International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 10 Issue: 01 | Jan - 2026 SJIF Rating: 8.586 ISSN: 2582-3930

Design and Development Manually Operated Seed Sowing Machine

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Abstract - Agriculture in developing countries still relies heavily on traditional methods of seed sowing, which are labor- intensive, time-consuming, and often result in non-uniform seed distribution. To address these limitations, this research focuses on the design and development of a manually operated seed sowing machine that is economical, simple to operate, and suitable for small and marginal farmers. The proposed machine aims to improve sowing efficiency by ensuring uniform seed placement, proper spacing, and controlled depth of sowing while reducing human effort and operational time. The design incorporates key components such as a seed hopper, metering mechanism, furrow opener, seed delivery tube, and ground-driven wheel mechanism. Standard engineering design principles and material selection criteria were applied to achieve durability, ease of maintenance, and low manufacturing cost. Performance evaluation of the developed prototype was conducted under field conditions, and results indicate improved seed placement accuracy, reduced labor requirement, and higher field efficiency compared to traditional manual sowing methods. The developed manually operated seed sowing machine offers a practical and sustainable solution for enhancing agricultural productivity in resource-limited farming environments.

1. INTRODUCTION

Indian economy is based on agriculture. Development in agriculture leads to raise economic status of country. In India farmers are facing problems due to unavailability of labors, traditional way of farming using non efficient farming equipment's which takes lot of time and also increases labor cost. This project is all about enhancement in seed sowing and pesticide spraying like farming operations by using multifunctional seed sowing machine. The main objective of sowing operation is to place seed at proper position respective of other placed seeds in every row at particular depth and provide a cover of soil on it. As per change in shape and size of different seeds the parameters like distance between two seed, depth of seed, planting rate chances.

This research is attempt to produce multifunctional and highly efficient seed sowing machine which will reduce time of plantation, cost of labour, and enhances production. Traditional method of seed sowing based on assumptions of seed to seed spacing and depth of placement which is not at all efficient and beside this it requires lot of time and efforts too. Sometime it results in back ache of farmers. As per change in climate farmers are facing one more problem which occurs due to harmful insects and pest. Farmers have to stay alert for fighting to this problem by using different pesticides .pesticide spraying is one of the common operations in agriculture field which requires lots of efforts to carry the pump in farm. It results in shoulder pain so badly. This machine contains pesticide spraying too which make it multifunctional. This project addresses improvement in agriculture processes like sowing of seeds on ploughed land and distribution of fertilizer combinable by using mechanisms. Primarily this system works manually, but with lesser input energy requirement.

2. LITERATURE REVIEW

Seed sowing is a fundamental agricultural operation that significantly influences crop yield and overall farming efficiency. Traditional manual sowing methods such as broadcasting and dibbling—are still widely practiced in many developing regions due to their low cost and simplicity. However, these methods often result in uneven seed distribution, poor seed-to-soil contact, and increased labor intensity, ultimately leading to suboptimal germination rates and reduced productivity (Patel et al., 2018).

Manual vs. Mechanized Sowing

Several researchers have emphasized the need for affordable sowing technologies suited for smallholder farmers. Mechanized seed drills have demonstrated improved uniformity, optimal seed placement, and higher field efficiency compared to manual methods (Singh & Sharma, 2017). However, high initial costs, heavy weight, and complexity often make such equipment unsuitable for marginal farmers. As a result, there has been a shift toward developing low-cost, manually operated sowing tools that bridge the gap between traditional practice and full mechanization (Kumar et al., 2019). Previous Developments in Manual Sowing Devices. Early designs of manually operated seed sowers focused on simple mechanisms where seeds fall through a fixed-size hole while the operator walks behind. Such designs are lightweight but suffer from inconsistent seed spacing and depth control (Reddy & Raju, 2016). More recent advances include the integration of adjustable metering devices and furrow openers to regulate seed flow and depth. For example, Joshi et al. (2020) developed a hand-pushed seed drill with a rotary metering mechanism that provided improved spacing uniformity but required refinement in ergonomics.

Components and Design Considerations:-

Key design components identified in the literature include seed hoppers, metering systems, transmission mechanisms, furrow openers, and depth control units. Selecting appropriate materials and minimizing the machine's weight are critical for ease of use and durability (Verma & Singh, 2021). Studies also highlight the importance of field trials to evaluate performance parameters such as seed spacing accuracy, field capacity, and operator fatigue (Sharma et al., 2022).

2. METHODOLOGY

2.1 Mechanical structure

The figure .shows the detailed drawing of seed sowing design mechanism. It is designed as per farm condition also it is as per the requirement so that it can dig the required size of rows for seed sowing. First we fill the hopper with seeds manually. System that will made, uses the manual push force to run mechanism. Rotary motion of wheels provided to the sowing shaft (which will placed in seed storage tank) by sprocket or belt drive. With controlled distance interval, seed get sowed in land vie pipe and digging arrangement and seed is covered with soil. Seed storage tank Storage device is one of the important devices of the system. And is designed according to weight sustained by the robot as well as the required capacity for planting. This component is stationary. To the bottom of this tank seed sowing disc is arranged as shown in figure 5. This disc serves the function of distribution of the seeds, as for each complete rotation of the rotating wheel, only one seed falls from the tank. Also number of seeds falling from tank is varied according to requirements. This disc serves the function of distribution design for common cereal/legume seeds (maize, millet, sorghum, cowpea, soyabean) with seed sizes 2–12 mm; single-row and modular multi-row versions. Provide adjustable seed spacing (50–300 mm) and depth control (10–50 mm).

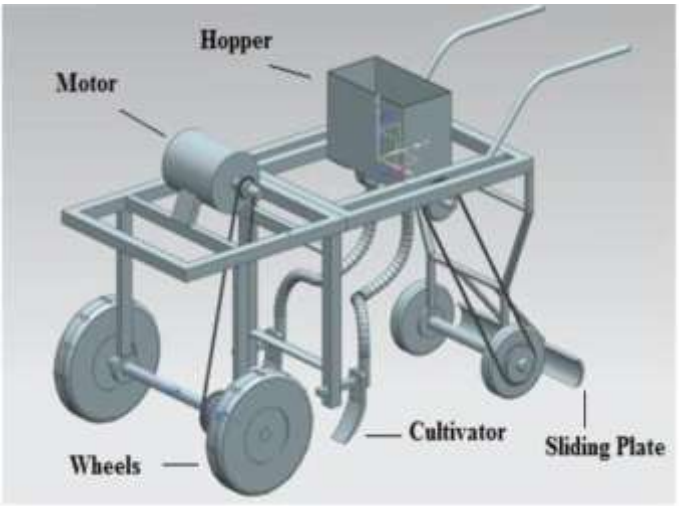

Fig. Seed Sowing Machine

2.2 Working

Seed Hopper: Seeds are stored in a container (hopper) on the machine.

Metering Mechanism: Seeds are released in a controlled quantity through a seed metering device (plate, drum, or fluted roller).

Seed Tube: Seeds pass through a tube to the soil. **Furrow Opener:** The machine creates a small furrow (trench) in the soil using a disc, hoe, or shoe-type opener. **Seed Placement:** Seeds fall into the furrow at uniform spacing.

Covering Mechanism: The machine covers the seeds with soil using a chain, roller, or soil cover device.

Pressing/Wheel Roller: Some machines have rollers to ensure seeds have good contact with soil for better germination

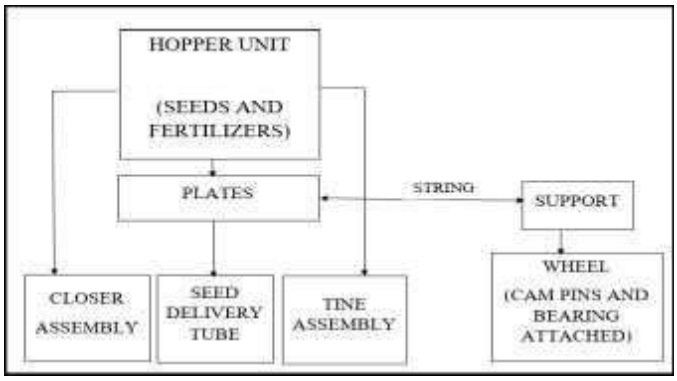

Fig.9 Block diagram of the proposed system

3. Advantages

- Improved efficiency in planting.
- Increased yielding and reliability in crop. Increased cropping frequency.
- Increased speed of seed planting.
- Seed planting accuracy.
- Since seed can be poured at any required depth, the plant germination is improved.
- Dependency on labor also decreased. Also it saves time of sowing.
- Uniform placement of seeds in row with required distance.
- Proper compaction over the seeds is provided.

4. Disadvantages

- Suitable for small Farms Only.
- Difficult to operate in moist condition.
- It will use man power to drive the machine.

5. CONCLUSIONS

The design and development of the manually operated seed sowing machine presented in this research successfully address the limitations associated with traditional manual sowing methods.

The developed machine provides uniform seed placement, consistent sowing depth, and improved seed spacing while significantly reducing human effort and time required for sowing operations.

The use of a ground wheel–driven seed metering mechanism ensures synchronized seed delivery with machine movement, resulting in enhanced sowing accuracy and field efficiency.

The machine is simple in construction, lightweight, and cost-effective, making it suitable for small and marginal farmers.

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