



## Automatic Seed Cum Fertilizer Sowing Machine with Water Dripping on Seeds

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### Abstract:

This project report presents the design and development of an Automatic Seed Cum Fertilizer Sowing Machine with Water Dripping on Seeds, a modern agricultural solution aimed at addressing labor shortages, increasing cultivation efficiency, and promoting precision farming practices. The machine performs multiple operations simultaneously, including digging the soil, placing seeds at a uniform depth and spacing, dispensing an appropriate quantity of fertilizer, and supplying water to the seed bed immediately after sowing to enhance germination. The system integrates mechanical, electrical, and microcontroller-based components to ensure accurate operation. A DC motor drives the mechanical transmission system, which operates the digging blades, seed sowing unit, fertilizer dropping mechanism, and water-dripping assembly. A solar panel with a battery and charge controller ensures eco-friendly and uninterrupted power supply. The machine enhances crop productivity by ensuring uniform seed placement and optimal fertilizer usage, while minimizing human effort and operational time. This technology supports small-scale and large-scale farmers, enabling mechanization in low-budget rural environments. In addition to enhancing operational efficiency, this machine contributes to the long-term vision of sustainable and smart agriculture. By integrating solar power and automation, it reduces the reliance on fossil fuels and minimizes carbon emissions associated with traditional farming tools. The synchronized seed-fertilizer-water delivery system ensures optimal soil nutrition and moisture conditions at the time of sowing, leading to healthier crop emergence and reduced input wastage. This technology empowers farmers to maintain productivity even during labor shortages, making the agricultural process more resilient, independent, and economically feasible for small-scale and rural farming communities. Furthermore, the machine addresses key challenges observed in conventional farming systems, such as inconsistent germination, excessive fertilizer usage, and manual water application delays. By offering a precise and continuous sowing mechanism, it reduces human dependency and allows farmers to perform large-scale operations efficiently. The compact and adaptable design makes it suitable for diverse soil conditions, and the solar-powered approach significantly lowers operational costs over time. This innovation not only enhances agricultural output but also plays a crucial role in uplifting rural farming practices by promoting affordable mechanization and encouraging adoption of renewable-energy-based farming tools.

**Keywords:** Sowing Machine, fertilizer, Seed, water dripping

## **1. Introduction**

Agriculture is the backbone of the Indian economy, and mechanization plays a vital role in improving farm productivity and reducing human labor. Traditional farming techniques involve manual seed sowing, fertilizer application, and watering, which are time-consuming, labor-intensive, and often inaccurate. These limitations lead to improper seed spacing, uneven fertilizer distribution, and delayed germination, ultimately affecting crop yield.

To address these challenges, this project introduces an Automatic Seed Cum Fertilizer Sowing Machine with Water Dripping on Seeds, designed to automate multiple agricultural operations simultaneously. The machine ensures precise seed placement, controlled fertilizer application, and immediate watering for better seed germination. The integration of solar power enhances sustainability, making it suitable for rural and off-grid farming environments.

This system operates using a DC motor mechanism powered by a solar-battery supply. It consists of major units, including a digging mechanism, seed metering unit, fertilizer delivery system, and water dripping assembly. The entire setup ensures uniform sowing depth, proper seed spacing, and optimum fertilizer and water delivery.

The machine is ideal for small and medium-scale farmers, providing an affordable solution to modernize agriculture while improving efficiency and productivity. By minimizing human effort and increasing accuracy, the machine supports precision agriculture and contributes to sustainable farming practices

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## **2. Literature Review**

Many researchers and agricultural engineers have explored automated farming technologies to increase crop efficiency and reduce labor dependency. Traditional manual sowing methods have been compared with semi-automatic and fully automated techniques in several studies.

Previous studies highlight the importance of seed metering accuracy, fertilizer proportioning, and moisture supply at the time of germination. Mechanical seed drills and fertilizer applicators have been developed; however, they often lack integrated water supply mechanisms. Systems involving microcontroller control for sowing automation have demonstrated improved accuracy but require electrical infrastructure which may not be feasible in rural areas.

This project builds upon these findings by combining mechanical sowing, fertilizer dispensing, and water dripping into one integrated solar-powered unit, ensuring sustainability and precision.

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### **Information**

The Automatic Seed Cum Fertilizer Sowing Machine with Water Dripping Mechanism is designed to perform multiple functions:

Soil digging

Seed sowing at precise depth and spacing

Fertilizer dispensing

Water dripping for immediate germination support

Solar-powered operation via battery storage

### **Working Principle**

A DC motor powers the mechanical linkage system to drive digging blades, seed meters, fertilizer drops, and water nozzles. A microcontroller ensures proper synchronization and timing of operations. Solar energy stored in a battery provides continuous power supply.

### **Major Components**

- Solar Panel & Charge Controller
- Battery
- Microcontroller Unit
- DC Motor
- Seed & Fertilizer Hopper

- Digging Blades
- Water Pump & Tubing
- Mechanical Transmission

The design emphasizes precision farming, reducing wastage and maximizing yield

### **Future Scope**

- Integration with GPS for automated row navigation
- Sensor-based irrigation and fertilizer control
- IoT-based monitoring system

- Hydraulic/robotic control for higher precision
- Use of AI-based crop monitoring and smart farming
- Larger capacity models for commercial agriculture
- Development of lightweight model for hill farming
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### 3. Block Diagram

The block diagram below represents the working system of the machine, integrating solar power, microcontroller control, and mechanical units.

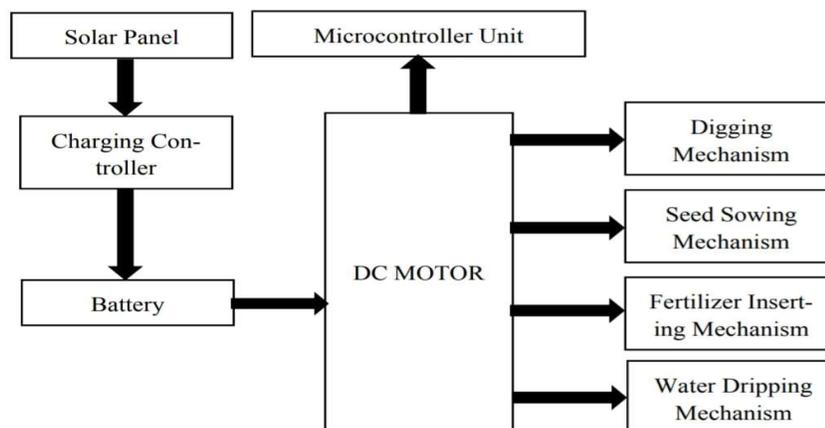


Fig. 1 Schematic diagram of the proposed method

The block diagram below represents the working system of the machine, integrating solar power, microcontroller control, and mechanical units.

(Block diagram inserted above in project)

#### Condition

This machine is suitable for:

Dry and semi-dry soil conditions

Flat and slightly uneven fields

Small to medium-scale farming

It requires proper calibration of seed flow and water supply before field use

#### Advantages

- Reduces manual labor and farming time
- Ensures uniform seed placement and fertilizer application
- Improves seed germination with water dripping
- Solar powered — reduces fuel cost
- Environment-friendly system
- Suitable for rural and off-grid farming areas
- Increases crop yield and efficiency
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- Increases crop yield and efficiency

### **1. Enhanced Seed Germination Rate**

The immediate supply of water after sowing increases the chances of successful seed germination by reducing moisture stress and providing ideal soil conditions.

### **2. Uniform Plant Growth**

Precise seed spacing, equal fertilizer distribution, and controlled water supply help achieve uniform plant height and healthy crop growth.

### **3. Reduced Labor Dependency**

Eliminates the need for multiple workers for sowing, fertilizing, and watering, which is especially beneficial during labor shortages.

### **4. Consistent Depth Control**

Seeds are placed at a uniform depth, improving root development and reducing losses caused by uneven sowing.

### **5. Improved Field Efficiency**

Saves time by performing three operations (sowing + fertilizer + watering) in a single pass, increasing field productivity.

### **6. Cost Saving in Long Term**

Reduces manual labor cost, fertilizer wastage, and water consumption, making farming operations more economical over time.

### **7. Suitable for Small & Medium Farmers**

Designed to support farmers who do not have large tractors or expensive farming machinery, promoting inclusive agricultural technology.

### **8. Solar Powered (Eco-Friendly)**

Uses renewable solar energy, reducing dependency on fossil fuels and operating cost while supporting green farming initiatives.

### **9. Minimizes Seed Wastage**

Mechanized distribution prevents scattering and ensures each seed is placed securely in the soil.

### **10. Portable & Lightweight**

Easy to transport and operate in small farms, uneven terrains, or remote farming areas.

### **11. Low Maintenance System**

Simple mechanical construction with minimal moving parts reduces maintenance effort and cost.

### **12. Easy Operation**

User-friendly design allows even less-skilled farmers to operate the machine without special training.

### **Disadvantages**

- Initial manufacturing cost is medium
- Limited capacity for large industrial farms
- Requires regular maintenance of mechanical parts
- Performance depends on proper calibration
- Solar power efficiency depends on weather

1. **Initial Fabrication Cost** Although long-term savings are significant, the initial cost of components like solar panel, motor, and frame fabrication can be slightly higher than a traditional manual seed sowing tool.

2. **Regular Maintenance Required** Water pipes, fertilizer nozzles, and mechanical parts must be cleaned regularly to prevent clogging and corrosion, especially when using organic fertilizers or muddy water.

3. **Limited Water Storage Capacity** The onboard water tank capacity may limit operation in large fields, requiring refilling which increases downtime.

4. **Not Suitable for Rocky or Hard Soil** The wheels and tines work best in soft to medium-texture fields; rocky or extremely dry soil may affect precision sowing and may require prior ploughing.

5. **Dependence on Solar Power** Solar-powered operation may slow down during cloudy weather or evening hours, reducing machine performance unless backup battery power is available.

6. **Manual Pushing Effort Required** Although mechanized, the system still needs manual pushing, which may be slightly tiring for long farming hours, especially in uneven land.

7. **Fertilizer Type Limitation** Granular fertilizers work best; liquid fertilizers can lead to clogging issues unless advanced filtered nozzles are used.

8. **Water Pressure Variations** If water tank pressure is low or irregular, dripping efficiency may reduce, affecting water distribution uniformity.

9. **Skill for Assembly & Repair** Farmers need basic understanding for assembly, troubleshooting, and cleaning pipelines and motors.

10. **Field Size Limitations** Best suited for small and medium-scale farms; large commercial farms may require bigger automated models or tractor-mounted systems.

### **Application**

- Used for seed sowing in various crops like wheat, maize, soybeans, pulses
- Suitable for fertilizer dispensing in row crops
- Can be used for micro-irrigation during plantation
- Best for small & medium farms and remote villages

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- Detailed Working & Mechanism

#### 1. Soil Digging Mechanism

The digging mechanism consists of sharp plough blades arranged in a row. As the machine moves forward, the blades penetrate the soil to the required depth, creating a uniform trench. Depth is controlled through adjustable linkages. Mild steel blades ensure durability and corrosion resistance.

#### 2. Seed Metering Mechanism

A rotating seed metering disc with calibrated holes ensures precise seed drop. The rotation speed synchronizes with wheel movement, ensuring equal spacing. The hopper is designed to prevent clogging and maintain continuous seed flow.

#### 3. Fertilizer Dispensing Mechanism

A screw-type feeder regulates fertilizer flow. The feeder speed and hole diameter determine the fertilizer quantity. This ensures correct nutrient dosage and prevents waste.

#### 4. Water Dripping System

A water tank with small pipes and control valves dispenses water directly into seed trenches. This immediate moisture supply helps faster germination.

#### 5. Power System

Solar panel charges a battery via a charge controller. Battery powers motor and microcontroller. Low energy consumption ensures long working duration.

### 5. Conclusion

This project successfully develops a multifunctional agricultural machine capable of performing seed sowing, fertilizer dispensing, and water dripping in one operation. It increases accuracy, reduces labor cost, and ensures better germination. The solar-powered system ensures sustainability and usability in remote areas. This innovation represents a step toward modern, efficient, and affordable farming technology.

In summary, the "Automatic Seed Cum Fertilizer Sowing Machine with Water Dripping on Seeds" represents a valuable innovation in sustainable agriculture. By combining seed sowing, fertilizer application, and precise water delivery into one unit, this system helps to reduce labor, save time, and improve crop establishment and productivity. Its solar-powered functionality further enhances its applicability in rural and off-grid areas, making it suitable for resource-constrained farmers.

Additionally, this project demonstrates the significant potential of low-cost automation in agriculture. It proves that affordable mechanization can achieve precision farming benefits without heavy machinery or high energy consumption. The integration of water dripping technology ensures improved germination rates, which is crucial for modern crop production, especially in water-scarce regions. The machine also supports uniform growth patterns, improved soil utilization, and reduced human fatigue.

Furthermore, the development and successful demonstration of this machine highlight opportunities for future enhancement, including IoT-based monitoring, GPS guidance, and fully automated control systems. With

continued development and community adaptation, this project can contribute to an agricultural revolution focused on efficiency, sustainability, and technological empowerment for small- and medium-scale farmers.

Overall, the project not only fulfills academic requirements but also provides a practical and impactful solution aligned with India's agricultural modernization goals, promoting cost-effective and environmentally responsible farming practices.

### **Acknowledgement**

We express our heartfelt gratitude to all those who contributed to the successful completion of this project titled "Automatic Seed Cum Fertilizer Sowing Machine with Water Dripping on Seeds".

We are extremely thankful to our respected project guide for their continuous support, valuable guidance, and encouragement throughout the development of this project. Their expert suggestions and motivation have been instrumental in shaping this work.

We also extend our thanks to the Head of Department and all faculty members for providing the necessary resources, laboratory facilities, and academic support.

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