# Automatic Seed Sowing Machine for Agriculture Sector

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*Abstract -* **Earth's population is projected to cross 10 billion by 2050, and the amount of food required to feed that population double of what we produce today. There is an immediate need to increase the efficiency of our agricultural practices. This is ever more relevant in India, where an estimated 70% of population is finds employment in the agricultural sector, compared to 2% in a developed country like the United States of America. During this study, analysis of seed sowing practices adopted by low-income farmers in the country has done. This paper utilizes the concepts of mechatronics and allied fields to develop a low cost machine that can automate the process to some extent. This machine will enable the farmers to engage in alternative activities that generate income. By this paper farmers will have an option that without their direct involvement, their land is being ploughed and seeds being sown. This automatic seed sowing machine will traverse the entire area of the field in parallel rows. During the traverse process this machine will dig up the earth and plant the seeds at the same time. Therefore, it will greatly reduce the time spent in planting. The machine will carry seeds on board and can be used to plant a variety of seeds. The spacing requirements of different flora are taken into consideration, and the machine will provide controls for adjusting the spacing between consecutive seeds being sown for particular seeds. It will be run on wheels, which are driven using a DC motor drawing energy from a battery. This machine aims to automate a highly labour intensive task for farmers lacking the financing resources to afford traditional farm machinery.**

*Keywords:* Automatic Seed Sowing Machine, Agricultural Mechanization, Precision Seed Placement, Low-Cost Farming Technology, Mechatronic System Design, Seed Spacing Adjustment Mechanism, Battery Powered Farm Equipment, DC Motor Drive System.

## I. INTRODUCTION

With rising population and increasing food consumption per capita, the demand for food is expected to overtake our capacity to produce it soon. Combating this issue is not as simple as allocating additional land for agricultural use, but to maximize the crop yield from the existing agricultural land.

India's progress in this field over the past four decades has been impressive, with the contribution of increased agricultural use land to increase in production falling. This has enabled the agricultural sector to increase production with growing food demand. But a considerable fraction of Indian farmers employs outdated and in- effective agricultural practices to this date. Most of these are low-income farmers owning plots of land less than 1-hectare area. They have been left out of the loop of the advances in agricultural practices and techniques by the high cost of modern farm machinery. These farmers to this day perform farm activities by hand or by employing cattle, using hand or cattle driven ploughs, tilling the land, and sowing the seeds. All these activities are highly labour intensive and time consuming, with entire families working to cultivate the small piece of land, it being their sole source of employment and income. This is a far cry from farming in developed countries, where a single farmer, using advanced machinery, can perform all these agricultural activities over hundreds of acres of land. The major deterrent for Indian farmers here is the high cost of tractors and other farm equipment.

This work aims to study the requirements of low-income Indian farmers, the ways in which agricultural activities, specifically ploughing and seed sowing, can be optimized, and developing a machine to automate the same. The main criteria here is to develop the machine at a low cost, so that small farmers would be able to afford it. This machine is not intended to perform the function or duplicate the versatility of tractors, but to provide an alternative piece of farm equipment to the farmers that cannot afford tractors and utilize cattle to cultivate their land. The automation of these tasks will allow farmers to pursue secondary sources of income, all without disturbing cultivation of their fields.

## II. METHODOLOGY

The methodology for developing the Automatic Seed Sowing Machine was carried out in a systematic manner. Initially, a literature survey was conducted to study existing seed sowing mechanisms and identify their limitations. A field survey was then performed to understand the practical requirements of small-scale farmers, including seed spacing, planting depth, soil conditions, and cost constraints. Based on the requirements, a conceptual design was prepared and

modeled using CAD software. Suitable mechanical components such as the frame, plough, seed hopper, seed metering unit, wheels, and chain-sprocket mechanism were selected. A 12V battery-powered DC motor system was integrated for machine movement and seed dispensing, controlled using a microcontroller-based unit. The machine was fabricated and assembled, followed by programming of the control system to ensure synchronized seed dispensing with forward motion. Calibration and field testing were conducted to evaluate seed spacing accuracy, planting depth consistency, operational speed, and power consumption. The performance was compared with conventional manual sowing methods to assess efficiency and cost-effectiveness.

## 2.1 Conceptual Design:

Defined functional requirements and constraints after consulting local farmers and considering field challenges such as soil type, crop spacing, and operational safety.



**Figure 1: Field survey**

## 2.2 Component Selection:

Identified and sourced necessary mechanical components (frame, wheels, metering unit, plough, hopper), as well as electronic parts (microcontroller, sensors, and battery).
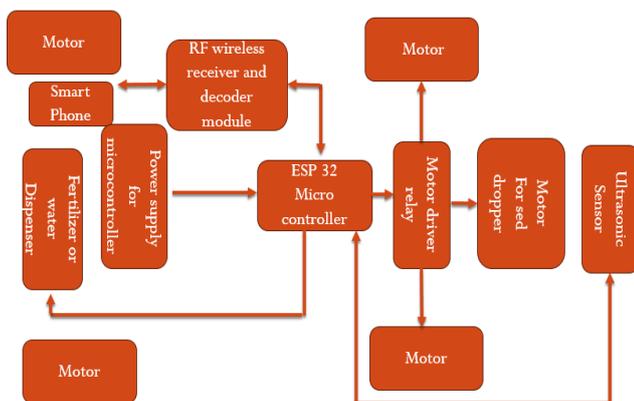


**Figure 2: Block Diagram of automatic Seed sowing machine**

## 2.3 Preliminary Design and Sketching:

Developed initial hand sketches and basic CAD models for the machine structure, seed metering system, and control layout for validation of the working concept.
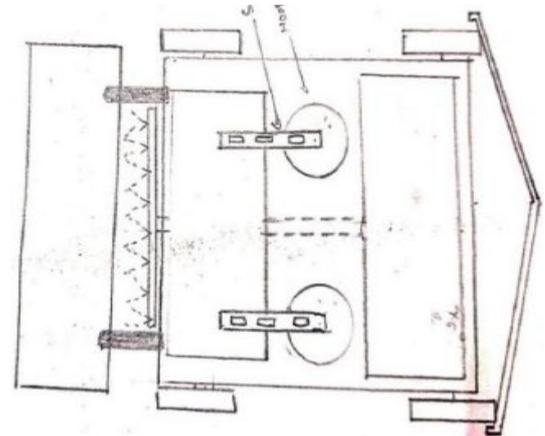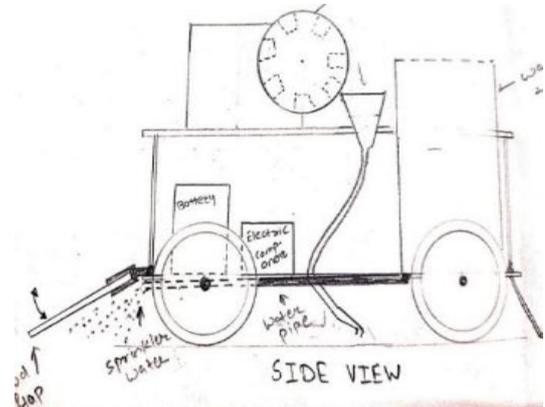


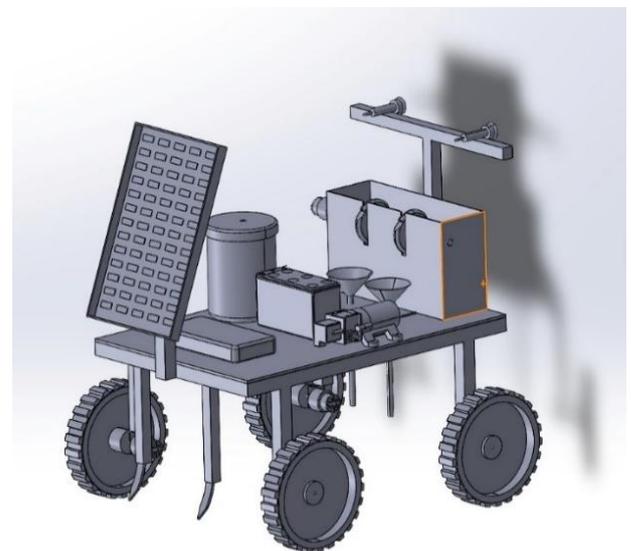**Figure 3: Rough sketch**

## 2.4 3D CAD modelling:



**Figure 4: 3D model**

**Figure 5: Top view of model**

## III. PROJECT COST ESTIMATION

**Table 1: Costing table**

| SR. NO. | COMPONENTS | QUANTITY | SPECIFICATION | COST (Rs) |
|---|---|---|---|---|
| 1 | Battery | 1 | 12V, 30Ah 3hrs backup | 3300 |
| 2 | Motor | 1 | 10 rpm | 600 |
| 3 | Motor | 4 | 100 rpm | 2500 |
| 3 | Arduino | 1 | - | 1500 |
| 4 | Plough Structure | 1 | Steel | 500 |
| 5 | Covering Structure | 1 | Steel | 500 |
| 6 | Tyres | 4 | Rubber | 2800 |
| 7 | Pipe | 2 | Plastic | 500 |
| 8 | Frame | 1 | Steel | 2000 |
| 9 | Hopper | 2 | Plastic | 500 |
| 10 | Sprocket | 2 | Steel | 500 |
| 11 | Chain | 1 | Steel | 250 |
| TOTAL | | | | 15,450/- approx |

## IV. RESULTS AND DISCUSSIONS

It will significantly increase planting efficiency by automating the labor-intensive sowing process, reducing the time required to cover a field. The machine will ensure precision farming through uniform seed placement, consistent depth, and optimal seed-to-seed spacing, maximizing germination rates. This automation will drastically lower farming operational costs by minimizing the reliance on manual labor and reducing seed wastage. The system will lead to higher and more reliable crop yields due to improved planting accuracy, directly contributing to local food security.

## V. CONCLUSION

The developed system contributes to modernizing agricultural practices by increasing efficiency, reducing physical drudgery for farmers, and supporting sustainable and precision farming methods.

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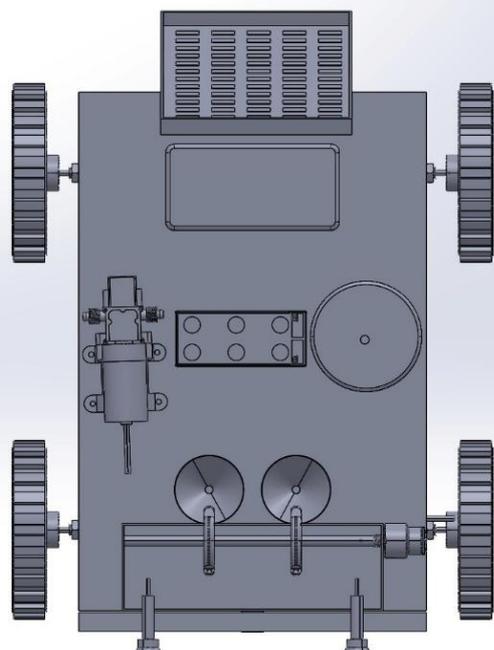
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