Solar Powered Atomatic funtional CropCultivator

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Abstract:

India is most growing country in the sector of farming. Hence demand of power is increasing day by day from farmers. Due to limitation of coal and weather condition, it becomes very difficult to fulfil the energy demand of farmers. Many areas of the country electricity supply to farmers field are at night hours. Farmar's has to feed water in night hours. Looking to this energy crisis solar power automatic functional crop cultivator is develop. In day hours there is lot of natural power is available in the form of solar. Only 70% solar radiation are absorbed by earth and rest of 30% are reflected back in atmosphere. This solar radiation can be utilized for electricity generation by PV cells and further can be use in farmer's need like in crop cutting machine, solar dryer etc. Now a days solar water pumps are being promoted by government for agriculture pump. This paper is practical study of crop cultivator use in paddy crop which is power by solar panels instate of petrol generator machine crop cultivator.

Keywords: *Solar panel, battery, microcontroller, automated, renewable energy*

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I .INTRODUCTION

In India where the main source of income is agriculture,[1] needs to be concentrated in some aspect like how to increase productivity, profit, how to reduce the cost and how to solve the problems of the farmers. In the list of problems of the farmers, cultivation of crops is one of them. In which farmers have to face many of difficulties. In India, two types of agricultural equipment are used, manual method (Conventional method) and mechanized method. In conventional method Crop Cutting is done by farmer or labor. In which labor has to work hard for many hours in field and also the farmers have to pay daily wages to the labors. So this will increase expenditure cost of farmers and the physical pain to the labors is one of the problem in this method. For manually harvested crop nearly for cutting and bundling the crop 185 to 340 man-hour/hector is needed in case of wheat crop where as in case of paddy crop it is 170 to 200 manhour/hector [11] In mechanized type method, the cutter is operated by the engine, engine runs on petrol and diesel which create the air pollution. Engine produces the vibration which is harmful for the farmers and also the operating and maintaining cost of recently operated cutter (Mechanized type) is high, which cannot be affordable by the Indian farmers. The crop cutter is a mechanized robot or machine which help the farmer to cut the crops and also help to collect the crop for bundling. In this paper of proto type model is design. Crop cultivator is named as Automatic crop cultivator due to the ability of handling multi mechanism in future. This crop cultivator is handy and can be easily to use for different types of mechanized work like cutting of grasses, cutting of weeds, cleaning of unwanted crops of field etc.

Population growth is the main problem of the universe today. Even in this world, we are facing problems such as pollution and blackouts. Due to this problem, there is so much interference in the work of daily life. To overcome these problems, we thought of a device that uses modern smart devices and overcome pollution Solar energy is one the best solution. The invention was going on from 1954.The idea of collection of solar energy & it is used as a renewable source for further applications as an energy source for electrical equipment. [2]. Today efficiency of conversion of solar energy into useable energy is 20 % or more than that [4]. The application of solar energy is in various areas like textile mill, food storage, water pumping etc. This paper gives idea of energy efficient solar lawn mower which is shown in figure 1a. The developed model for grass cutter is automated which reduces human efforts and reduces noise pollution. The device is microcontroller base. Figure 1b shows basic block diagram of solar powered grass cutter. In addition to photovoltaic, solar energy is widely used as water heater systems. Solar energy now be homes and business for electrification this saves lot of energy [5]. Earlier there is development of solar based manually operated the lawnmower. This device has a straight blade and is not affected by weather [6]. The main purpose of this develop product is Unskilled workers can use this device. This paper gives novel Topology which is automated and can be able to cultivate crop. The system uses microcontroller for automation activity and which detects obstacle in between working of device. For power source renewable energy i.e., Solar power is used to as a source of energy through battery and is installed on the top position of the device which reduces the power problem.

II. METHDOLOGY

A. Block Diagram

Figure 1 shows of microcontroller-based crop cutter device and figure 2 block diagram of microcontroller-based crop cutter.In this proposed system atmega328 AVR (Arduino Uno) microcontroller is used, Two side shaft, high torque DC motor and driver circuits. This model is totally operated by solar energy. In fig.3 of block diagram, one ultrasonic sensor which is have use for obstacle sensing that means when obstacle is detected then machines stop and vice versa. Microcontroller continuously check the output of ultrasonic sensor and gives signals to the motor driver circuits which drive the motor. The process is as shown in figure 3.

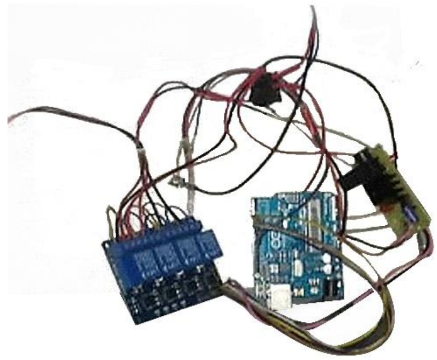

Figure 1. Solar powered crop cutter microcontroler base circuit

In this model following components are used

1) Microcontroller
2) ATMEGA 328 AVR (Arduino uno),
3) Two side shafts,
4) High torque DC motor
5) Driver circuits

The device having ultrasonic sensor which is used for obstacle sensing,which detects obstacle and stop machines.Microcontroller continuously check the output of ultrasonic sensor and gives signal to the motor driver circuit which drive the motor.The process is shown in figure 2

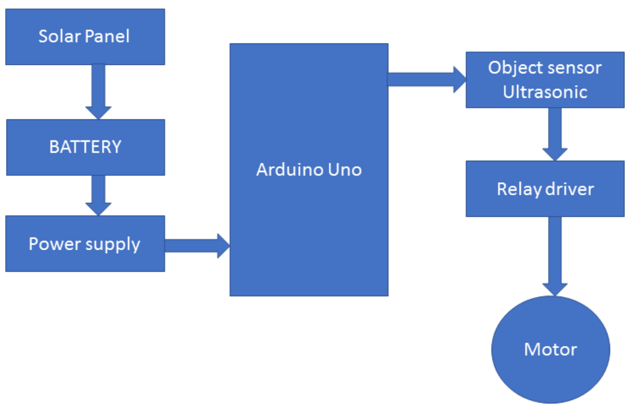

Figure 2.Block Diagram of solar powered Crop cutter

Arduino Uno is a microcontroller board based on 8-bit ATmega328P microcontroller. Along with ATmega328P, it consists of other components such as crystal oscillator, serial communication, voltage regulator, etc. to support the microcontroller. Arduino Uno has 14 digital input/output pins (out of which 6 can be used as PWM outputs), 6 analog input pins, a USB connection, A Power barrel jack, an ICSP header and a reset button.

Arduino IDE (Integrated Development Environment) is required to program the Arduino Uno board

Table 1 shows the technical specification of Arduino Uno

TABLE 1 TECHNICAL SPECIFICATION

Sr. No	Microcontroller	ATmega328P – 8 bit AVR family microcontroller
1	Operating Voltage	5 V
2	Recommended Input Voltage	7-12 V
3	Input Voltage Limits	6-20 V
4	Analog Input Pins	6 (A0 to A5)
5	Digital I/O Pins	14 (out of which 6 provid PEM output
6	DC Current on I/O Pins	40 mA
7	DC Current on 3.3V Pin	50 mA
8	Flash Memory	32 KB (0.5 KB is used for Bootloader
9	SRAM	2 KB
10	EEPROM	1 KB
11	Frequency (Clock Speed)	16 Mhz

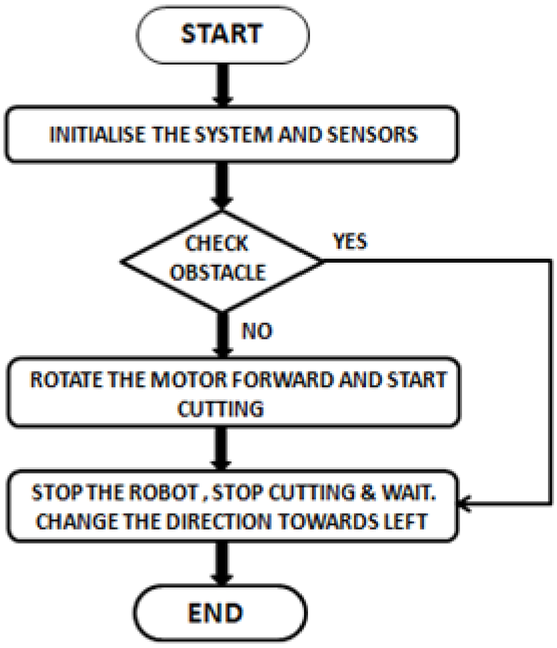

Figure 3.flow chart of solar powered Automatic functional Crop Cultivator

B. Working of crop cutter :

Working of crop cutter starts with execution of Program which initialize all the memory location and pointers. All the modules are initialized. Commands are checked for cropcutter, if command is yes then relay circuit activate and motor get start. If any obstacle is comes in path of crop cutter then it stops and wait for further command. After detection of obstacle Arduino gives command of left turn by receiving this command relay driver send command to the motor and grass cutter turn left and move forward. Figure 4 shows interfacing of devices with microcontroller.

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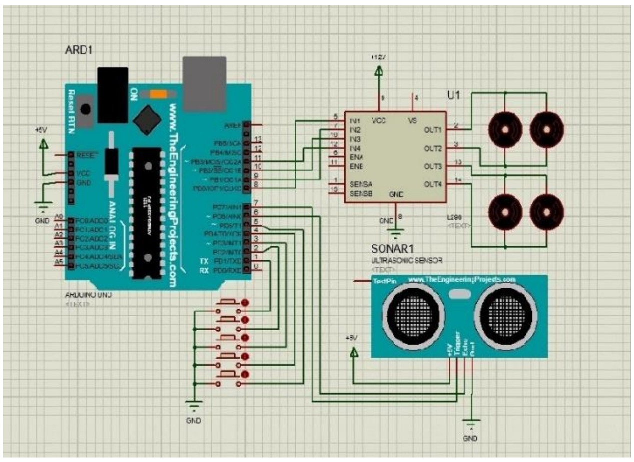

Figure 4. Microcontroller interfacing

Figure 4 shows interfacing of devices with microcontroller

Figure 5. Crop Cultivator with solar panel

Figure 5 is the practical model of crop cultivator with solar panel of 80watt 12volt. This model is design at very low budget so that it should be economical to farmers.

IV NEED OF LOW COST OF CROP CUTTERS FOR FARMERS:

The main aim behind this is to construct such equipment which are essential for the farm field with the suitable cost which will be affordable for the poor farmer and also the efficiency of the equipment should be high, so that all farmer can prefer it first rather going to the convectional equipment's. The other need is the labour availability, now a day the labour's are not being easily available. Also if they are available, the working cost of them is very high and the efficiency of the labour is very low. With this model, work can be completed in the given time. When farmers use the convectional machine like the diesel machine the main problem caused by this machine is the pollution. Because of the pollution the farmers life is getting affected and resulting cause of breathing problem.There isabundant nonconventional energy source available in our surrounding which can be used rather than the convectional source of energy. There is no harmful effect like polluting the surrounding environment on use of such model. Solar energy is freely available andno one has need not pay for it. The trapping of solar energy is very easy and also conversion of it into the electricity is very easy. The equipment's required for the conversion of solar energy is easily available in the market with the suitable low cost. Table2 shows labor cost for harvesting for one acre of filed.

TABLE 2. COST AND TIME PARAMETER FOR CULTIVATION OF ONE ACRE OF LAND.

Sr. No	Parameter	For conventional method for 6 labour	For crop cutter
1	Time Required	12 hours	6 hours
2	Cost spend on harvesting	1.5 days of working, 400 salary per day, 6*600=3600 rs	Petrol required 8 liters, 8*85=680 + 2 labours, 400*2=800
3	Total cost spends	3600 Rs	1480 Rs

Form table 2. In all parameters farmer has to pay some amount. This amount can be minimised by use of solar power crop cultivator.

V.RERULTS & DISCUSSION

This project is based on microcontroller which performs function based on desired input commands given by the operator. So, it helps to reduce human efforts by doing automatic function of cutting crop and by doing automatic motion. Here in thismodel the aims to use automation technology by reducing human efforts and perform a desired task with minimum time and get the better output. In this project Dc motor is powered by battery, this battery is charged by panel circuit present, again this motor is connected to spiral shaped grass cutting blade. This system can be used work during day & night due to its battery backup. When there is no work solar panel charges and stores energy. Table2 gives ratings of major components applied for the system. Fig 6 shows microcontroller programming for interfacing devices ForAutomatic functional CropCultivator.

TABLE 2 LIST OF COMPONENTS FOR AUTOMATED SOLAR POWERED GRASS CUTTER.

Sr.no.	Component	Application	Quantity	Rating
		Table Column Head		
1	Solar Panel	To supply power to the system	1	polycrystalline solar panel 80watt , 12volts inclination angle16 to 19 degree
2	Blade driving motor	Rotating of the blade	1	7000 to 12,000 RPM
3	Wheels of a system	For motion of a system	4	8/8"
4	Battery	To supply power to circuit	1	12V battery (Lead acid) 7.5 AH
5	Geared motor DC	For rotation of the wheels	2	10,000 RPM
6	Driver	To control Motor	1	ULN 2003
7	Arduino UNO	Microcontroller	1	AT mega328

A Designing System

1.1. Power required to shear the grass is from-11. 51N.This strength is provided by spiral cutting blades.

Assume

$Force = 10\ N$

$Force = T$ (1)

Where Torque = torque provided by shaft, radius= Radius of cutting blade=12 cm

$Torque = $ (2)

$= 10*0.12=1.2\ Nm$

Also shaft power is given by

$P = $ (3)

$P = T * 2\pi N/60$

$Where\ P = Power\ deliver\ by\ shaft$

$T = Torque\ required$

$N = Shaft\ speed\ in\ rev/min = 10000\ rpm$

$P = 2 * 3.14 * 10000 * 1.2/60$

$P = 1256\ watt$

B.Selection of motor

$Motor\ Speed = 10{,}000\ RPM, Motor\ Voltage = 12\ V$

$Motor\ Watts = 1256\ W$

C. Power Calculation

$Power = I\ X\ V$ (4)

$where\ V = 12, I = 2.3\ Amp$

$P = 2.3\ X 12 = 27.6\ watt$

D. Calculation of Solar Panel parameter

$Solar\ panel\ volt = 12\ V$

$Solar\ panel\ watt = 10\ W$

$W = V\ X\ I$

$10 = 12\ X\ I = 0.833A$

$I = 833\ mA$

E. Calculation of Battery parameters

$BAH/CI = 7.5\ ah/833\ mA$

$= 9\ h$

$To\ find\ the\ current$

$Power = 27.6W, Voltage = 12\ V$

$Current = ?$

$P = V\ X\ I, 27.6 = 12\ X\ I$

$I = 27.6/12 = 2.3, Battery\ usage\ with\ 2.3\ A.$

VI. CONCLUSION

The main objectives of this project is to use renewable source of energy ,to design a automated solar powered crop cutter machine,which minimizes the human efforts, also reduces pollution by using emission and noise free devices. It saves time by using new technologies. This project is successfully designed which completes its work by automatic control by microcontroller and by use of solar energy it is also energy efficient as daily we do not required lawn mower, we can charge it. The charging time is nearly nine hours and can be used for up to 2.5 hrs. Even if it is not charged in emergency can be used with step down transformer from AC Power Supply.

VII. ACKNOWLEDGMENT

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