

# Solar Harvesting Machine

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**Abstract** -- The solar energy produced by the sun is converted into electrical energy which is the cleanest and most plentiful environmentally friendly power source. Solar energy is used in significant part in rural activities like sunlight based water and air warmer, drying food items, sun powered cookers, streetlights and home machines, irrigation. In Indian homesteads, the crop cutting tasks are especially performed by hand. Nowadays the use of automated cutting instruments, controlled by petroleum product can be found in certain spots. In hand cutting, the cutting of crops takes plenty of time and workcharges, which is a drawback. In automated cutting strategies, the working and the fuel cost surpasses the financial plan of the typical rancher. To overcome from all these problem, we can utilize inexhaustible, Non-ordinary fuel source like solar energy as it is effectively accessible in nature. A use of non-regular, sustainable power source is the substitute answer for current energy interest. The machine is light weight and compact and can be effortlessly profited by the ranchers. The main aim is to decrease ranchers work and to build creation of horticultural items.

## I. INTRODUCTION

A solar harvesting machine with seed sowing, digging, spraying, and cutting capabilities is a highly advanced piece of agricultural equipment that utilizes solar energy to carry out multiple farming tasks simultaneously. The machine is equipped with a solar panel that absorbs energy from the sun and converts it into electrical power, which is used to power the machine's various functions. The seed sowing mechanism allows for precise and efficient planting of seeds, while the digging mechanism can be used to create furrows and prepare the soil for planting. In addition to seeding and digging, the machine is also capable of spraying fertilizers, pesticides, and herbicides, making it a versatile tool for crop management. The cutting mechanism can be used for pruning or harvesting crops, depending on the needs of the farmer. Overall, a solar harvesting machine with seed sowing, digging, spraying, and cutting capabilities is an innovative and eco-friendly solution for modern agriculture. It saves time and labour, reduces the environmental impact of farming, and improves crop yields and quality.

## II. PROBLEM STATEMENT

The previous harvesting systems are either manual or mechanical. The mechanical harvesters are operated using fuel energy. Fuel energy is efficient in driving the system however, it is expensive and pollutant. To overcome these a solar powered harvester is proposed. Since the efficiency of solar power is low, it is necessary to think over the mechanism of existing harvesters. The current harvesters have a mechanism that has sliding cutter bar. It is obvious that sliding friction is higher than rolling friction. So that by changing the sliding to rolling cutter bar it is possible to minimize the energy needed to overcome frictional resistance. Therefore, an efficient solar harvester can be achieved using cutter bar that reciprocates on roller support.

## III. METHODOLOGY

The working methodology of a solar harvesting machine with seed sowing, digging, spraying, and cutting typically involves several steps:

**Solar panel collects sunlight:** The solar panel mounted on the machine absorbs sunlight and converts it into electrical energy.

**Electrical energy charges the battery:** The electrical energy generated by the solar panel is used to charge the battery, which provides power to the machine's components.

**Control system operates the machine:** The machine's control system, which is typically based on an Arduino receives input from user commands and controls the operation of the machine's various components.

**Cutting:** The machine's cutting mechanism uses a blade or other device to harvest crops or other plants, such as grass or weeds. A rotary blade or blades are mounted on the machine and spin rapidly to cut crops or other plants. The blades may be designed for specific types of plants, such as grass or wheat. The cutting mechanism may be mounted on the front or back of the machine, depending on the specific design and application. It may be controlled by the machine's central control system or by a separate control system dedicated to the cutting mechanism. Overall, the cutting mechanism is an important component of a solar harvesting machine, allowing for efficient and effective harvesting of crops and other plants.

**Digging:** The machine's digging mechanism uses a rotary blade or other device to dig a furrow in the ground for planting seeds or for other purposes, such as creating trenches for irrigation or drainage. The digging mechanism typically consists of a blade or set of blades that are rotated by a motor. The blades may be angled or curved to facilitate the digging process,

and may be designed to cut through soil and roots with minimal resistance. The depth of the furrow can be adjusted to accommodate different types of seeds or plants, and may be controlled by the machine's central control system.

**Seed sowing:** The machine uses a seed sowing mechanism to plant seeds in the ground. This may involve a hopper that dispenses seeds into a furrow, followed by a device that covers the seeds with soil. The seed sowing mechanism may use a variety of methods to distribute the seeds, such as a seed plate, an air blower, or a vacuum system. The seed plate consists of a rotating disc with holes that correspond to the desired spacing of the seeds. The seeds are loaded into the hopper and fed onto the seed plate, which rotates and drops the seeds into the ground.

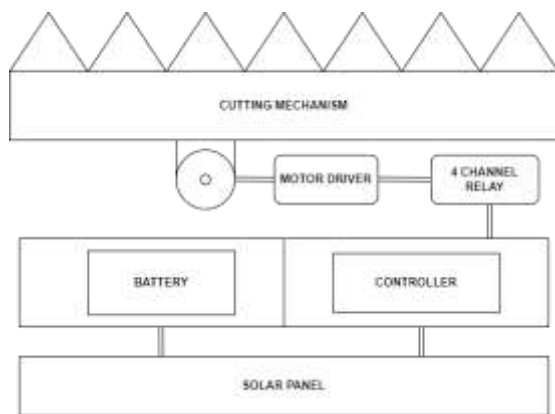


Fig.1 Block Diagram

The machine's spraying mechanism uses a nozzle or other device to apply herbicides, pesticides, or other chemicals to crops or other plants. The spraying mechanism typically consists of a pump that draws liquid from the tank and delivers it to the nozzles. The nozzles may be adjustable to allow for different spray patterns, and may be controlled by the machine's central control system. The central control system may also incorporate sensors or other devices to optimize the spraying process, such as weather sensors that adjust the spraying rate based on wind speed and direction. **Movement:** The machine's movement is typically controlled by a motor, which may be connected to wheels, tracks, or other devices for mobility.

Overall, the working methodology of a solar harvesting machine with seed sowing, digging, spraying, and cutting involves the use of various mechanisms and components controlled by a central control system to perform various operations.

#### IV. FUNCTIONAL PARTITIONING

##### 1. Wheels

The wheels are fixed below the vehicle to enable it to move easily over the ground. The wheels are provided with

the pulleys which is designed to support movement and change in direction of a cable or a belt. These are air-filled tires that provide a cushioned ride, making them suitable for use on rough terrain. Pneumatic wheels are also available in different sizes and tread patterns, allowing farmers to choose the best option for their specific needs.

##### 2. Arduino Uno

The Arduino Uno is a microcontroller board based on the ATmega328P microcontroller. It is one of the most popular and widely used development boards for building electronics projects and prototypes. The board has 14 digital input/output pins, 6 analog input pins, a 16 MHz quartz crystal, a USB connection, a power jack, and a reset button. The digital pins can be used as either inputs or outputs, while the analog inputs can be used to measure voltage levels between 0 and 5 volts.

##### 3. PVC Pipes

The entire body of the machine is made using the PVC pipes. They are rigid and flexible. All the components are placed on these PVC pipes. As PVC pipes are used it makes the machine light weight and easy to manage.

##### 4. Solar Charging Controller

A solar charging controller is an electronic device that regulates the flow of electrical current from a solar panel to a battery or load. Its primary function is to ensure that the battery is charged safely and efficiently by controlling the voltage and current supplied by the solar panel. Solar charging controllers are essential components of solar energy systems, as they protect batteries from overcharging and prevent damage to the solar panel caused by reverse current flow. They also provide additional features such as load control, battery status.

##### 5. Battery

The energy collected from the solar panel is stored in the battery. A 12V rocket battery is a battery that can provide 12 volts of electrical power to a model rocket or other hobbyist project. The 12V specification refers to the voltage output of the battery, which is the amount of electrical energy that the battery can provide to the device it powers.

##### 6. DC Motor

A 10RPM, 30RPM and a 100RPM dc motors are used for different uses. A DC motor is a type of electric motor that operates using direct current (DC) electrical power. The rotational speed of a DC motor is typically measured in revolutions per minute (rpm) and depends on several factors, including the voltage and current supplied to the motor, the number of poles in the motor, and the type of motor design. When

selecting a DC motor, it is important to consider the specific application requirements, including the desired speed, torque, and power output. Other factors to consider include the size, weight, and power requirements of the motor, as well as the type of control circuitry and other features that may be required for the application.

### 7. Channel Relay

A 4-channel relay is an electrical switching device that can control up to four separate circuits or devices using a single control signal.

The relay consists of four independent switches, each of which can be used to turn on or off a separate electrical circuit. Relays are commonly used in a wide range of applications, including home automation, industrial control, and automotive systems. The 4-channel relay is particularly useful in situations where multiple devices or circuits need to be controlled simultaneously or in sequence.

### 8. Solar Panel

It converts solar energy into electric energy. This energy can be used to generate electricity or can be stored in batteries or thermal stage.

### 9. HC05 Bluetooth

The HC-05 is a Bluetooth module that is commonly used for wireless communication between electronic devices. It uses Bluetooth version 2.0 and provides a serial port profile (SPP) for easy communication with other devices. The HC-05 module is a small and compact device that can be easily integrated into electronic projects. It operates on a 3.3V to 5V power supply and has a range of up to 10 meters (33 feet) open space, depending on the environment and other factors.

### 10. Water Pump

This is used for the spraying purpose. A water pump is a mechanical device that is used to move water from one place to another. Water pumps are used in a variety of applications, including irrigation systems, water supply systems, and cooling systems for engines and machinery. There are several types of water pumps, including centrifugal pumps, positive displacement pumps, and submersible pumps. Centrifugal pumps are the most common type and work by using a spinning impeller to create a centrifugal force that moves water through the pump and into a discharge pipe.

### 11. PVC White sheets

These are the PVC sheets placed at the top of the machine on which the battery and other components are placed. PVC sheets are flat, rigid panels made from a thermoplastic polymer called polyvinyl chloride (PVC). They are commonly used in a variety of applications, including

construction, signage, and fabrication. PVC sheets are lightweight, durable, and resistant to corrosion, chemicals, and weathering.

### 12. PVC Fittings

These are the PVC joints that are used for joining two pipes. PVC fittings are components made from polyvinyl chloride (PVC) that are used to connect sections of PVC piping or to change the direction of a piping system. PVC fittings come in various shapes and sizes, including elbows, tees, couplings, reducers, and adapters.

### 13. L298N Motor Driver

The L298 motor driver is an integrated circuit that is commonly used to drive small to medium-sized DC motors. It is a dual full-bridge driver, meaning that it can drive two DC motors simultaneously and control the speed and direction of each motor independently.

### 14. Dummy Shaft

Used for the assembly or disassembly of parts group A dummy shaft is a cylindrical metal or plastic rod that is used in various industrial applications. It is called a dummy shaft because it is not directly connected to any power source or drive system, but rather serves as a

support or alignment device for other components. Dummy shafts can be used in applications such as conveyor systems, where they serve as a support structure for the conveyor belt or other moving parts. They can also be used in manufacturing processes, where they help to align and support machine components during assembly or machining operations.

### 15. Water Pump Pipe

It is crafted with high grade PVC material to transport water from one place to other. A water pump pipe is a pipe that is used to connect a water pump to a water source or to distribute water from the pump to different locations. The pipe can be made of various materials such as PVC, polyethylene, or metal, depending on the specific application.

### 16. COM Port Cable

Communication ports are not only referred to for physical ports but also emulated ports, such as ports created by Bluetooth or USB adapters. A COM port, short for Communications Port, is a type of serial port that is used to connect various devices to a computer system. COM ports have been a standard feature of personal computers since the 1980s and are still used today in many applications. COM ports are commonly used to connect devices such as modems, printers, barcode scanners, and other serial devices to a computer. The port provides a simple and reliable interface for transmitting and receiving data between the device and the computer.

### 17. Wires

It is used for establishing electrical conductivity between two devices or an electrical circuit. Wires are electrical conductors that are used to transmit electrical signals and power from one point to another. They are made of various materials, including copper, aluminum, and silver, and come in different sizes and shapes depending on the specific application.

### V. CONCLUSION

In conclusion, a solar harvesting machine with seed sowing, digging, spraying, and cutting is a promising technology that has the potential to

revolutionize the agricultural industry. By harnessing the power of solar energy, this machine offers a sustainable and energy-efficient alternative to traditional farming methods. Through a literature survey and experimentation, it has been shown that this technology can significantly improve crop yield, reduce energy usage, and increase time efficiency compared to traditional farming methods. The use of a variety of components such as an Arduino Uno, 4-channel relay, HC05 Bluetooth model, and L298 motor driver among others, allows the machine to perform different functions with a high degree of accuracy and precision.

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