

# MICROCONTROLLER BASED SOLAR POWERED SEED SOWING MACHINE

## Abstract

India is land of agriculture. Agriculture is the main profession of India which decides the economic condition of the country. The government of India has various plans to encourage agriculture and support farmers. Agriculture is defined as an art of growing plants and other crops which involves science in it. Various activities are involved in agriculture such as preparing the land for cultivation, formation of furrows, seed sowing, irrigating the crop, cutting of the crops, drying of crops etc. All these activities demand labor and time. With the increase in population it has become necessary to increase the yield of agriculture and also rate of production to meet the demand. At the same time labor problem is also increasing. Therefore, it has become inevitable to adopt machinery and their automation in the profession of agriculture. The seed sowing machine is a key component of agricultural field. The various technique used in India for seed sowing are manual, ox and tractor operated. The manual and ox operator technique are time consuming and productivity is low. Tractor is running on fossil fuel which works out be costlier and since it emits carbon dioxide which results in environment pollution. Therefore, here an attempt is made to design a seed sowing machine which is cheap and works using renewable energy. This machine is driven by solar fed D.C motors and is controlled by microcontroller. In this machine solar panel is used to generate electrical power and is stored in the battery. This power is used to drive two DC motor and one stepper motor. The aim is to carry out effective sowing of seeds. Here program is written to control the speed of the motors so that the distance between the seeds can

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be controlled depending upon crop. The nozzle of the seed container can be controlled so that it can be used for sowing of different types of seeds. The condition of the seed container, whether it is empty or not is displayed and also gives information by buzzer. In this way this machine helps to carry out processes of seed sowing effectively in fewer amounts of time and labor.

## I. INTRODUCTION

India is the country of agriculture. Agriculture is the main profession of India. The economic condition of India depends strongly on agriculture. Therefore, it is necessary to adopt newer techniques and skills to improve the yield of agriculture. At the same time, the population of India is growing day by day. Hence it becomes necessary to improve the profession of agriculture in order to full fill the demand. There are various activities one need to carry out for effective farming. One among is seed sowing process. It is one of the tedious, time consuming and laborious work. There are various traditional methods of seed sowing. They are discussed in brief here.

## II. TRADITIONAL SOWING METHODS

Sowing of Seed is the processes of putting the seed in the soil at a particular depth for good germination. The conventional methods include manually broadcasting, opening furrows by a country plough and dropping the seeds by hand and dropping seeds in the furrow by a bamboo/metal funnel attached to a country plough. For sowing in small areas dibbling i.e., making holes or slits by a stick or tool and dropping seeds by hand, is practiced.

- 1. Animal Drawn Multi-Crop Planter:** In earlier days animals were used to sow the seed. One such method is shown in Figure 1.



**Figure 1:** (a) and (b) Animal drawn multi-crop planter      Fig 1.2 The tractor operated seed sowing

Figure 1 (a) shows common method of seed sowing. In this method seed sowing is carried out using two oxen. Two persons are involved. One is for preparing the furrows and another for sowing the seed. Figure 1 (b) shows animal drawn 3-row planter is a multi-crop planter for planting of bold and small seeds. The planter is also suitable for sowing of inter-crops as different seeds can be filled in different boxes. These traditional methods are time consuming. Hence to save the time, machine operated seed sowing technique has come up.

- 2. Tractor Operated Seed Sowing:** For planting of bold and small seeds tractor operated 6-row inclined plate planter which is a multi-crop planter is used. It is having a frame with

tool bar, modular seed boxes, openers for furrow and a system for ground drive wheel. It will have six modular design seed boxes with inclined plate type seed metering mechanism which acts independently. Different types of Seed plates for sowing different seeds can be selected and changed as desired. The plate thickness, number and size of cells on seed plate vary according to seed size and desired plant-to-plant spacing. For operation, the seed is filled in the hopper, seeds are picked up by the cells of inclined plate and delivered in the opening connected to furrow opener through seed tubes. Shoe type furrow openers ensure deep seed placement in moist zone for sowing under dry land condition. Modular seed box-furrow opener units are adjustable for sowing seeds at different row-to-row spacing. By changing the transmission ratio the plant to plant spacing can be changed. It is shown in Figure 2

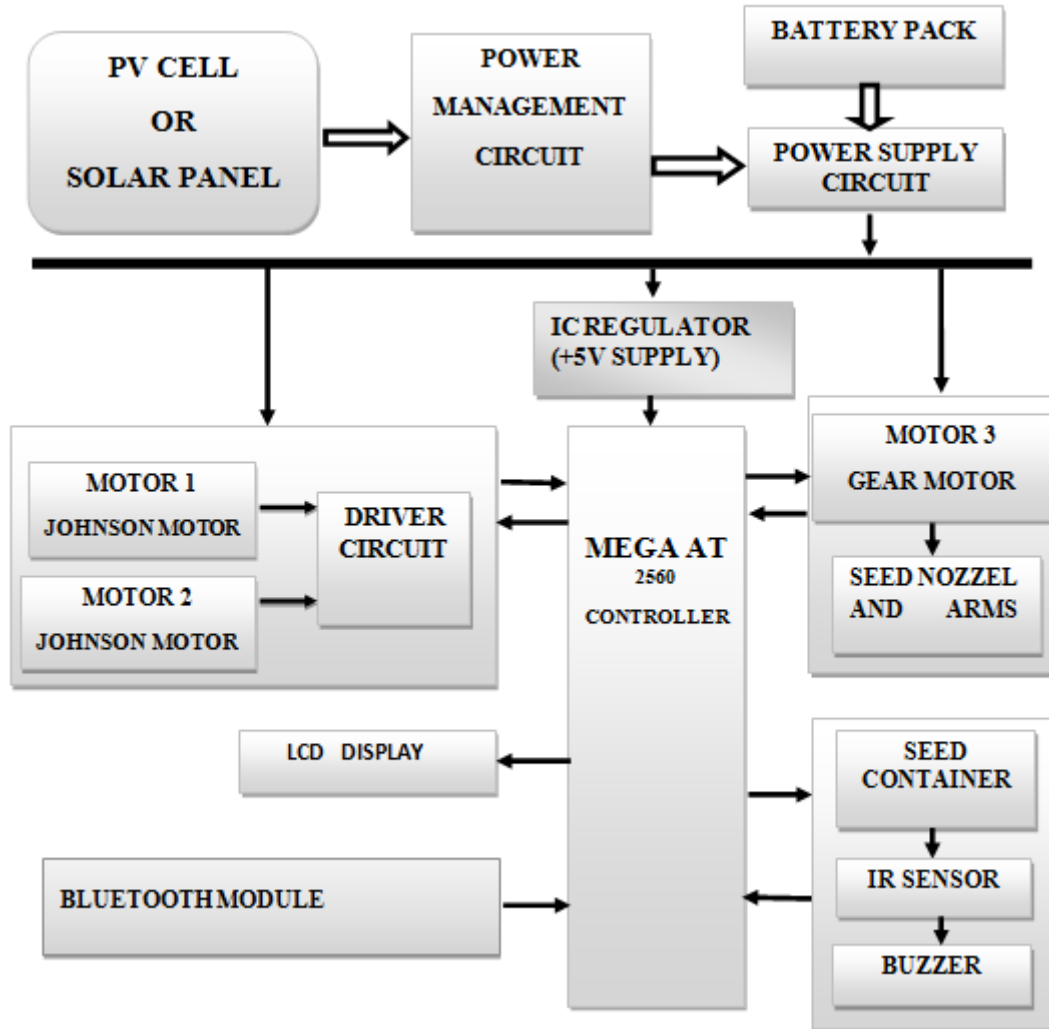
### **3. Limitations of Traditional Sowing Methods of Seed:**

- In manual method of sowing the seeds, it is difficult to attain uniformity in spacing or distributing the seeds.
- Farmer may sow at the required rate but inter- row and intra – row spacing of seeds is likely to be uneven which results in bunching and gaps in field. The control over depth of seed placement may not be good.
- Because two persons are required for dropping seed and Fertilizer labor requirement is high.
- The effect of inaccuracies in seed placement on plant stand is greater in case of crops sown under dry farming conditions.
- Use of tractor works out to be costlier and is not environment friendly.

To overcome the above said drawbacks, it is required to design a low cast, automatic and environment friendly sowing machine for seeds.

### III.METHODOLOGY

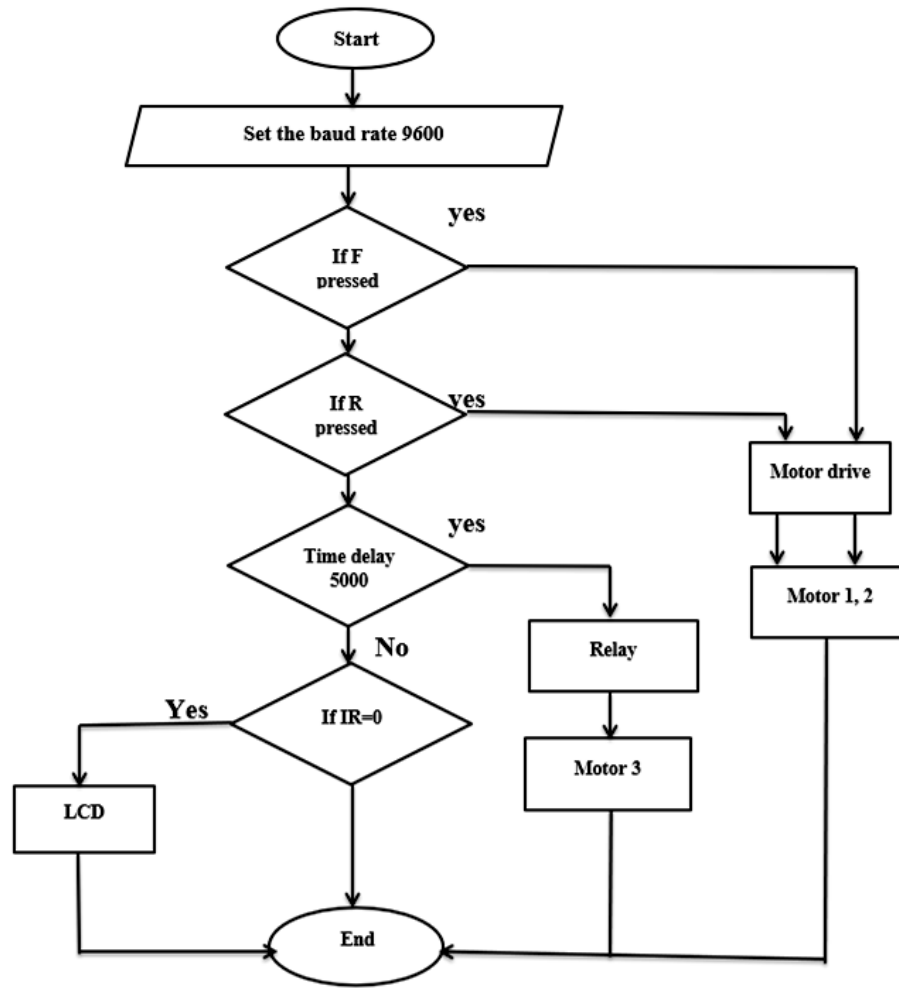
The method used for the implementation of the work is described with the help of block diagram and is shown in Figure 3.



**Figure 3:** Block Diagram of Sowing Machine for Seeds

In the diagram, motor 1 and motor 2 are used for driving the sowing machine of seeds. The third motor is used for controlling the opening as well as closing of the nozzle of the seed container. These motors are powered from the energy generated by the solar PV cell. The controlling operation of the machine is carried out using microcontroller. Blue tooth module is used for giving controlled signal for the to and fro movement of the machine. The sensors are used to check the status of the container to indicate whether it is empty or not. The buzzer is used to indicate the empty status of the seed container.

The logic used in the work is given in the Figure 4



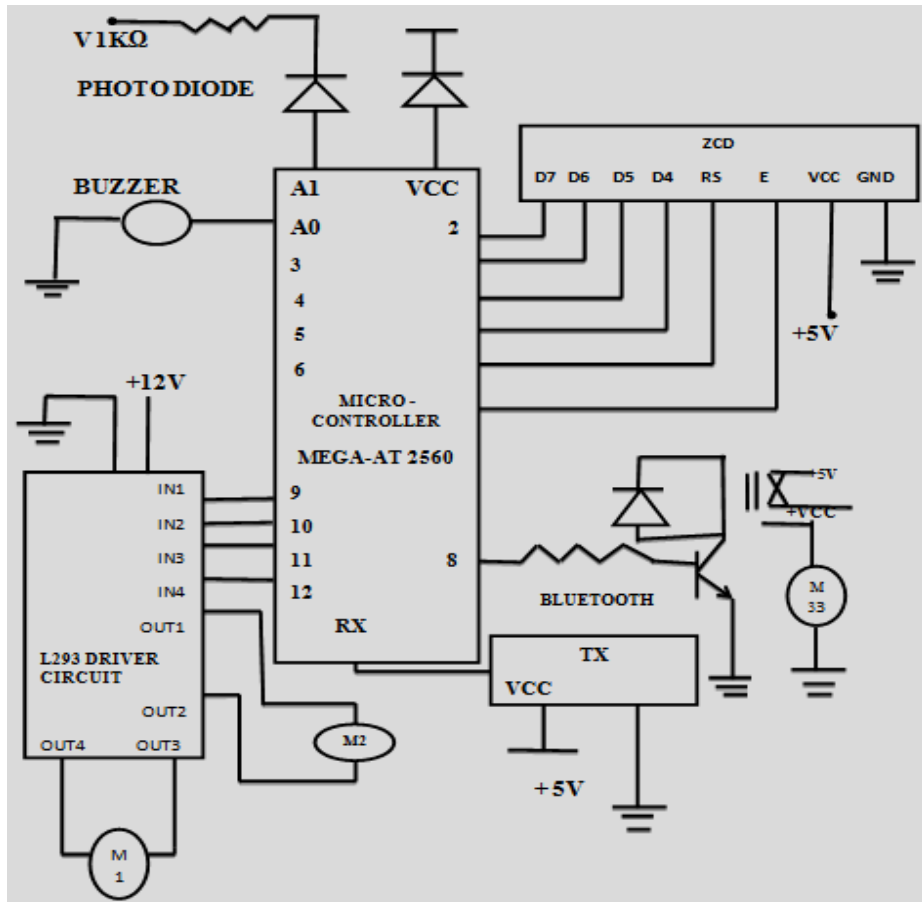
**Figure 4:** Flow Chart

On receiving the signal from blue tooth module and IR sensor, microcontroller generates signal to drive the motors and display the information on the LCD. Buzzer indicates the empty condition of the seed container.

#### IV. HARDWARE COMPONENTS

The hardware components used for fabrication and operation of the sowing machine of seeds are

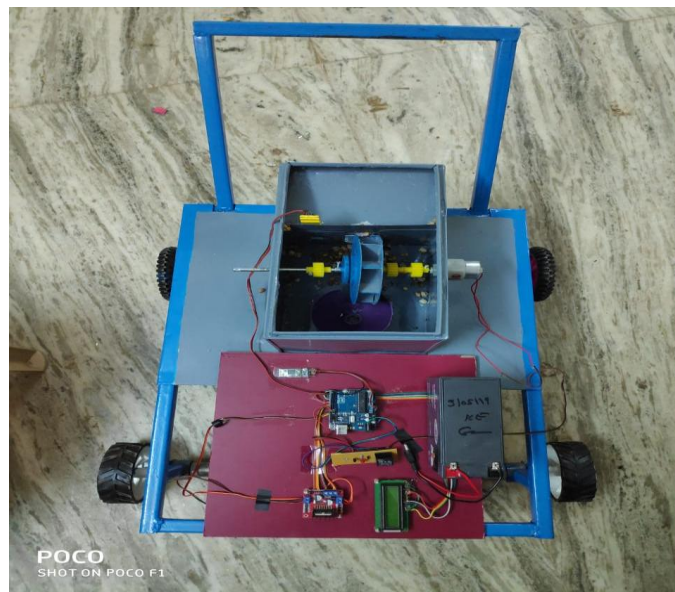
1. **Mechanical Components:** The mechanical hardware components used for the fabrication of the machine are frame, Hopper, Disc Shaft and Plough
2. **Electrical Components:** The electrical hardware components used for the operation of the seed sowing machine are: Solar panel, Johnson motor, AT MEGA 2560 Microcontroller, 7805 voltage regulators, LCD display, Driver circuit, Gear Motor, Blue tooth module, IR sensor, Photo diode and relay. The interfacing of all these electrical components for their controlled operation is shown in Figure 5



**Figure 5:** Interfacing all the components with microcontroller

## V. RESULTS AND DISCUSSIONS

The complete assembly of the machine is shown in Figure 6



**Figure 6:** Model of Seed Sowing Machine

The speed of the Johnson DC motor and gear motor is controlled by varying the delay. As the delay increases, the voltage applied decreases, hence the speed of the DC motor and gear motor decreases. This results in increase in distance between the seeds. The results are shown in the Table 1 and Table 2 and in Figure 7

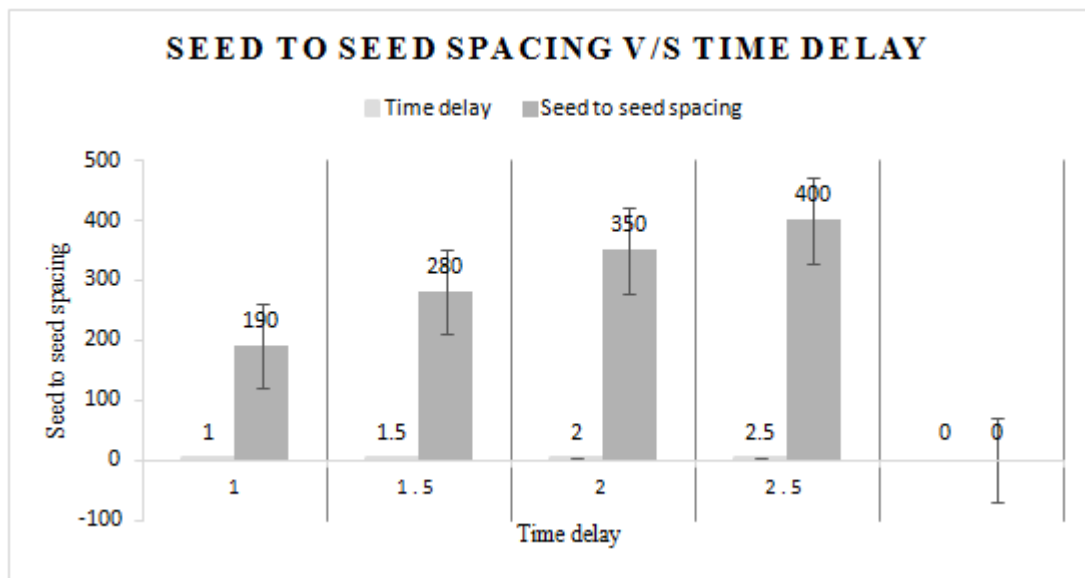
**Table 1 Speed of the Motors and Time Delay**

Time Delay	Johnson motor speed	Gear motor speed
1 sec	2.5 R.P.S	0.25 R.P.S
1.5 sec	1.6 R.P.S	0.1 R.P.S

From this table it is clear that the speed of the motor is controlled by controlling the delay in the program.

**Table 2: Seed to Seed Distance and Time Delay**

Time Delay (seconds)	Seed to seed distance (mm)
1 sec	190
1.5 sec	280
2 sec	350
2.5 sec	400

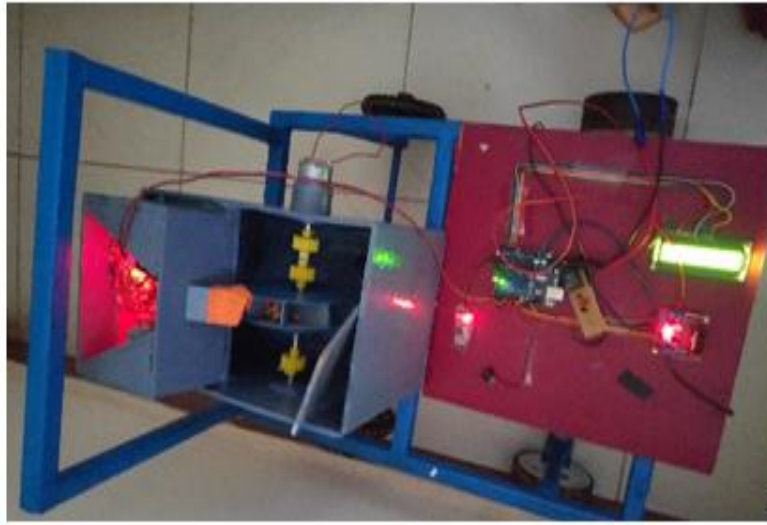


**Figure 7: Relation between Seed to Seed Distance and Time Delay**

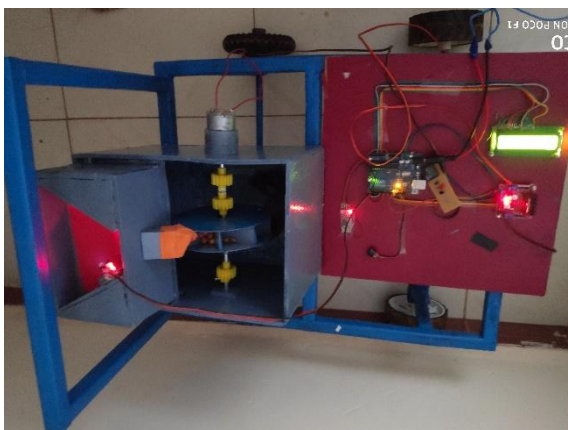
From the tables 1 and 2 it is clear that as the delay increases the distance between seeds will also increase.

The condition of the seed container whether it is full or empty is also checked and results are presented in the Figure 8.





(a)



(b)

**Figure 8:** Seed Container condition (a) seed container is full (b) Seed container is empty

The Figure 8 (a) shows that, when seed sowing machine's container is full the IR Sensor does not send a signal to the buzzer through Arduino so it does not make sound. The LCD displays that "seeds box is full".

The Figure 8(b) shows that, when seed sowing machine container is empty, IR Sensor sends a signal to the buzzer through the Arduino so it makes sound then the LCD displays that “seeds box is empty.

From the results, it is seen that the operation of the machine is easy. The distance between the seeds can be controlled very easily simply by changing the delay in the programme.

The condition of the seed container is monitored and displays the status. Hence, it is possible to carry out effective sowing, which intern results in increased yield and reduces labour cost and time. The machine works out to be cheaper as it is fed by solar.

## REFERENCES

- [1] A. R. Kyada & D. B Patel, “Design And Development Of Manually Operated Seed Planter Machine” of Lecture 5th International & 26th All India Manufacturing Technology, Design and Research Conference (AIMTDR 2014) , IIT Guwahati, Assam, India. Vol 2. Dec. 2014
- [2] D. Ramesh , H.P. Girishkumar, “ Agriculture Seed Sowing Equipments: A Review” , ISSN N0.:2278-7798,Vol.3. July 2014.
- [3] A.Kannan , K. Esakkiraja , S. Thimmarayan, “Design And Modification Of Multipurpose Sowing Machine” VOL:2 ,ISSN (ONLINE): 2321-3051, Jan. 2014.
- [4] Roshan V. Marode, P.Gajanan, and K.Swapnil , “Design & Implementation of Multiseed Sowing Machine”, Vol : 2,No. 4, Oct. 2013.
- [5] A.Rohokale , “International journal of advanced agriculture system with proper seed spacing”. 2004
- [6] B.Shivaprasad, M. Ravishankara, B.Shoba “Design And Implementation Of Seeding And Fertilizing Agriculture Robot” , Vol. 1(3), pp.190-213, 2010.