouse gases. Converting this waste into electricity helps reduce emissions and adds value to discarded materials.

The project considers technologies such as anaerobic digestion, microbial fuel cells, and thermal conversion for energy extraction, with the choice guided by waste availability, efficiency, and environmental impact. Effective battery storage systems are also crucial to ensure a steady power supply for charging applications.

MATERIALS

Sr no.	Components
1.	Juice Mixer Grinder
2.	Container (Plastic box)
3.	Cathode Plate
4.	Anode Plate
5.	Wires
6.	Resistors
7.	PCB
8.	Voltage Measuring Device
9.	Storage Battery
10.	LED bulb
11.	Diode IN4007

METHODOLOGY

Step 1: Juice Extraction

1. Place fruits and vegetables in a mixer to separate juice from pulp.
2. Transfer the juice through a pipe from the mixer to a plastic container.

Step 2: Composting the Fruit Waste

1. Transfer the remaining fruit waste to a composting container for fertilizer production.
2. Create layers in the compost container, alternating between fruit pulp and dry leaves, straw, or shredded paper (2:1 ratio).
3. Aerate the compost every few weeks to prevent Odor and speed up decomposition.
4. Keep the compost moist but not soggy, and monitor its temperature (54°C - 60°C).
5. After several weeks, once the compost looks dark and crumbly, let it cure for stability.
6. Test the compost for pH and nutrients before using it to enrich soil.

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Step 3: Generating Electricity from Vegetable Juice

1. Pour the vegetable juice into the container.
2. Insert zinc and copper plates (anode and cathode) into the juice, ensuring they don't touch.
3. The vegetable juice acts as an electrolyte, facilitating ion movement and completing the circuit.

At the Anode (Zinc): Zinc undergoes oxidation, releasing electrons.

$$Zn \longrightarrow Zn^{2+} + 2e^-$$

At the Cathode (Copper): Hydrogen ions or other positive ions gain electrons, potentially forming hydrogen gas.

$$2H^+ + 2e^- \longrightarrow H2(gas)$$

Step 4: Capacitor

1. Use a capacitor to store and release electrical energy as needed.

Step 5: Resistor

1. A resistor limits the current flow, preventing potential damage to the circuit.

Step 6: Storage Battery

1. Store the generated electricity for later use in a battery.

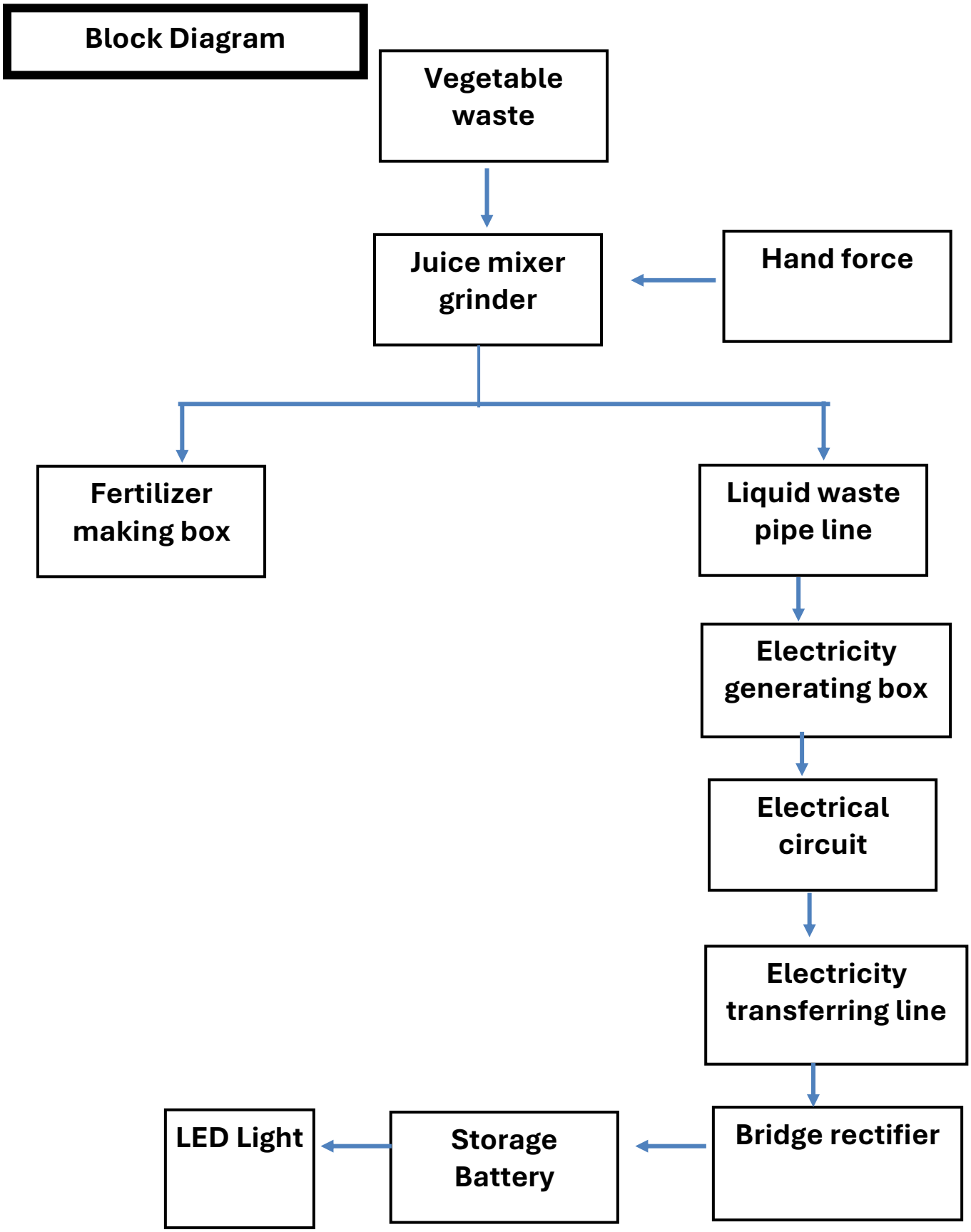
Step 7: Printed Circuit Board (PCB)

1. Use a PCB to provide support and electrical connections for components in the circuit.

Step 8: Measure Voltage

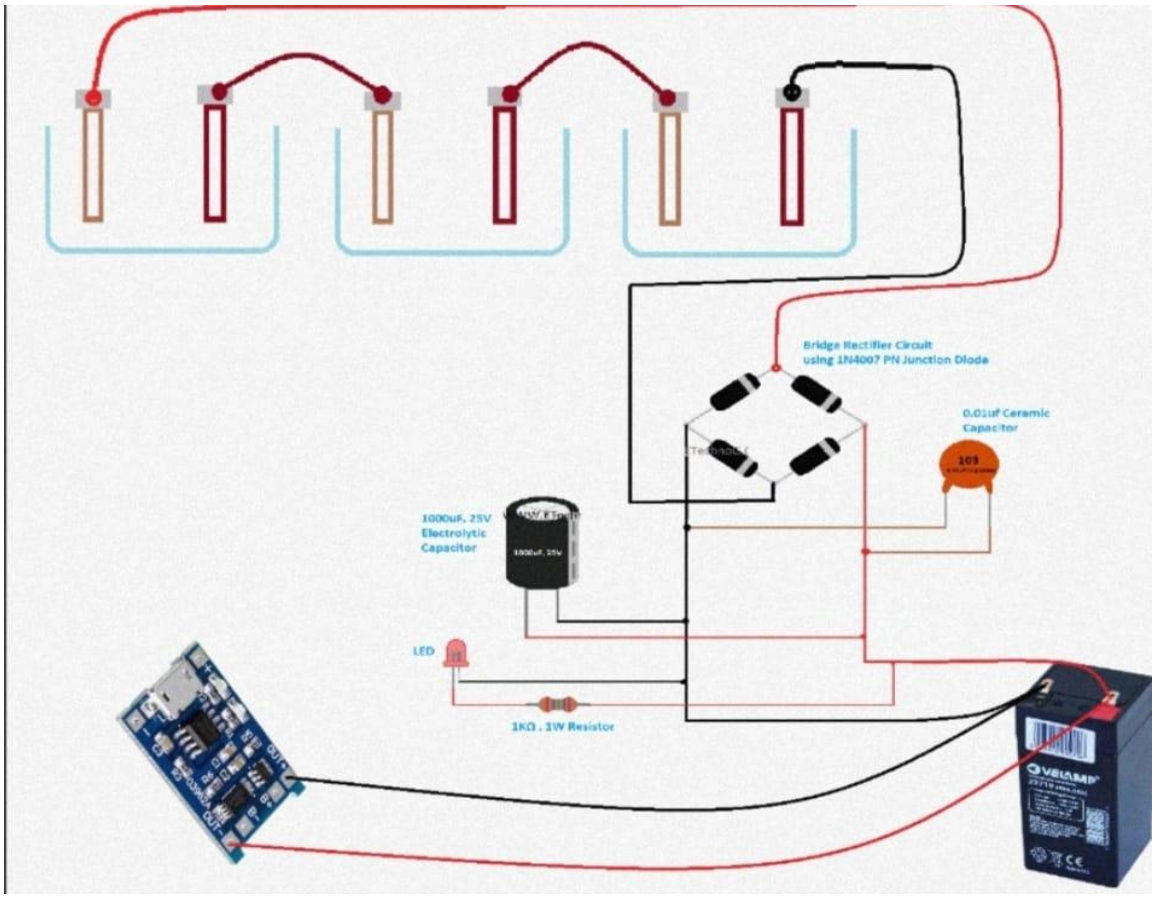
1. Turn on a multimeter to check the voltage, typically in millivolts.
2. Optionally, increase power by connecting multiple container in series for a higher voltage.

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Circuit diagram



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