A Project Report

on

"Seed Sowing with Springless Suspension Mechanism"

Towards partial fulfilment of

Bachelor of Technology (B. Tech)

of

"University College of Engineering & Technology

Vinoba Bhave University, Hazaribagh, Jharkhand"

Under the supervision of

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ABSTRACT

In the farming process, often used conventional seeding operation takes more time and more labor. The seed feed rate is higher but the time required for the total operation is more and the total cost is increased due to labor, hiring of equipment. The conventional seed sowing machine is less efficient, time consuming. Today's era is moving towards the rapid growth of all sectors including the agricultural sector. To meet the future food demands, the farmers must implement the new techniques which will not affect the soil texture but will increase the overall crop production.

This machine reduces the efforts and total cost of sowing the seeds and fertilizer placement. Sowing machine should be suitable to all farms, all types of crops, robust construction, also it should be reliable, this is basic requirement of sowing machine. Thus, we made a seed sowing machine which is operated manually but reduces the efforts of farmers thus increasing the efficiency of planting also reduces the problem encountered in manual planting. For this machine we can plant different types and different sizes of seeds also we can vary the space between two seeds while planting. This also increased the planting efficiency and accuracy. We made it from raw materials thus it was quite cheap and very usable for small scale farmers. For effective handling of the machine by any farmer or by any untrained worker we simplified its design. Its adjusting and maintenance methods are also simplified.

DECLARATION

I undersigned, hereby declare that the project titled **"Seed Sowing with Springless Suspension Mechanism"** submitted in partial fulfilment for the award of Degree of Bachelor of Technology (B. Tech) of "University College of Engineering & Technology, Vinoba Bhave University, Hazaribagh, Jharkhand " is a Bonafide record of work done by me under the guidance of "Name of Faculty, Designation" Department of Mechanical Engineering, UCET, VBU Hazaribagh Jharkhand. This report has not previously formed the basis for the award of any degree, diploma, or similar title of any University.

Date ………………

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CERTIFICATE

This is to certify that the report titled **“Seed Sowing with Springless Suspension Mechanism”** being submitted by “ASHISH KUMAR, UCET-2000101; AMAN KUMAR, UCET-2000104; ANIMESH KUMAR SAW, UCET-2000106; VICKY KUMAR, UCET-2000132’’ in partial fulfilment of the requirements for the award of the “Degree of Bachelor of Technology (B. Tech)”, of “University College of Engineering & Technology, Vinoba Bhave University, Hazaribagh, Jharkhand” was prepared under my guidance. This report has not previously formed the basis for the award of any degree, diploma, or similar title of any University.

Date ………………

Mr. Santosh Prasad

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CERTIFICATE

This is to certify that the report titled **"Seed Sowing with Springless Suspension Mechanism"** being submitted by "ASHISH KUMAR (UCET-2000101); AMAN KUMAR (UCET-2000104); ANIMESH KUMAR SAW (UCET-2000106); VICKY KUMAR (UCET-2000132)" in partial fulfilment of the requirements for the award of the "Degree of Bachelor of Technology (B. Tech)", of "University College of Engineering & Technology, Vinoba Bhave University, Hazaribagh, Jharkhand " is a Bonafide record of the project work done by "ASHISH KUMAR (UCET-2000101); AMAN KUMAR (UCET-2000104); ANIMESH KUMAR SAW (UCET-2000106); VICKY KUMAR (UCET-2000132)".

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ACKNOWLEDGEMENT

We gratefully acknowledge the invaluable contributions and support from numerous individuals and organizations that made the development of the seed sowing mechanism with a springless suspension system possible.

First and foremost, we extend our heartfelt appreciation to our mentor Mr. Santosh Prasad for their visionary leadership, dedication, and expertise in conceptualizing and guiding the development of the springless suspension mechanism. Their innovative approach and unwavering commitment have been instrumental in pushing the boundaries of agricultural technology.

We would like to express our sincere gratitude to our Head of Department, Dr. Chandra Bhushan Kumar for his collaborative efforts, technical expertise, and relentless pursuit of excellence throughout the research and development process. The collective contributions of the team have been indispensable in overcoming challenges, refining design iterations, and ensuring the functionality and performance of the seed sowing mechanism.

Our gratitude also extends to our partners and collaborators across academia, and the agricultural sector. Their collaborative spirit, knowledge sharing, and support have enriched every stage of the project. Special thanks to our institute, University College of Engineering and Technology, Hazaribag for their collaborative research efforts, technical support, and access to resources, which have accelerated the development and testing of the mechanism.

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Chapter: 1
INTRODUCTION

1.1 HISTORY

Humans require food, water, and air to survive. The first two are readily found in the natural world. However, food must be grown because it is not always present in the environment. When it comes to our nation, India, its economy is centered on agriculture. The core of India is its agriculture. Agriculture's growth is essential to the nation's ability to grow sustainably. It is not a company; rather, it is our way of life in India. We take it from our forefathers and their customs. Our nation's GDP is primarily derived from agriculture. The globe won't have food if agriculture is stopped, which will result in starvation. Because of this, "Annadata Sukhibhava" is given a slogan in India, and for his invaluable efforts he is regarded as a king of modern era.

[1]The history of seed sowing machines dates back to ancient times when simple hand tools were used to sow seeds manually. However, the development of mechanical seed sowing machines began in the 18th century with the Industrial Revolution.

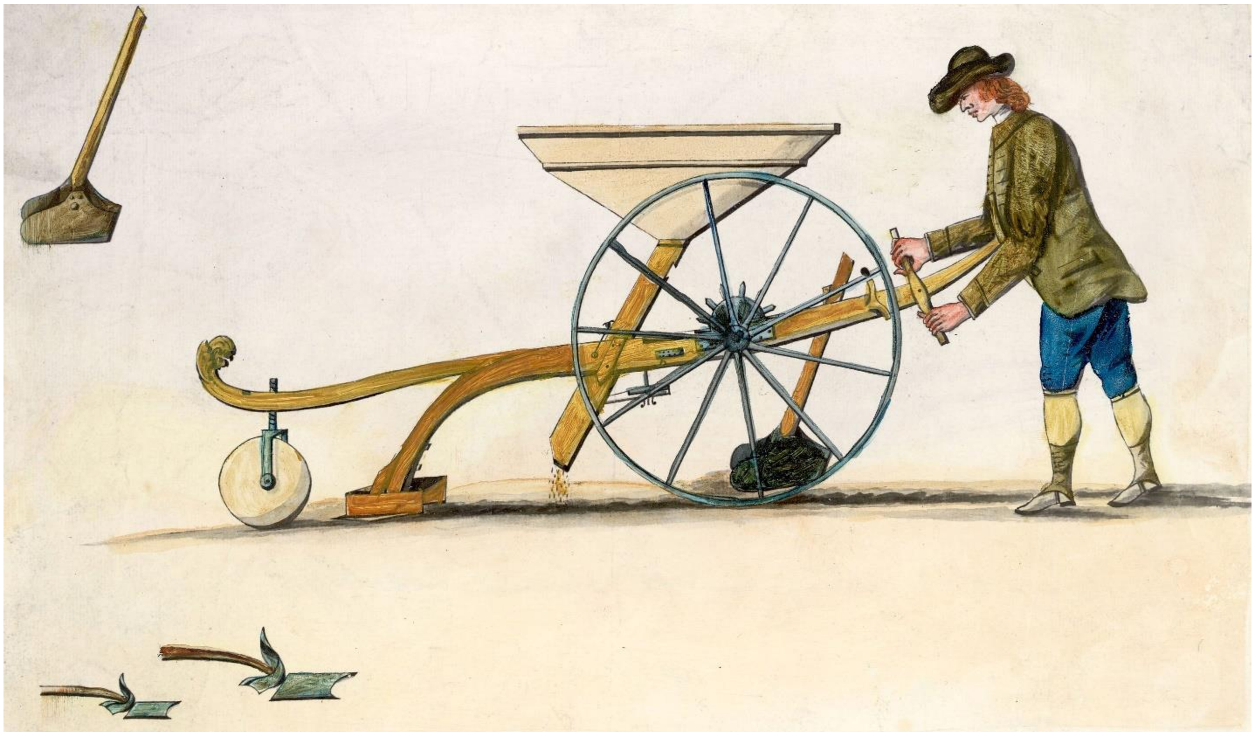
18th Century: Early seed sowing machines were developed in Europe during the 18th century. These machines were simple and operated manually, often consisting of a hopper for seeds and a mechanism for distributing them onto the soil.

19th Century: The 19th century saw significant advancements in seed sowing technology. In 1837, Jethro Tull, an English agricultural pioneer, invented the seed drill, which was a revolutionary machine that could sow seeds in rows at a controlled depth. This invention greatly increased the efficiency of seed sowing and led to higher crop yields.

Early 20th Century: In the early 20th century, seed sowing machines continued to evolve with the introduction of motorized and tractor-mounted seed drills. These machines were more efficient and could cover larger areas of land than previous models.

Late 20th Century to Present: In the late 20th century, with the advancement of technology, seed sowing machines became more sophisticated and precise. Computerized seed drills were developed, which could precisely control seed spacing and depth, leading to further improvements in crop yields.

Recent Advances: Recent advancements in seed sowing machines include the development of GPS-guided precision seeders, which can sow seeds with high accuracy and minimal waste. Additionally, innovations such as springless suspension systems have been introduced to improve the performance and efficiency of seed sowing machines.



1.2 MECHANIZATION OF AGRICULTURE

[2]Mechanization in agriculture is the use of machines to perform agricultural tasks. This includes tasks such as tilling the soil, planting, harvesting, and transporting crops. Mechanization can make these tasks faster and easier and can allow farmers to produce more crops in a shorter amount of time. There are different levels of mechanization, from hand/muscle power to powered hand-tools, powered tools, and program controlled powered tools. The level of mechanization determines the speed, accuracy, and efficiency of the production process.

It is the use of machines, either wholly or in part, to replace human or animal labor. Unlike automation, which may not depend at all on a human operator, mechanization requires human participation to provide information or instruction.

The process of mechanization in agriculture generally refers to the use of machines and technology to improve farming efficiency and productivity. This can include the use of machines for tasks such as planting, harvesting, and transporting crops, as well as using technology for tasks such as monitoring soil conditions and crop growth.

What is the meaning of mechanized agriculture?

Mechanized agriculture is the process of using agricultural machinery to mechanize the work of agriculture, greatly increasing farm worker productivity. The effective mechanization contributes to increase production in two major ways: firstly, the timeliness of operation and secondly the good quality of work. The process of mechanization is an important one for any business or organization that relies on machines and technology to do work. This process can be a costly and time-consuming one, but the benefits of mechanization are typically worth the investment. When done correctly, mechanization can lead to increased efficiency, productivity, and profitability.

Why is mechanization important in agriculture?

There is no doubt that sustainable agricultural mechanization can play a significant role in the development of value chains and food systems. By making postharvest, processing and marketing activities and functions more efficient, effective and environmentally friendly, sustainable agricultural mechanization can help to improve the overall efficiency of the food system and make it more resilient to shocks and stresses. In addition, sustainable agricultural mechanization can also help to create employment opportunities and improve the incomes of small-scale farmers and other actors along the value chain.

What are the problems of farm mechanization?

Farm mechanization is limited by economic, poverty, and land tenure factors. Most farmers cannot afford to purchase or own farm machines, and land fragmentation often prevents their use.

The use of machinery to replace human or animal labour has been happening for centuries, but it has accelerated in recent years thanks to advances in technology. This has led to fears of mass unemployment, as robots and computers can do many jobs that humans currently do. However, it has also led to increased productivity and efficiency in many industries, as well as new opportunities for humans to do more creative and interesting work.

What are the benefits of mechanization

1. Agricultural mechanization has improved techniques and commercialization nullifies effects of labor shortages.
2. It makes more space for crops and increases farm income.
3. Agricultural mechanization has also provided environmental benefits by reducing soil erosion and water pollution.

Agricultural mechanization has improved land reclamation, reduced soil erosion, and made irrigation systems more efficient. The cultivators attached to tractors help to smooth out the soil, fill in ditches and remove weeds, which all help to increase the amount of land used and prevent soil from eroding.

1.3 PROBLEMS FACED BY THE FARMERS

During cultivation of crops, the common problems faced by the farmers range from the phase of seed sowing to harvesting the crops with adverse effects of weather sometimes. In the crop fields, it is important to use the right type of seed and appropriate ways of planting the seeds according to the suitable soil and weather conditions. It requires considerable efforts and time at the beginning of cultivation of a new crop. Particularly,

1. During the starting of the season farmers require a mechanized equipment to clean or remove the previous crop before starting to cultivate a new crop. Not all farmers can afford to buy a tractor for doing this work.
2. During the time of planting a seed, they need also a suitable and affordable equipment.
3. After planting the seeds, weed growth need to be avoided with a well-equipped facility.
4. Like the above issues, there may be multiple times to plough the soil during cultivation.

1.4 SEED SOWING/PLANTING

As mentioned earlier, seed sowing is one of the most significant aspect of problems in crop cultivation. Sowing of seeds means planting the seed in a particular point and cover it with soil. At that time, farmers have to plough the soil before one or two weeks of the planting and also have to plough the soil during sowing. This means that they have to plough the soil for at

least two times during cultivation. Crop planting operation is the art of placing seed in the soil to obtain good germination and crop stands. A perfect sowing gives

1. Correct amount of seed per unit area.
2. Correct depth of sowing.
3. Correct spacing between row-to-row and plant-to-plant.
4. Correct seed rate.

The primary objective of any planting operation is to establish an optimum plant population and plant spacing, the ultimate goal being to obtain the maximum net return per unit area. Population and spacing requirements are influenced by:

1. Type of crop.
2. Type of soil.
3. Fertility level of soil.
4. Amount of moisture available.

1.5 SEED SOWING WITH SPRINGLESS SUSPENSION MECHANISM

"Seed sowing with springless suspension mechanism", as the title showing there is a mechanism for seed sowing machine which do not contain any kind of springs (whether it is helical, conical, leaf, torsion or air, etc.) as a suspension system. In this project, we are making a mechanism that not only sows various kinds of seeds, but this is an **All-Terrain Rover**. The unique design of this rover makes it capable of moving in the odd agricultural land along with a Differential Mechanism for sustaining jerks of the path coming in front of it.

This rover contains four motor powered wheels that gives enough endurance to move on off-road lands of agricultural field. These broad wheels help to distribute the overall self-weight of the rover that prevents it to getting stuck in the land.

The Springless Suspension System combines a Differential Mechanism and an Oscillating System. This differential system uses three straight bevel gears. It is a gear train with three drive shafts that has a property such that the rotational speed of one shaft is the average speeds of the others, or a fixed multiple of that average and Oscillation is the repetitive or periodic variation of an object.

Suspension systems must support both road holding/handling and ride quality, which are at odds with each other. The tuning of suspensions involves finding the right compromise. It is important for the suspension to keep the road wheel in contact with the road surface as much as possible, because all the road or ground forces acting on the vehicle do so through the contact patches of the tires. The suspension also protects the vehicle itself and any cargo or luggage from damage and wear.

The Frame of the system is mostly made of mild steel. The frame that holds the tires oscillates freely. The same frame is connected to the differential. A motor is connected to a gear in the differential mechanism, thereby making it the driving gear. The driving gear is connected by bevel gear on both the side. Each gear is connected to two wheels on each side. Each wheel is driven by an individual motor. The motor makes sure that the gears and the wheels are in motion and the oscillating property makes sure that the vehicle is moving forward even in rough terrain.

In the current generation most of the countries do not have sufficient skilled manpower especially in agricultural sector and it affects the growth of developing countries. The main requirement of Automation is to reduce manpower in our country; the buzzword in all industrial firms generally involve electrical, electronic component as well as mechanical part. Automation saves a lot of tedious manual work and speeds up the production processes. So, it is the time to automate the sector to overcome this problem. In India there are 70% people dependent on agriculture. Seed has been an important agricultural commodity since the first crop plant was domesticated by pre-historic man. In this model seed sowing process is automated to reduce the human effort and increase the yield.

Cropping is important and tedious activity for any farmer, and for large scale this activity is so lengthy also it needs more workers. Thus, agriculture machines were developed to simplify the human efforts. In manual method of seed planting, we get results such as low seed placement, less spacing efficiencies and serious back ache for the farmer. This also limited the size of field that can be planted. Hence for achieving best performance from a seed planter, the above limits should be optimized. Thus, we need to make proper design of the agriculture machine and also selection of the components is also required on the machine to suit the needs of crops. The agriculture is the backbone of India. And for sustainable growth of India development of agriculture plays vital role. The India has huge population and day by day it is growing thus demand of food is also increasing. In agriculture we saw various machines. Also, there traditional methods are there. Since long ago in India traditional method is used. Also, India has huge manpower. This manual planting is popular in villages of India. But for large scale this method is very troublesome. The farmer must spend his more time in planting, but time available is less for him. Thus, it requires more manpower to complete the task within stipulated time, which is costlier. Also, more wastage happens during manual planting. Hence there is need of developing such a machine which will help the farmer to reduce his efforts while planting. This process of using machines is called as **Mechanization**. Along with mechanization automation also helps to increase the efficiency of the process.

The robotic system is an electro-mechanical machine (conveys a sense that it has agency of its own) and artificial agent which is steered by DC motor which has four wheels. The farm is cultivated by the machine, depending on the crop considering particular rows & specific columns.

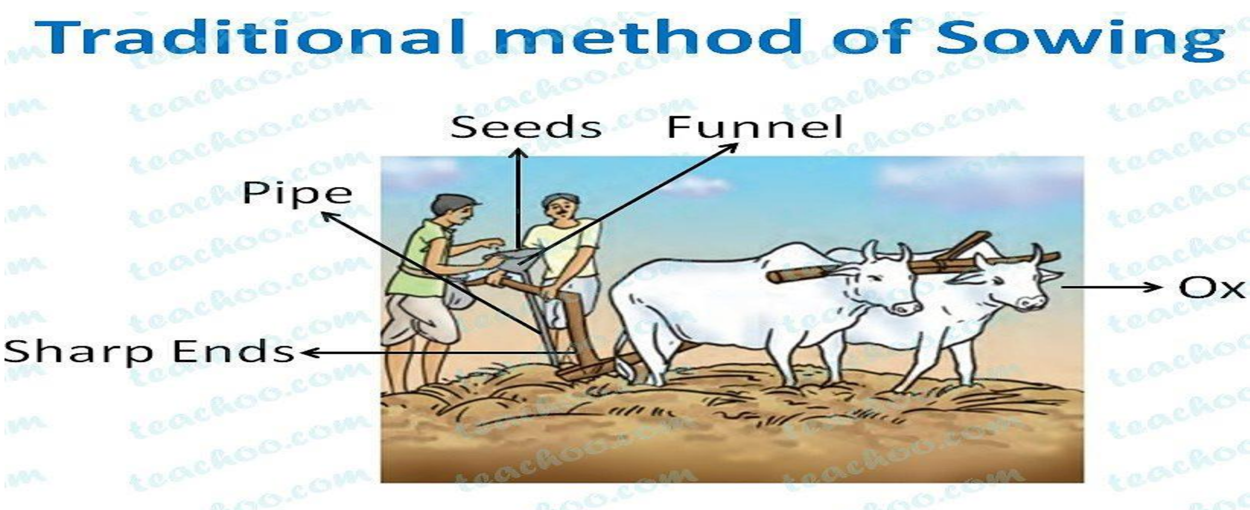
Traditional Sowing Methods:

[3]Traditional methods include broadcasting manually, opening furrows by a country plough and dropping seeds hand, known as ‘Kera’, and dropping seeds in the furrow through a

bamboo/mental funnel attached to a country plough (Pora). For sowing in small areas dibbling i.e., making holes or slits by a stick or tool and dropping seeds by hand, is practiced. Multi row traditional seeding device with manual metering of seeds are quite popular with experienced farmers.

Traditional sowing methods have following limitations:

- In manual seeding, it is not possible to achieve uniformity in distribution of seeds. A farmer may sow at desired seed rate but inter-row and intra-row distribution of seeds is likely to be uneven resulting in bunching and gaps in field.
- Poor control over depth of seed placement.
- It is necessary to sow at high seed rates and bring the plant population to desired level by thinning.
- Labour requirement is high because two persons are required for dropping seed and fertilizer.
- The effect of inaccuracies in seed placement on plant stand is greater in case of crops sown under dry farming conditions. During kharif sowing, placement of seeds at uneven depth may result in poor emergence because subsequent rains bring additional soil cover over the seed and affect plant.



Chapter: 2

LITERATURE SURVEY

A literature survey on seed sowing machines with springless suspension mechanisms reveals several key insights and advancements in this field. This technology is crucial for precise and efficient seed placement, which is essential for maximizing crop yields.

1. Singh, A., et al. (2019)[4] "Development and Performance Evaluation of Seed Drill with Springless Tine". Singh et al. (2019) presents the design and performance evaluation of a seed drill with a springless tine mechanism. The machine showed improved seed placement accuracy and depth control compared to traditional designs.

2. Li, J., et al. (2020)[5] "Improving Seed Placement Accuracy Using Precision Planting Technology". Li et al. (2020) discusses the use of precision planting technology to enhance seed placement accuracy in seed drills with springless suspension mechanisms. The study demonstrates significant improvements in seed spacing and depth uniformity.

3. Kumar, S., et al. (2018)[6] "A Comparative Study of Seed Drill Designs". Kumar et al. (2018) compare different seed drill designs, including those with springless suspension mechanisms, and evaluate their performance in terms of seed placement accuracy, depth control, and field efficiency.

4. Sharma, R., & Singh, V. (2017)[7] "Challenges and Opportunities in Seed Drill Design". Sharma and Singh (2017) provide an overview of the challenges and opportunities in seed drill design, focusing on innovations such as springless suspension mechanisms and their impact on seed placement accuracy.

5. Patel, H., et al. (2016)[8] "Field Performance Evaluation of Seed Drills". Patel et al. (2016) evaluates the field performance of seed drills with springless suspension mechanisms under various soil and crop conditions. The results highlight the importance of precise seed placement for improving crop yields.

6. P. Usha et.al (2015)[9] used to development of develop agricultural land without the manpower. The aim of this paper is to decrease the manpower, time and there is increase in productivity rate. All the automated robot works like seeding, harvesting etc. and the vehicle is navigated are preferred by using microcontroller.

7. Ramesh & Girish Kumar (2014)[10] worked for seed sowing equipment. The objective of sowing operation is to insert the seed in the field in a row at certain depth and with equal spacing, covering the seeds with soil and provide proper compacting in soil. The recommended equal row spacing, how much seeds are inserted in soil with spacing and depth of seed which vary in different climatic conditions to achieve optimal yields. Seed sowing devices plays a most important role in agriculture field.

8. P. Sreelakshmi et.al (2016)[11] proposed for a prototype of an agriculturally based robot capable of performing farming activities like sowing seeds. This automatic robot is capable of performing and scanning field operations. The robot is fed with inputs like field dimensions, spacing between the seeds and the tasks are performed accordingly. This model of the agricultural robot is cost effective and user friendly.

9. Shriyash Thawali et.al (2017)[12] deals with manufacturing and development of robot in agricultural applications. The main application of this robots in agriculture is of harvesting stage i.e. seeding. This robot is replaces human labour consumption. This paper represents a robot which is capable of performing operation automatic seed distribution and spraying of pesticide. The microcontroller supervises the entire process. The robot for Manual control uses the Remote controller to control the device and helps in the directing of the robot on the field.

10. Mebrhit et.al (2017)[13] focused on designing and developing prototype of seeding mechanism. For the case of it is economically relevant for poor farmers, the researcher assured to have low cost by conducting cost of the mechanism. Unique features of this new design include seeding mechanism for seeding variable size grains and specify their space, it is controlled by the wheel rotation, it is easy to operate, its minimum damage to the seed in this process, its high level of operational reliable.

11. Vinay Kumar Tiwari et.al (2017)[14] focused on all the basic automatic of the seeding mechanism for moving it forward and backward and also for putting the plough of seeding mechanism up and down for it to seed at a given depth. [14] The systems of sowing the seeds and directing the vehicle are preferred by this automatic robot using microcontroller, relay switches etc. [14] The seeding technique is now used as an alternate to the old farming techniques and promote to soil and water conservation.

12. Pradeep Gorre et.al (2017)[15] carried on work mainly on seeding mechanism with a DC servo motor which controls a driller and sow the seeds with a simple wheel mechanism and sowing the seeds is planned and the seeds are sowed with equal spaces between them. [15] The issue of a farmer of sowing the seeds is taken and overcome use of fire bird robot. Here, a DC servo motor equipped for drilling is for digging a hole and sow the seeds with a simple wheel mechanism attached to that servo motor.

13. Devesh Barhate et.al (2018)[16] research work was mainly on the base frame of the agrobot with 4 wheels connected and driven by dc motor. Cultivator is fitted on the one end which is driven by dc motor and is made to dig the soil. Funnel made of sheet metal stores the seeds and the seeds goes through the tube joined to a funnel into a drilled hole on the shaft in digged soil. On the end leveler is fitted to close the seeds to the soil, and water pump is to spray the water.

14. Swapnil Umale et.al (2018)[17] proposed research work is mainly on sowing machine should be reliable to all farms, all types of crops and this is basic condition of sowing machine

From above literature review we conclude that, there are many mechanisms of sowing seeds some are traditional, and some are modern. The traditional one is hand driven or human and animal efforts are needed. And the modern mechanism is highly complicated which cannot be used by the small farmers because they are highly automated and also they are more expensive to afford.

Chapter: 3

OBJECTIVES OF PRESENT WORK

The objectives of a seed sowing machine with a springless suspension mechanism are:

- **Improved Seed Placement**: To achieve more precise seed placement at the desired depth and spacing, ensuring optimal seed-to-soil contact for better germination and crop establishment.
- **Uniform Seed Spacing:** To maintain uniform seed spacing across the field, which promotes even crop emergence and reduces competition among plants for resources.
- **Reduced Impact of Terrain Variations:** To minimize the impact of uneven terrain on seeding performance, ensuring consistent seed placement even on rough or undulating surfaces.
- **Increased Seeding Efficiency:** To enhance seeding efficiency by reducing seed waste and ensuring that seeds are placed only where needed, leading to cost savings for farmers.
- **Improved Crop Yields:** To ultimately improve crop yields by optimizing seed placement and spacing, which are critical factors influencing crop growth and development.
- **Reduced Maintenance:** To design a suspension mechanism that is durable and requires minimal maintenance, reducing downtime and operational costs for farmers.
- **Adaptability to Various Field Conditions:** To create a seed sowing machine that can perform effectively in a variety of soil types and field conditions, maximizing its utility for farmers.
- **Integration with Precision Agriculture Technologies:** To integrate the machine with precision agriculture technologies such as various sensors, enabling real-time monitoring and adjustment of seeding parameters for optimal performance.
- **Reduced Soil Disturbance:** Another important objective is to minimize soil disturbance during seeding. A springless suspension mechanism can help achieve this by providing smoother and more controlled seed placement, reducing the impact on the soil structure. This helps preserve soil fertility and moisture, promoting better seedling emergence and growth.

- **Improved Seed-to-Soil Contact:** A springless suspension mechanism can be designed to ensure optimal seed-to-soil contact, which is crucial for seed germination and early growth. By minimizing bouncing and uneven seed placement, the machine can help seeds establish better contact with the soil, leading to more uniform germination and healthier crop growth.
- **Enhanced Durability:** Durability is a key objective for agricultural machinery. By eliminating springs, which are prone to wear and breakage, a springless suspension mechanism can improve the overall durability of the seed sowing machine. This reduces maintenance requirements and downtime, leading to lower operating costs.
- **Compatibility with Modern Farming Practices:** The seed sowing machine should be compatible with modern farming practices such as conservation tillage and precision farming. A springless suspension mechanism can support these practices by providing precise seed placement while minimizing soil disturbance, helping farmers achieve sustainable and efficient crop production.
- **Cost-Effectiveness:** Finally, the machine should be cost-effective to manufacture, operate, and maintain. By eliminating the need for springs and simplifying the design, a springless suspension mechanism can help reduce production costs and make the machine more affordable for farmers.

Overall, the objective of a seed sowing machine with a springless suspension mechanism is to enhance seeding precision, reduce seed waste, and improve crop yield, especially in challenging field conditions.

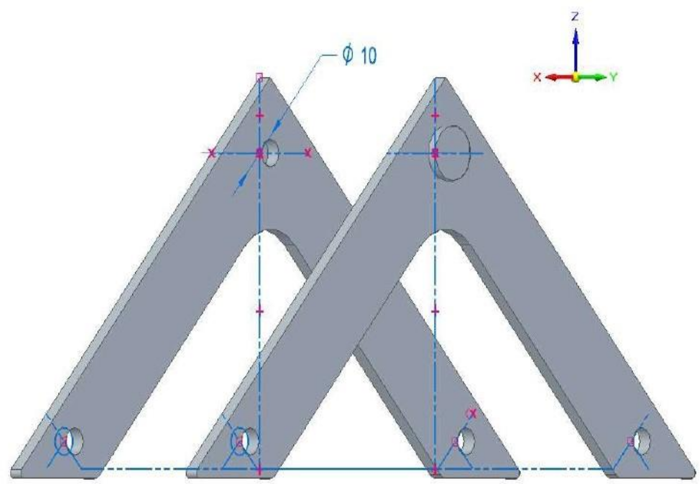
Chapter: 4

COMPONENT DETAILS

The system will be consisting of following components,

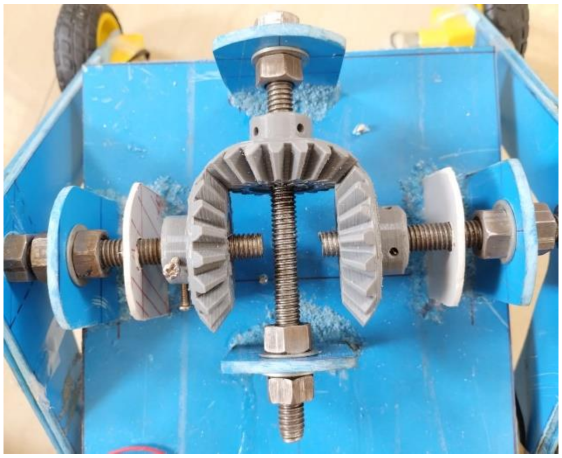
4.1 Based on Mechanical requirements:

- Angle Rods: These rods are joined together by means of joining operation to create two angle-shaped frames.

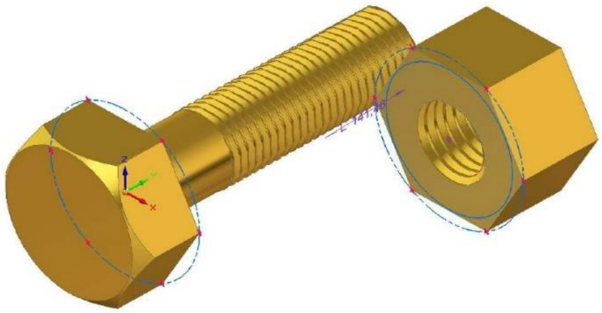


- Bevel Gear: A differential mechanism of three bevel geared train is used for sustaining the jerks of terrain and thus this will act as a suspension mechanism for the rover.

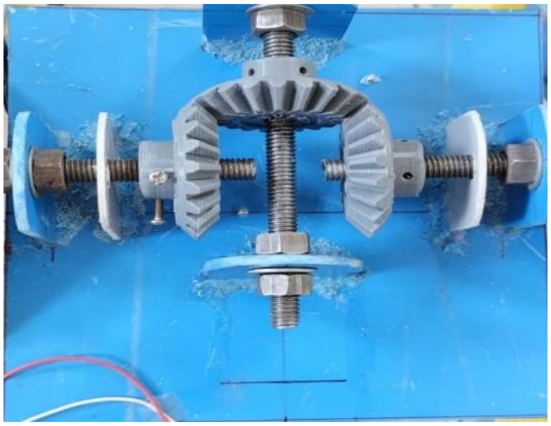
- Springless Suspension Mechanism: The springless suspension mechanism maintains consistent ground contact for the seeding units, ensuring that they remain at the desired depth and angle.



- Nuts & Bolts: They are used for joining two or more components.



- Supporting Frame: Entire differential system is resting upon this frame.

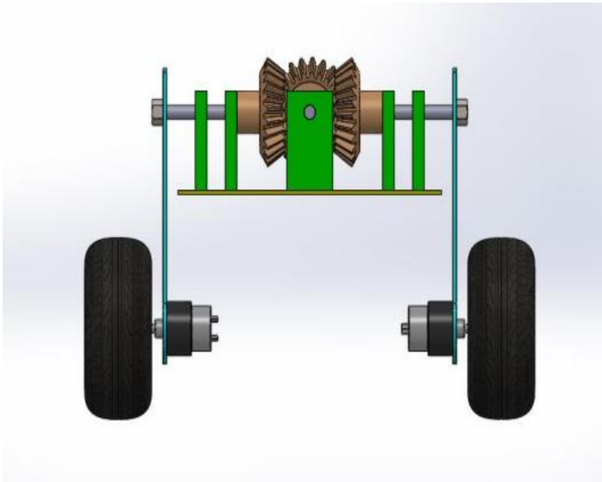


- Wheels and Tyres: A total of 4 wheels has been used to move the rover on all types of lands.

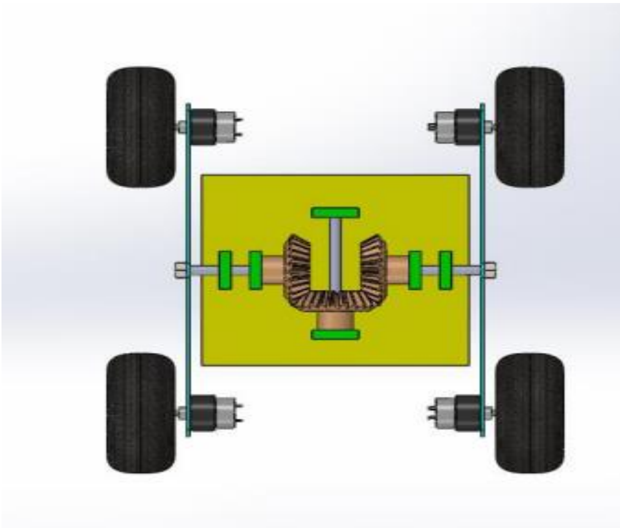
- Shafts: They are used as a holding part for bevel gears in the differential mechanism.
- Base Frame: Entire electronic and seeding mechanisms are placed over this frame.
- Mounts and Joints
- Screws and Connectors

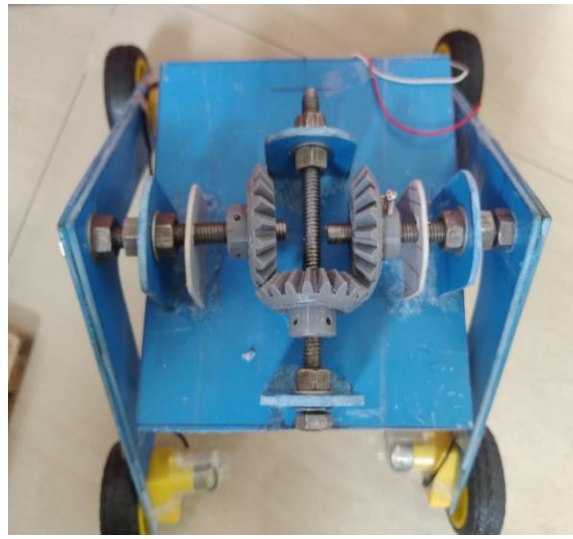
<u>Other Assemblies</u>

- Front View

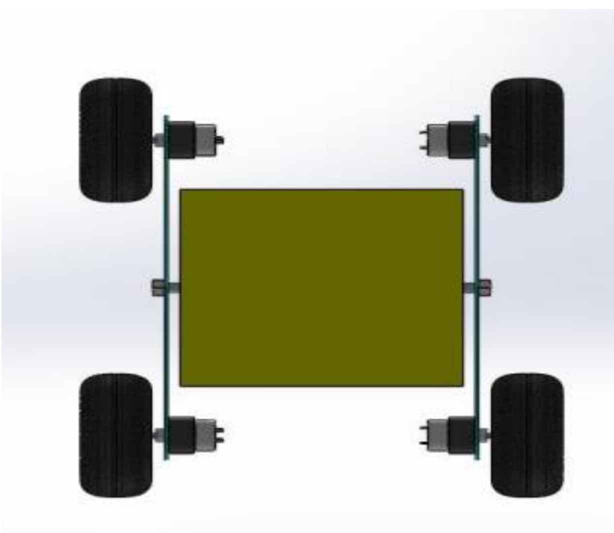


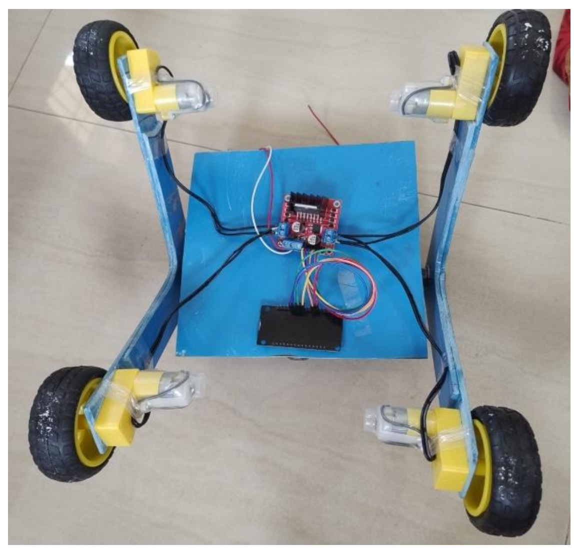
- Top View





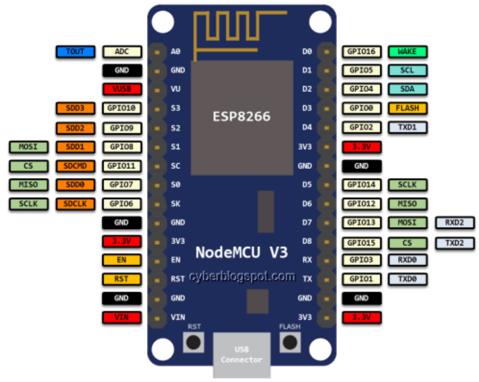
- Bottom View





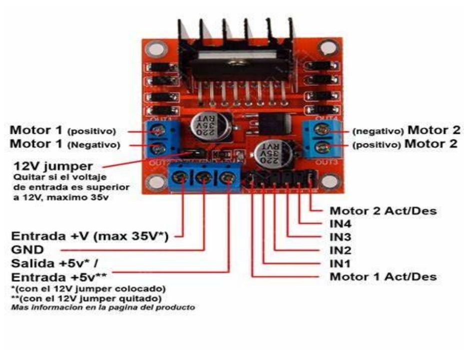
4.2 Based on Electronic requirements:

- ESP 8266: The WIFI microchip with micro-controller capabilities.



- DC Motors: Low speed – high torque DC Motor is used to power the rover for its motion in the terrain.

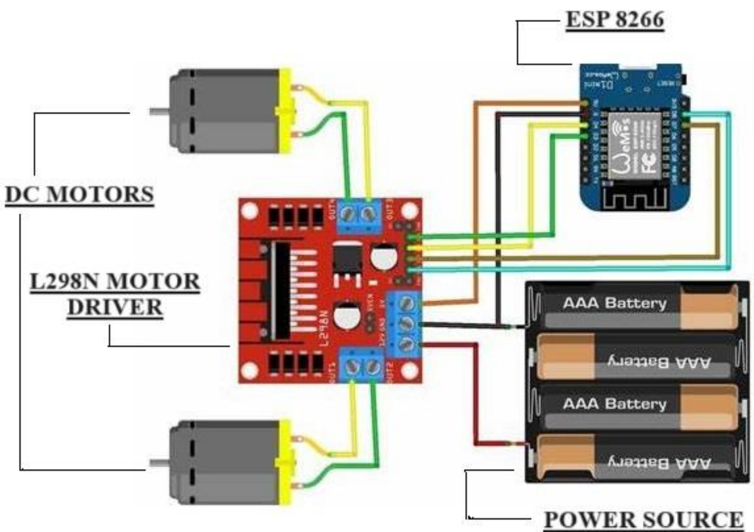
- Driver: L293d is a DC motor driver used for driving DC Motors.



- Power Source: A battery is used to supply the power for functioning all the electronic components.

<u>Other Assemblies</u>

- Circuit Diagram

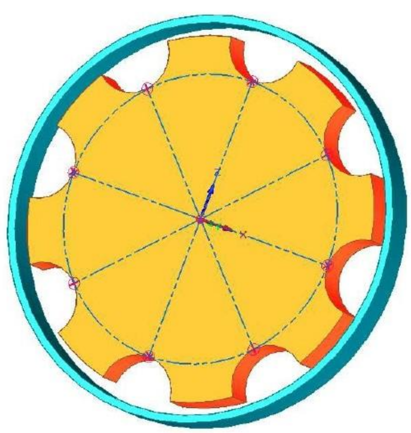


CIRCUIT DIAGRAM

4.3 Based on Seed Sowing requirements:

- Seed Hopper: The seed hopper stores the seeds and feeds them into the seeding mechanism. It should have a capacity large enough to hold an adequate number of seeds for the desired planting area.

- Metering System: The metering system regulates the flow of seeds from the hopper to the seeding mechanism. It ensures that the correct number of seeds is dispensed at the desired rate.



- Distribution System: The distribution system distributes the seeds from the metering system to the seeding units. It should ensure uniform seed spacing and placement.

- Seeding Units: The seeding units are responsible for placing the seeds into the soil at the desired distance.

Chapter: 5

METHODOLOGY & WORKING

To provide a comprehensive overview, let's focus into the methodology and working of a seed sowing machine with a springless suspension mechanism.

5.1 Methodology

Design Considerations

The design of a seed sowing machine with a springless suspension mechanism involves several key considerations to ensure optimal performance and durability. These considerations include:

- Suspension System: The suspension system is a critical component of the machine, responsible for maintaining consistent ground contact for the seeding units.
- Seeding Units: The seeding units are designed to place the seeds into the soil at the desired spacing. They are adjustable to accommodate different seed types and planting requirements.
- Distribution System: The distribution system ensures uniform seed spacing and placement. It is designed to minimize seed waste and ensure accurate seed placement.
- Frame: The frame provides the structural support for the machine and holds all the components together. It is sturdy and durable to withstand the rigors of field operation.
- Control System: The control system regulates the operation of the machine, including seed flow, seeding spacing.
- Optional Features: Optional features such as GPS guidance, variable rate seeding, and monitoring systems can enhance the functionality and performance of the machine.

Construction and Assembly

Once the design considerations are finalized, the construction and assembly of the seed sowing machine can begin.

This involves -

- Fabricating the frame: Fabrication of frame has been done using PVC (Poly Vinyl Chloride) plastic for strong and elastic behaviour that absorbs the shocks while running on the farm land. As we have decided to construct the entire assembly from scratch and raw materials, our project is quite cheap and affordable by every farmers existing.

Fabrication of rover also includes the construction of supporting clamps, supporting bed, seed metering unit, seed hopper, seed flowing tunnel, etc

- Assembling and installation: Installation of angle rods and assembly of the suspension mechanism by using bevel geared meshing (differential mechanism) which is relying on supporting clamps using long bolts and nuts (as shafts).
- The base of angle rods are empowered with wheels by using DC geared motors on all the four sides. These DC motors are fully controlled by using L298N motor driver and ESP 8266 (which a WIFI microchip having capabilities of microcontroller) powering with Li-ion 18650 rechargeable battery.
- Seeding units, and distribution system; this unit is responsible for seed flowing and transferring to land for sowing. Seed meter is responsible for distribution and limited flow of seeds at desired quantity that sows seeds at fixed depth. Seed meter has been empowered with another DC geared motor which gives a fixed seed rate.
- All the 4 DC motors for rover and 1 DC motor for seed meter has been driven by using L298N motor driver and ESP 8266 powering with Li-ion battery.

Testing and Calibration

After assembly, the machine undergoes rigorous testing and calibration to ensure that it meets the desired performance specifications. This includes testing the suspension system under various terrain conditions, calibrating the seed metering system, and verifying the accuracy of seed placement and spacing.

5.2 Working Principle

Rover Operation and Control

The All-Terrain rover is being moved by using 4 DC motors and controlled by a remote controller. One motor has been used for seed metering unit.

Seed Loading and Metering

The seed sowing machine is loaded with seeds into the seed hopper. The seed metering system regulates the flow of seeds from the hopper to the seeding units, ensuring that the correct number of seeds is dispensed at the desired rate.

Seeding Spacing Adjustment

As the machine moves across the field, the suspension mechanism maintains consistent ground contact for the seeding units. The spacing between seeds is controlled by the distribution system, which ensures uniform seed spacing across the field.

Seed Placement

The seeding units place the seeds into the soil at the desired spacing. The springless suspension mechanism allows the seeding units to adjust to the terrain, ensuring that they remain at the desired angle for optimal seed placement.

Control System

The control system regulates the operation of the machine, including seed flow, and spacing. It can be adjusted by the operator to suit different field conditions and seed types.

Chapter: 6

CONCLUSION

In conclusion, a seed sowing machine with a springless suspension mechanism represents a significant advancement in agricultural technology, offering several key benefits over traditional seed sowing machines. By maintaining consistent ground contact for seeding units and ensuring precise seed placement and spacing, these machines can improve seeding efficiency, crop yield, and overall farm productivity.

The seed sowing machine with a springless suspension mechanism is a sophisticated agricultural tool that offers precise seed placement and uniform seed spacing, even on rough terrain. By incorporating advanced design principles and technology, these machines can significantly improve seeding efficiency and crop yield, making them essential tools for modern agriculture.

The springless suspension mechanism allows the machine to adapt to varying terrain conditions, ensuring that seeds are placed at the optimal depth and spacing for germination. This is particularly important in modern agriculture, where field conditions can vary widely and impact seeding performance.

Furthermore, the design and construction of these machines are critical to their performance and durability. Proper attention to design considerations such as suspension system design, seeding unit adjustment, and control system integration is essential to ensure optimal performance in the field.

Overall, seed sowing machines with springless suspension mechanisms have the potential to revolutionize the way seeds are planted, offering farmers a more efficient, reliable, and cost-effective solution for seeding operations. Continued research and development in this area are likely to further enhance the capabilities of these machines and drive innovation in agricultural technology.

Chapter: 7

FUTURE APPLICATIONS

The future applications of a seed sowing machine with a springless suspension mechanism are wide-ranging and can significantly impact agriculture.

Some potential future applications include:

- **Precision Agriculture and Compatibility:** Integration with advanced technologies such as GPS, sensors, and AI for precision agriculture applications. This would enable real-time monitoring and adjustment of seeding parameters based on field conditions, leading to more efficient use of seeds and improved crop yields. Compatibility with other precision agriculture technologies and systems to enable seamless integration into modern farming practices.
- **Variable Rate Seeding:** Implementation of variable rate seeding techniques to adjust seeding rates based on soil fertility maps and crop requirements. This would optimize seed placement and spacing, reducing seed waste and improving crop uniformity.
- **Autonomous Operation:** Development of autonomous seed sowing machines that can operate without human intervention. These machines could be programmed to sow seeds according to predefined patterns or algorithms, increasing efficiency and reducing labor costs.
- **Environmental Monitoring:** Integration with environmental monitoring systems to assess soil health, moisture levels, and other environmental factors. This information could be used to optimize seeding practices and minimize environmental impact.
- **Multi-Crop Compatibility:** Designing seed sowing machines that are compatible with a wide range of crops, including row crops, cover crops, and specialty crops. This would enhance the versatility and applicability of the machines across different agricultural settings.
- **Energy Efficiency:** Improving the energy efficiency of seed sowing machines using lightweight materials, advanced propulsion systems, and energy-efficient components. This would reduce the carbon footprint of agricultural operations and lower operating costs.

- **Data Integration and Analysis:** Integration of seed sowing machines with farm management software for data collection, analysis, and decision-making. This would enable farmers to make informed decisions about seeding practices and crop management strategies.
- **Enhanced Suspension System:** Develop more advanced suspension systems that can adjust to terrain variations more quickly and accurately, ensuring even better seed placement and spacing.
- **Integration of Advanced Technologies:** Incorporate advanced technologies such as artificial intelligence, machine learning, and robotics to automate and optimize seeding operations, leading to improved efficiency and precision.
- **Improved Seed Monitoring:** Develop advanced seed monitoring systems to track seed placement in real-time, allowing for immediate adjustments to seeding parameters for optimal performance.
- **User-Friendly Design:** Focus on making seed sowing machines more user-friendly and easier to operate, maintain, and repair, to increase their adoption among farmers.
- **Cost-Effective Solutions:** Develop cost-effective solutions that offer the benefits of springless suspension mechanisms without significantly increasing the cost of the machine, making it accessible to a wider range of farmers.

By addressing these areas in future work, seed sowing machines with springless suspension mechanisms can continue to evolve and improve, contributing to more efficient, sustainable, and productive agriculture.

Overall, the future applications of seed sowing machines with springless suspension mechanisms are likely to be driven by advancements in technology, increasing demand for precision agriculture solutions, and the need to optimize resource use in agriculture.

Chapter: 8

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