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Smart Gardening: Simplified Seed Sowing Techniques

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Abstract

The primary objective of the exhibiting operation is to plant seed and fertilizer in rows at the proper depth and seed-to-seed spacing, cover the seeds with soil, and make sure there is enough compaction over the seed. To get the maximum yields, different recommended row-to-row spacing, seed rate, seed-to-seed spacing, and depth of seed placement are required for different agro-climatic conditions and crop kinds. A comparative analysis is conducted between the conventional sowing method and the newly suggested machine, which offers various advantages and can execute multiple tasks simultaneously. This machine lowers the effort and overall cost of seeding seeds and applying fertilizer, as labor availability and cost become increasingly of issues for farmers. The design and building of a semi-automated seed-planting device are covered in this study.

Keyword: Agro-climatic, seed-planting, Food demand, agricultural sector, weeding

INTRODUCTION

By assisting with the ideal seed sowing location, a seed sowing machine is a tool that helps farmers save time and money. The major objectives of the sowing process are to cover the seeds with soil, make sure the dirt is adequately compacted over the seeds, and place the seeds in rows at the proper depth and spacing from one another. This study examines several facets of seed sowing machines, which will aid in the agricultural sector's transformation to automation. India's consistent growth has always been supported by its agriculture sector. Food demand increases in parallel with India's population growth. As a result, farms now demand more cropping, which calls for the use of high-capacity, effective machinery. Because of a lack of expertise and access to sophisticated machinery and instruments, mechanization of the agricultural sector in India is still in its infancy. Traditional seed sowing techniques involve disseminating by hand, using a plough to make furrows, then physically dispersing the seeds. India's consistent growth has always been supported by its agriculture sector. India's population is growing, and with it, so is the demand for food.

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As a result, farmers are required to field numerous crops, which calls for effective and time-saving machinery. The article addresses several seed-planting kinds of equipment that will aid in the agricultural sector's transition to automation.

Traditional Sowing Methods

Conventional techniques involve manual transmission, using a country plow to create furrows, then manually distributing seeds into the furrow using a bamboo or metal funnel fastened to the plough. Dibbling, or creating holes or slits with a stick or other object and manually dropping seeds, is an ordinary way of sowing in tiny areas. Expert farmers use multi-row conventional seeding equipment with manual seed metering, which are quite popular. It is impossible to ensure consistent seed dispersal when cultivating by hand. Even if a farmer sows at the appropriate seed rate, there may still be gaps and bunching in the field due to unequal seed distribution both within and between rows.

Traditional sowing methods have following limitations.

- It is impossible to establish consistency with regards to the dispersal of seeds when sowing by force.
- Even if a farmer sows at a proper seed rate, there may be irregular seed distribution both inside and between rows, which might lead to bunching and gaps in the field. There may also be lacking control over the depth of seed planting. The labor need is considerable because dumping seed and seed requires two workers.

When it comes to crops, the impact of inaccurate seed distribution on plant stand is larger. India is expected to be mostly an agricultural nation, with 75% of its people living either directly or indirectly from farming. For centuries, our farmers have been employing the same tools and techniques. For instance, weeding, spraying, and seeding. Effective weeding and spraying equipment have to be developed in order to increase productivity. The majority of Asia's emerging nations struggle with having a higher population density than developed ones and having less productive land. Low levels of agricultural automation and inadequate electricity supply on farms are two major causes of low productivity.

This particularly applies to India. Globally, it is increasingly acknowledged that agriculture must modernize in order to satisfy the demands of an expanding population and accelerating industrialization. It is stated that poor seedbed preparation and postponed planting, harvesting, and threshing cause productivity issues on many farms. Mechanization enables input conservation by precise metering that guarantees improved distribution, reducing the quantity needed for improved response, and avoiding losses or waste of applied inputs. Mechanization lowers manufacturing costs per unit by increasing output and conserving inputs. The government's program for agricultural machinery and implements has focused on selective automation in order to maximize the utilization of human, animal, and other power sources.

The supply of implements, tractors, power tillers, combine harvesters, and other power-operated machinery was boosted, as was the manufacturing and availability of better animal-drawn implements, in order to fulfill the demand. The latter was given particular attention because over 70% of farmers are classified as small and marginal farmers. It's commonly believed that small farms are challenging to mechanize. Japan's typical land holding is much lower than ours, yet with the right automation, agriculture there has reached unprecedented heights. To reduce the amount of work that small farmers must do, boost profitability, and free up time for them to engage in extra or supplemental revenue-generating activities, the use of contemporary time-saving devices and machinery of the right size must be appropriately promoted.

LITERATURE SURVEY

The Pundkarand Mahesh R. A. K. Mahalle's [1] review, which is given, gives a quick overview of the numerous advances made in seed-sowing machines that are available for plantations. One essential tool in the agricultural sector is the seed-sowing machine. The cost and yield of agricultural goods are significantly impacted by the effectiveness of seed sowing devices. There are now several methods for determining a seed-sowing device's performance.

According to Laukik P. Raut's [2] research, current farming is unavoidable in order to fulfill the food needs of the expanding population and the fast-paced industrialization. Through accurate metering that ensures better distribution, lowers the quantity required for better response, and preventing losses or wasting of applied inputs, mechanization makes it possible to conserve inputs. Mechanization lowers manufacturing costs per unit by raising productivity and conserving inputs.

In their evaluation, D. Ramesh and H. P. Girish Kumar [3] provided a brief synopsis of the many advancements in seed-sowing apparatus. The primary objectives of the sowing procedure are to place the seeds in rows at the appropriate spacing and level, cover the seeds with soil, and make sure the soil is compacted over the seeds. Variable recommended row-to-row spacing, seed rate, seed-to-seed spacing, and depth of seed placement are required to achieve maximum yields for varied agro-climatic conditions and crop kinds. Devices for sowing seeds are extensively utilized in the agricultural industry.
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Pranil V. Sawalakheand [4] conducted research on how every component of the economy, including agriculture, are expected to expand rapidly in the modern period. Farmers need to adopt innovative practices that will boost crop productivity overall without degrading the texture of the soil in order to fulfill future food demands. This essay discusses the many seed planting and sowing strategies utilized in India.

Traditional sowing requires more time and work in Indian nurseries. This feed rate is higher, but it also means that the entire procedure takes longer, and the cost goes up because of manpower and equipment hire. Traditional seed-planting machines need a lot of time and are less efficient. The current economic climate is geared for the swift expansion of every industry, including agriculture. In order to fulfill future needs, new procedures must be implemented in order to boost total output.

This equipment lessens the work and total cost of planting seeds and placing fertilizer, which is a big worry for farmers since labor costs rise with time. Theoretical research on pneumatic seeding equipment for tiny seeds in cups, focusing the benefits of this kind of equipment with better parameters derived from the crops under consideration. The vacuum generator may be operated electrically, and the equipment is easy to handle and operate in smaller areas. Implementing this equipment will boost output, decrease the amount of area needed to develop seedlings, and raise the usual number of seeds. Plants have guaranteed spaces for germination, growth, and development, and inexpensively constructed, automated equipment is available [5].

Conclusion: Traditional seed-planting machines need a lot of time and are less efficient. Today's markets are expanding quickly across a number of industries, including the agriculture industry [6].

This explains the goal of seed planter machinery design, elements changing seed emergence, and various mechanisms. The major objectives of the sowing procedure are to cover the seeds with soil, ensure enough compaction over the seed, and arrange the seed and fertilizer in rows at the proper depth and seed-to-seed spacing. To attain optimal yields, various crops require varying seed to seed spacing and seed planting depths depending on the agro climate. This indicates that mechanical parameters, such as consistent seed distribution along rows and uniform seed depth placement, have an impact on seed germination. This power transmission device makes use of plunger, seed meter, and other mechanisms. When the machine is pushed, the power wheel rotates, sending power to the plunger via the chain and sprocket system. Currently, a cam placed on a sprocket shaft pushes the plunger downward. After the plunger has penetrated the dirt, the flapper opens during the backward stroke, allowing the seed to be released from the plunger and placed into the excavation [7].

This gives us the notion that selecting a belt with tiny holes and a set thickness will be advantageous for our project. Since our automatic seed feeder is limited to tiny seeds, it is beneficial to utilize a conveyor belt with a motor.

A number of technologies are being updated to reflect new automation-based developments that operate extremely precisely, highly efficiently, and quickly. The increasing demand for higher-quality agricultural goods and the scarcity of manpower in rural farming regions have made progressive invention in the agricultural system a crucial responsibility. The technology is meant to use a micro controller to seed and fertilize agricultural robots. The proposed system's goal is to assess soil pH, temperature, moisture content, and humidity in addition to sowing and fertilizing. A remote is used to operate the robot. The robot is operated using a remote control as part of the intended system. Via the internet system, the robot and remote system are connected. The robot is navigated by use of DC motors. With a controller, a DC motor's rpm may be adjusted. The solenoid regulates fertilized and seeding. This study discusses the automation and motor consumption for belt conveyor movement [8-9].

This study describes a robotic platform-based farming system that operates at a high pace as part of an advanced agricultural process. The robotic system is an artificial agent driven by a DC motor with four wheels that is electromechanical (meaning it has agency of its own). A machine cultivates the field using the crop, taking into account certain rows and columns. The infrared sensor recognizes the turning position of the vehicle at the end of the track in addition to identifying obstructions in its path. The force of water may be used to identify and solve the seed block. The solar panel is utilized to charge the DC battery, and the machine may be operated remotely.The microcontrollers are programmed using assembly language. Using a DC motor, the microprocessor maintains a track of the vehicle's system motion.

Additionally, the unit's completed result is shown.In summary, this study outlines the necessary steps and advancements taken to realize a precise autonomous agricultural system in the future. The assembly is designed to autonomously cultivate plowed area, requiring less electricity. Water pressure plays a key role in solving the seed blockage issue. Thus, this initiative optimizes accuracy and efficiency.There are two distinct mechanisms in the project.The first mechanism involves gathering a group of clean-moving vehicles, while the second involves getting a seed bed ready on tilled soil.The vehicle's system motion is monitored and controlled by the microcontroller. Both a DC motor and a servo motor can be utilized to control it [10].

The advantage of this form of equipment with better parameters derived from the crops under consideration is highlighted in the research, which includes theoretical studies and experimental results related pneumatic equipment for sowing tiny seeds in cups. Devices that are easier to handle and operate can be employed in smaller areas. The vacuum generator can be powered by heat or electricity. Using this equipment reduces the amount of area needed to grow seedlings, increases production, and lowers the standard of seeds. Plants have guaranteed area for germination, growth, and development, and minimally expensive, automated equipment may be constructed. The production index, consumption standard, emerging degree, and plant percentage achieved will all be the subject of ongoing research and experimental testing. In conclusion, the vacuum generator may be operated either thermally or electrically. The installation's depression doesn't need to be larger since the seeds are small in mass. The nozzle holes should represent 0.5–0.6 of the smallest seed size.

Utilizing this equipment results in higher results less area needed to produce seedlings, and a lower standard for seeds; Plant germination, growth, and development space is maintained. Equipment can be constructed at low cost and automated.

OBJECTIVES

1. To manufacture seed sowing machine which can be operated by the single operator
2. To set fertilizer with sowed seed.
3. To level the ground in small extent
4. To enable the machine for the sowing of several of seed like maize, wheat etc.
5. To maintain the same distance between two seeds at the time of sowing process.

SCOPE

A seed sowing machine is a tool which aids farmers save time and money by aiding with the proper seed sowing position. A concerted effort is made to design and construct equipment that could make seed sowing and spraying more efficient and cost-effective in light of these factors.

Reduce operating expenses by implementing a novel process.

- Work reliably under different working conditions
- Decrease the cost of the machine.
- Decrease labor cost by advancing the spraying method
- The machine can be operated in the small farming land (1 acre)
- Making such a machine which can be able to perform both the operation.

Currently, the project's main goal is on developing an appropriate operating system. The locally made unit has been employed in the design to ensure economy and simplicity. With our project, safety is increased, manual labor is reduced, efficiency is increased, workload is decreased, worker weariness is decreased, and maintenance costs are cut (Figure1).

DESCRIPTION

- It preserves the appropriate spacing among rows so that seeds and fertilizers may be planted at the right depth.
- This device may manage the pace at which seeds are lost and ruined.
- Innovative seed sowing equipment allows seeds to be continually incorporated into the soil without any hindrance during the intake of seeds.
- Accelerating the planting stage while ensuring adequate compaction over the soil.
- No extra man power required.
- Less ermaintenance cost.
- It’s use ful for both composting and seed feeding.
- Its will be front & back moveable part.
- The material of this project used M. S (IS:2602 or E250).
- The front portion will dig holes and conveyor will sow seeds and the plate at the end will close the holes.
- For movable I have used the dc Motor.

MATERIAL DESCRIPTION

Chain and Sprocket

You'll probably choose a chain operating as your power transfer system when building your own human-powered vehicles since it's a cheap, simple-to-install, and highly reliable drive mechanism. Bicycle chains are easy to work with; all you need is a cheap tool to remove and reattach links. Some fundamental should be understood as a recumbent cycle frequently requires a chain that is 1.5–3 times longer than an ordinary upright cycling chain, and you'll probably need to make the chain for your cycling.

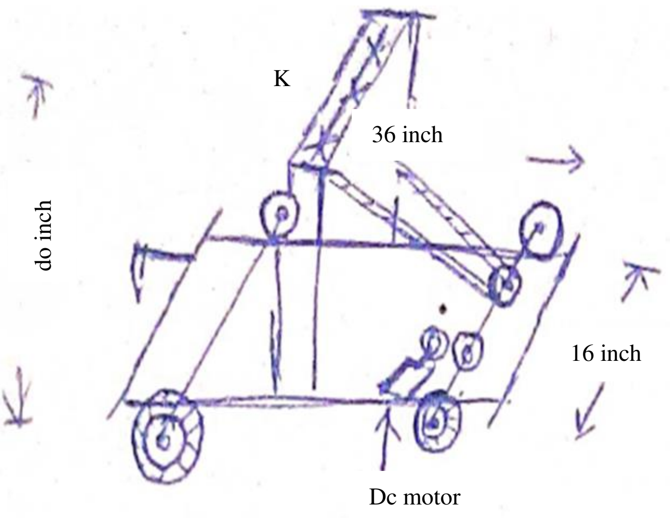

Figure 1. Model diagram.

Seed Drilling

Using a seed drill, one may plant agrarian seeds by putting them in the ground and covering them up to a certain average depth. This ensures that the seed is set up uniformly. In order to protect the seeds from becoming eaten by birds and blown by the wind, the seed drill sows the seeds at the appropriate depth and at the targeted seeding rate (kg/ha). While seeds are inserted in rows with seed drill machines, the operator cannot alter the spacing between seeds as they can with vacuum control planters. The maker may adjust the spacing between rows so that plants receive enough sunshine, nutrients, and water from the soil.

Hand seed planting was the norm prior to the invention of the seed drill. In addition to being inefficient, planting was sometimes haphazard, resulting in a dispersed seed supply and low yield. The crop yield ratio—the number of seeds collected for every seed planted—can increase up to nine times with the use of a seed drill.

Sowing

Planting is an instance of sowing. A space or item that has had seeds sown in it are known as sown. The kinds of plants that are usually thought of among the main field crops are maize and soybeans, grasses and legumes are seeded, and oats, wheat, and rye are sowed. In order to achieve accurate and equitable spacing between individual seeds in a row, broad rows—typically length 75 cm (30 in) or more—are needed while planting. Various systems have been developed to count out individual seeds at precise intervals.

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Sowing Types

For hand sowing, several sowing types exist; these include:

- Flat sowing
- Ridge sowing
- Wide bed sowing

Shaft

A shaft is a revolving machine section, often with a circular cross section, that delivers power between components or between a supplying machine and an absorbing machine.On it are placed the different components, including gears and pulleys.

Motor

A DC motor is a direct current (DC) electric generator with mechanical commutation. Since the stator is by definition inactive in space, the commutator enables the rotor's current to be similarly stationary in space. This produces the highest torque by maintaining the relative angle between the magnetic flux of the stator and rotor close to ninety percent.

DC motors are equipped with a permanent attraction or static field winding that produces the primary magnetic flux, as well as a rotating armature winding that induces a voltage but a non-spinning armature magnetic field. Different armature winding and field connections result in various intrinsic features for speed/torque regulation. A DC motor's speed may be adjusted by changing the domain current or the voltage supplied to the armature. Speed control was made possible by the addition of variable resistance to the field or armature circuit. Power electronics devices known as DC drives are frequently used to operate modern DC generators.

Frame Material: M.S (IS:2062) or E250

The standard for steel grades used for construction purposes is IS 2062 E250BR. The grade has a compact design and offers plates with perfect finishing, thermal stability, precise dimensions, and resistance to corrosion. Because of the alloy's exceptional strength, steel plates are resilient. According to Laukik P. Raut's research, modern agriculture is unavoidable in order to fulfill the food needs of the expanding population and the fast-paced industrial.

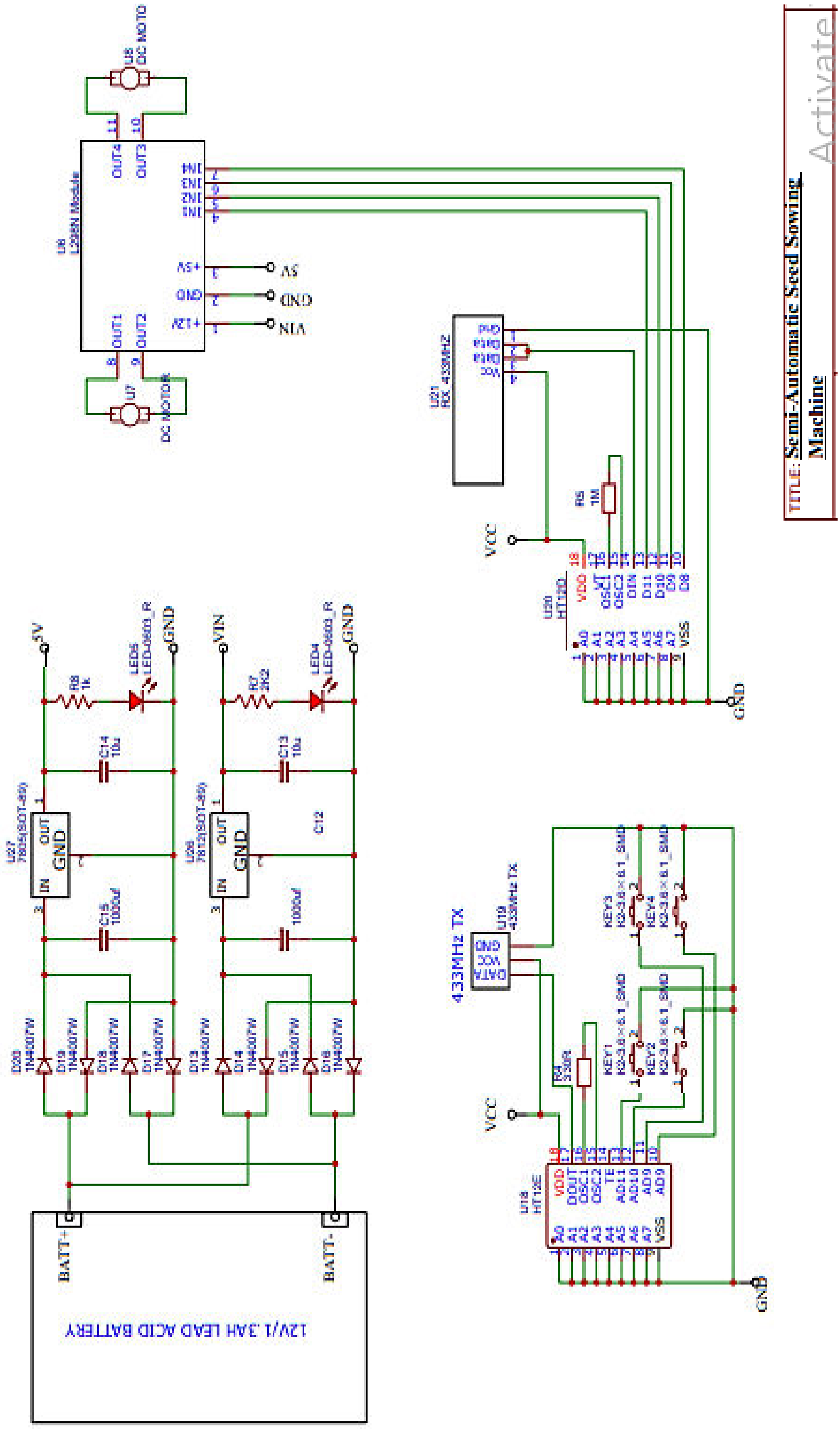

Figure. 2 Steel grade recognition system.

Through accurate metering that promotes better distribution, lowering the quantity required for better response, and preventing losses or wasting of applied inputs, machinery makes it possible to conserve inputs. Mechanization lowers manufacturing costs per unit by increasing output and sparing inputs. These plates offer excellent creep strength and resistance to oxidation. Additionally, this grade has good durability at low temperatures. These plates are designed to be stronger and more resilient at larger temperatures.

Table 1: Yield strength

Yield strength N/mm2	Tensile strength N/mm2	Elongation (%)
250 min	410 min	23

According to the Steel Grade Recognition System, category 1 steels define the E250 grade of steel. The minimum yield strength of the steel is indicated by the following three numbers, and the suitable sign for engineering steel is E (Table 1). "Steel for General Structural Purposes" is what this grade is for. Reliable Manufacturer's structural steel satisfies all quality requirements of this standard up to Grades A, B, and C. This grade is also sometimes referred to as IS 2062 – GRADE 250 (Fe410WA). In general, the grade Fe glow A specifications fall under (Figure 2).

CONCLUSIONS

The project's work has been fully finished. The project hardware performs as intended and with sufficient functionality. In order to minimize bottlenecks and ensure a smooth final integration process, the project work was created with many trials conducted prior to concluding the design work.

Overall, the development of the idea was educational, and working on the project practically allowed us to gain a great deal of expertise. Through lectures in the theoretical sessions as well as we were able to comprehend the practical limitations of creating such systems.

Seeing so many theoretical concepts that we had learned about in books and lectures come to pass in real-world situations was a fulfilling experience.

Innovative seed-sowing techniques have a significant impact on agriculture. Using this creative innovation of seed sowing equipment allows us to save a significant amount of labor costs and sowing time. Particularly useful for small-scale formers is this. It is concluded that this semi-automatic seed-sowing vehicle or machine may be used in place of the present one after measuring the various seed sowing methods and the limits of the machine.

- Ineachcompleterotationofrotatingwheelthereisaseedfallfromtheseedhoppertothegroundthrought hefurrowflowand plantation process takes place smoothly without wastage of seeds.
- Maintain row spacing and controls seed rate.
- Control the seed depth and proper utilization of seeds can be done with less loss.
- Perform thevarioussimultaneousoperationsandhencesaveslaborrequirementsoaslaborcost, labor time and also save lots of energy.

There is a lot of potential for this seed plantation instruments to increase planting output. Tractors were the primary traction unit used in farming up to this point. This seed sowing machine's objective will be fulfilled with its customization. Therefore, it is imperative to advance this technology and make it cheap for even small-scale farmers. This machine is easily constructed in readily available workshops and may be made using raw materials as well, saving the cost of the entire project. The engine that powers the machine and the seed hopper are the sole expenses. Therefore, by employing this machine, we can regulate depth fluctuation and accomplish flexibility of distance for various seeds. hence suitable for all plant seeds.

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