

Agricultural Automatic Seed Sowing Machine: A Review

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Abstract: The present review provides brief information about the various types of automatic seed sowing equipment. Agriculture forms an integral part of the Indian economy. The methodology implemented in carrying out agricultural activities as many constraints such as non-availability of labor low productivity rate, regularity due to whether constant and fatigue. To overcome this problem, we need to automate and mechanize the agriculture sector. During the Sowing operation we can carried out the other operations simultaneously so the cost will reduce and also saves time. By using the seed sowing cum fertilizer sowing and pesticides sowing machine we can do this all the operation simultaneously.

Keywords: Seed sowing machine, seed drill, broadcasting, sowing behind the plough.

1. Introduction

Agriculture plays an important role in the life of economy. It is the backbone of Indian economy. India is known for villages. This being said that the major occupation of majority of villages in India is agriculture and about 70% of the people in villages depends on agriculture. While working in field manually the workers have to face the problems like body pain, drudgery, fatigue etc. also now a days there are the lot's of problems regarding the pollution and the inadequacy of the fuel sources. So we need to study on improving agricultural equipment and also need to use the maximum conventional sources of energy.

The workers and the farmers don't have much more knowledge about the mechanism action and operation of the larger machinery. So, we need to focus on the automatic operated machinery. Sowing is the major operation among all the operations performed while farming. This is because the whole production from the farm depends on the sowing. Generally, farmers use traditional way or manual methods for the sowing. But manual methods of planting resulted in low seed placement, there is not possible to achieve uniformity in distribution of seeds, seeds may not place at a uniform depth, row to row spacing will not be maintained, labor requirement is high, also there is no smartness of work done. Hence there is a there is a

greater need for mechanization and to develop the automatic sowing machine. Seed sowing machines are a device which helps in the sowing of seed in the desired position and assisting the farmers in saving time and money. Because of seed sowing machine it will be possible to place the seeds in rows at desirable depth, seed to seed spacing is maintained, cover the seed with soil and provide proper compaction over the seed. Thus, it will be helpful for the agriculture industry to move toward mechanization.

Present Situation:

The present situation of seed sowing machine and their working are discussed as below:

Present Practices:

Sowing is the most important practice in the agriculture. As the whole production depends on the sowing done. Now a day the farmers use the following methods of sowing from the long era.

Traditional seed sowing techniques:

1) *Broadcasting*

It is also called as random sowing method. It is the scattering of seeds by hand all over prepared field. Hindi method of sowing 100% germination is not possible.

2) *Dibbling*

It is actually a line sowing. Inserting a seed hole at a desired depth and covering the hole. Dibbling is practice on plane surface and ridges, furrows or beds and channels. The seeds are dibbled at 2/3rd from top for 1/3rd from bottom of the ridge.

3) *Sowing behind the plough*

Sowing behind the plough is done by manual or mechanical means. Seeds are dropped in furrows open by the plough and the same is closed or covered when the next furrow is opened. The seeds are shown at uniform distance. Kera and para methods are related to Desi or indigenous plough.

4) *Drill sowing for drilling*

Drilling is the practice of dropping the seeds in a definite depth covered with the soil and compacted. In this method, sowing implements are used for placing the seeds into the soil.

Seeds are drilled continuously or at a regular interval in rows and are placed at uniform depth, covered and compacted.

2. Literature Review

A. Manual Seed Sowing Equipment

Adalinge N.B. et al.: This research paper present 'the design and manufacturing of seed sowing machine which can be operated by single operator'. In this they present the objective of machine to set fertilizer with sowed seed, to level the ground, enable the machine for sowing several or multiple seeds, to maintain the same distance between two seeds. The working of the equipment as when the equipment is pushed forward by using handles, different wheel rotates and the gear is mounted on the axle of the will start to rotate and its rotation is then transferred to pinion through the chain drive. The motion of the pineal is converted into reciprocating motion by single slider crank chain mechanism, due to this arrangement the connecting rod moves upward and downward which then reciprocate the piston of single acting reciprocating pump mounted on the top of the storage tank. During the upward motion of the connecting rod the pesticide is drawn into the pump and during the downward motion of the connecting rod the pesticide is forced to the delivery valve, the delivery valve is then connected to the pipe carrying the number of nozzles. Improved seed come seed drill are provided with seed and seed boxes, metering mechanism, fur openers, covering devices, frame, ground drive system and control for variation of seed and seed rates. This equipment higher safety, reduce human efforts, increase the efficiency, reduces the workload, reduces the fatigue of workers and reduces maintenance cost.

Kyada A.R. et al.: This research paper presents design and development of manually operated seed planter machine. This paper deals with the basic objectives of sewing operation to put the seed and fertilizer in rose at the desirable depth and seed to seed spacing, cover the seed with soil and provide proper compaction over the seed. The metering system selected for the seed should not damage the seed while in operation. The working of the machine is as machine is pushed, power wheel is rotating which transmit power to plunger through chain and sprocket mechanism. Can is mounted on sprocket shaft which push plunger to a downward direction. Once plunger is penetrate in soil and during backward stroke flapper is open to seed get separate from plunger and inserted in dig. This equipment is affordable to the farmers. this planter machine can be readily made from local component in workshop only specialized items required are the seed meters plunger. By using this machine, achievement of flexibility of distance and depth variation for different seed plantation is possible.

Kanthivaran R. et al.: This research paper present design and fabrication of manually operated seed sowing machine. In this design the drive shaft is directly control the seed metering mechanism which eliminate completely attachments such as pulleys, belt systems, thereby eliminating complexities which increased the cost, and increasing efficiency at a highly reduced cost which is the focus of this project. System that will made, uses the manual push force to run mechanism. rotary motion of

wheels provided to the sewing shaft by sprocket or belt drive. With controlled distance interval, seed get sowed on land vie pipe and digging arrangement and seed is covered with soil. The whole assembly of the implement consists of seed metering mechanism digger mechanism seed storage tank seed sowing disc, disc bucket and power transmission mechanism. Hindi separate pesticides spring assembly also fitted. by using this innovation project of seed sowing equipment, we can save more time required for sewing process and also it reduces lot of laborer cost. It is very useful for small scale farmers as weight is less. This machine can maintain row to row spacing and control seed rate, the sea depth and proper utilization of seed can be done with less loss. Also performs the various simultaneous operation and hence sales labor requirement so as labor cost, labor time and also saves a lot of energy.

Renitha P. et al.: This research paper presents a study about the design and fabrication of automatic seed sowing and fertilizer spraying machine. They designed equipment with an objective as to put the seed and fertilizers and rose and at the desired depth and desirable distance between two seeds, to manufacture seed sowing machine which can be operated by the single operator, to set fertilizer with salt seed, to level the ground in small extent. the machine uses the mechanism of manual push force for running. The complete assembly is attached to the tractor. Rotary motion of the wheel is given to the sowing shaft by sprocket or belt drive. With measured distance interval, seed sowed in the soil vie pipe connecting seed Hopper with the digger and then seed is covered with soil and provide compaction over seed. Sprayer mechanism works on battery. Electrically operated pump is used which is placed at the front of machine. which is chargeable can be charged after specified interval of time, it's depending on capacity of battery. The complete assembly is made using CATIA V5 T20 software with extra mixed cropping arrangement. Thus, it can be concluded that, treatment for spacing and control seed and fertilizer rate. It performs the various simultaneous operations and hence saves labor requirement, labor cost, labor time, total cost of savings and can be affordable for the farmers. It can be improved in planting efficiency and increase in crop in and cropping reliability.

B. Animal Drawn Equipment

Umale S. et al.: This research paper presents the design and evolution of multi seed sowing machine. Hindi step present objectives seed sowing machine design, sowing seed with proper distance and depth reduced time and reduce work done. The working as when the machine is pulled by OX it moves in forward direction, due to the inclination angle for a goes inside at 5 to 6 inch depth and it creates a row for seed. At the same time power will rotate with some specific rotation which has joined sprocket wheel and are mounted on the metallic rod with bearing for frictionless rotation. Also, these pockets are mounted on metallic rod which transmit the rotating motion of the wheel to another sprocket wheel, and again from the sprocket wheel to the wheel which is mounted to the shaft which has to rotate the metering rotor. The chain drive is used to smooth transmission of motion of the wheel to the metering

rotors shaft assembly. Needle used sprocket provides the flexibility to the drive system. When the rotational power is transferred to the shaft on which metering rotor is mounted it rotates and pick up the seed fertilizers with it into sales provided on the rotor, and threw into the funnel. Funnel has connected to differ by rubber tube. The flow of these seeds in the downward direction takes place due to gravity and seeds flow through the holes. This flowing seed and fertilizers in the flexible pipes and after that it comes in the back side of the furrow and sows in the soil. Author compared ox operated machine with tractor mounted sewing machine and manual sewing machine. With his machine, percentage reduction in time required for fertilization was observed to be 50%. And reduction in labor cost as compared to conventional method was 80%. This machine has very less capital cost as compared to other type of motion and also principal advantages of having eco-friendliness and easy troubleshooting.

Marode R.V. et al.: This research paper presents design and implementation of multi seed sowing machine. This equipment is designed with the objectives of meter seeds of different sizes and shapes, place the seed in the acceptable pattern of distribution in the field, place the seed equality and uniformly at the desired depth in the soil and cover the seed and compact the soil around to enhance the germination emergence. The complete seed cum fertilizer assembly is made using PRO-Engineer software with additional mixed cropping arrangement, depth control arrangement, Row spacing arrangement. 2 peg wheels are given so that the wheels does not slip on the land as the sea during devices work on the rotation of ground wheels and maintain the plant spacing and control the plant density. Working of recruitment as when a pair of bulls pulls the machine, the motion is transmitted to the fluted roller seed Cup from sprocket at ground wheel through the chain. The fluted roller seed Cup is having the arrangement of seed cut off to control the amount of seeds and fertilizers. The shovel type furrow opener opens the furrows in the soil. The seeds and fertilizers will get placed in the furrows through the guide pipes. In this way seeds and fertilizers are placed in the furrows at proper distance and this machine maintains the proper rows spacing. Performs various simultaneous operations and hence saves labor requirement, labor cost, labor time, total cost of saving and can be affordable for the farmers.

C. Self-Propelled Machineries

Thorat S. V. et al.: This research paper presents design and fabrication of seed sowing machine. This machine has very less cost, simple to use hence, unskilled farmer is also able to handle this machine. The simplified the design also made it cheaper and affordable to every rural farmer. They made various adjustments and simplified it from controlling and maintaining point of view. In this design we connected driveshaft to metering mechanism which eliminates the attachments such as pulleys and belt system. DC motor drives the shaft of motor which is coupled with battery bank. As motor start it moves robot as well as operate the metering mechanism. Seeds storage tank is connected at the top of the robot near rear wheels. The sensor is fitted to it which senses the level of seed in it and it

serves the function of guiding the robot. As many obstacles come in front of robot it gives the signal to the robot and diverse the path of robot. For every rotation of the wheel according to the advertisement it allows. The definite seed to fall into the Hopper so that there is no wastage of seeds also the sowing process done smoothly. When the robot reaches at other end and when it completes task it creates an alarm so that we can provide required facility. By using this machine, we can achieve flexibility of distance and control depth variation for different seeds. Hence it is usable to all seeds.

Deoghare M. N.: This research paper presents solar operated multigrain seed sowing and fertilizing machine. This equipment is having a Power of PV panels is transmitted to the battery and then to the motor which will drive the front wheel. The chain and sprocket mechanism are provided in between the front and rear wheels so the rear wheels will be driven. As soon as the machine is cool by the power source the ground wheel holds the grip on the surface of field, the motion is transferred from the teeth wheel shaft to the main shaft by chain, the Main shaft is rotated and the seed are poured from hopper to the groove the seed metering mechanism, as the hole matches with Hopper seed fall into the hose and from hose to the ground. The teeth plow the soil in definite pattern. For different types of seeds, the manual seed adjustment mechanism is provided. This machine will help the farmers of those remote areas of country where fuel is not available easily. And also, they can perform their regular cultivation activity as well as fuel up to extent. At the same time by using solar energy environment pollution can also be reduced.

Senthinathan N.: This research paper presents fabrication and automation of seed sowing Machine using IOT (internet of things). The aim was to design and develop a less expensive, distinct attachment to the machine so that we can be used in easy way. This machine consists of DC motors, hoppers, seed distributor, cultivator, belt and pulley drive, wiper motor. Using jumper wires output voltage is supplied to input terminal of ESP8266 Wi-Fi module. The codes are uploaded to the microprocessor ESP8266 and then it is connected to mobile hotspot which is going to act as the controller of machine. When the command is given through the Android phone, the motor transfers the motion to the front wheel and then to belt and Pulley mechanism. When the machine moves the real wheel drives the seed distributor hence the seed are shown at regular intervals from the Hopper into the soil. The secret sewing machine has been designed and fabricated and process of seed sowing is automated using IoT in order to minimize the human effort. The modification in selection of microprocessor is done to achieve wireless connectivity between machine and the controller. ESP8266 has been used in order to host and application from other application processor. This model fabrication only automation have been turned to overcome the difficulties of farmers by achieving regular distance between rows and consecutive seeds.

Baladarshini P. et al.: This research paper presents design machine mechanism of sowing of multiple seed in equally spaced rows close the seed with soil after sowing it. Large and heavy machinery will damage the wet soil and will also get

stuck into the muddy fields. So that universal seed sowing machine is designed with low cost and having light weight. The universal seed sowing machine works on the basis of sowing technique called "SOWING BEHIND THE PLOUGH" and sows three types of seeds at the same time. The seal falls at approximate distance from one another due to the vibration created by the motor when driving off-road due to gravitational force. The working of the project main depends on the power of the motor and the weight of the total body. Wiper motors are selected on the basis of their torque power or otherwise known as pulling or pushing force. There are total five motors which helps the machine to move easily. There are a total of 5 motors which helps the machine to move easily. One motor controls the four wheel drive, and other of four motors controlling in the forward and backward motion. The authors concluded that the seed sowing machine can maintain Rose PC proper utilization of seeds and be done with the less loss perform the various simultaneous operation and hence save labor requirement labor cost labor time and can be affordable for the farmers. For one acre land a tractor takes about 2 hour for playing but that time in universal seed sowing machine is reduced by 50%.

Soyoye B. O. et al.: This research paper presents the design and evaluation of motorized multi-grain crop planter. The country like Nigeria there is a need of increasing the productivity because of due to growing population. He develops a motorized crop plant that would be suitable for planting operation in tropical soil objectives of.

1. Designed components of the planter for precision planting.
2. Fabricate and assemble the components of the planter using locally available materials.
3. Test the performance of the planter.

The motorized planter is a machine that was designed to tackle the major constraint and challenges encountered in the use of existing planters and planting systems (low productivity, drudgery, cost, safety etc.). He designed the precision planter having following components. Metering device as a key component, electrically driven motor, two separate seed boxes one for each row, vertical seed plate with peripheral seed cells, frame was constructed from a hollow square pipe to maintain rigidity of the planter at the same time making it lighter in order to reduce its weight so as to eliminate the problem of compaction. Furrow opener where in vegetable state one for on road transportation and another for on-field seeding with the seed furrow openers below the wheels. The hole machine was designed and tested in the laboratory he found the following test results that the planter when operated electrically has the highest efficiency of 98% at the meeting speed of 40 RPM with the field capacity discharge and application rate of 0.25 ha/hr, 14.28 kg/hr and 54.9 6kg/ha. Author concluded that, Hindi plant ahead inform discharge and application rate, the optimum rotational speed of the metering unit of planter when operated manually was 24rpm while it was 40 rpm when operated electrically, the diameter of the seeds was not significant at low speed.

Mohalkar A.: This research paper presents automatic seed sowing machine using solar panel. This machine is designed

with an objective as to control the seed depth and properly utilization of seeds to reduce the wastage of seeds. This machine is designed with components as LCD, Program memory, keypad, DC motor driver (L293D), IR sensor. The working of the equipment is as, the Solar panel used to capture solar energy is converted into electrical energy. Energy is charge 12V battery which is utilized by DC motors. We enter seed to seed spacing distance through keypad. After providing these distance wheels motor start to rotate in clockwise direction then machine will start. These motors will stop after covering the provided distance digging motor will start. Machine will dig the soil through mechanical assembly and stop the digging motor. At the same instant seeds dropper motor starts to rotate. Is dropped into it and cover the seed with soil. This process is continuously repeated till one row is completed. Thus, the solar operated Seed sowing machine can maintain seed to seed spacing, proper utilization of seed can be done, reduce labor requirement cost.

Parvatikar A.G.: This research paper presents Automatic seed sowing and moisture control using ARM controller. The agriculture robot developed in this project performs seed sowing and sensing the moisture content in the field and digging operation. It consists of soil moisture sensor, RS-232, DC Motors, chases wheels, ARM controller (LPC2148), funnel. The two wheels of robot are connected to the DC motors and other two wheels connected at the front without DC Motors. For proper growth of plants moisture has to be maintained. This is done by using soil moisture sensor (YL-38). Agriculture robot is started with giving the supply and input is given from the computer. According to this commands robot moves left right forward or reverse direction. When it moving in forward direction it moves for 3 seconds then servomotor activates and the seed falls on the ground. Thus, the seed sowing is done. UART is used for sending the data after completion of silt soil motion sensor is used. The Robot is designed for movement in forward, reverse, right, and left so the entire field can be covered. The cost for the robot is less. It is also that 21% of time reduced for seeds sowing. Soil moisture content in the soil is measured so as per the requirement farmer has to supply the water in the field. Thus, the water can be saved.

Deshmukh B. et al.: This research paper presents fabrication and implementation of automatic seed sowing machine. The designed Hindi machine with an objective as to cultivate different kinds of seed with different distance, and when the system reaches the age of the field we can change the direction with the help of remote switches. The working principle of this machine is simple as, battery operated DC motor is used to transmit the rotary motion to the shaft with the help of chain drive, and there is another connection of sprocket and change to the seed meter for the rotary motion. When the farmer puts it into the upper the seeds drops into the speed meter which is controlled by the rack and pinion arrangement mounted on the assembly. As the seed meter rotate, seed drop in the pipe, which is connected to the furrow opener for the seeding; there is furrow closer for covering the seeds by soil. There is another connection of DC motor connected to power and worm gear for steering mechanism connection of front wheel which is guided

by microcontroller unit with the help of bluetooth device via mobile phone. The approximate showing capacity of machine is found to be 12 kg/hr. The assembly is developed for cultivating loud land automatically that is less power is required. the blocking of seed problem is eliminated with the help of water pressure. So, this model increases the efficiency and accuracy. The system also detects obstacles present in the path of the vehicle by infrared sensors.

Singh A. K. et al.: This research paper presents the design and development of automatic solar powered digging, seed sowing and dripping machine. this mechanism involves the use of solar panel to capture the solar radiation simultaneously convert it into the electrical energy for further storage. Electrical energy stored charges for 12-volt battery, which in turn provides the required input power to two Mount DC motors, which are fixed to each of the tires of the wheel. The power is transferred to the microcontroller setup, which transfer it to the motors thus carrying out the motion of the wheels. Two 6" cast iron plough which is attached to the front end of the arrangement, which makes a continuous grows on the ground surface creating a path for the seeds to be sown. This vehicle has a water dripping mechanism, which kind drop water and insect inside when required. The dripping system, when activated, drops the water mixed along with insecticide from the tank provided on the robot. This machine reduces fatigue and time involved in this seed plantation time, reduces the seat spacing and maintenance efficient distribution of seeds on the ground surface, uses of a remote-control setup make it easier for the farmer.

Kaur T. et al.: This research paper presents the design and development of calibration unit for precision planter. This equipment designed with the components as, calibration unit setup with pair of gear tooth sensors being attached to roller and SMU unit for RPM calculation, Embedded hardware, computer software. And to make this vehicle solar power so that it can be charged using solar energy. Keyhole design consists of microcontroller, drive chain, rotary encoder, keypad, solar panels and servo motor.

Mudalagi S.: This research paper presents the automatic solar powered seed sowing machine. They designed this equipment with an objective as, to design and fabricate a smart seed sowing robot vehicle which can automatically sow seeds in the field based on variable pitch which is given as input by the farmers using the keypad present on the robot. The working of machine is as the farmer initially inputs the pitch using the numerical keypad provided on the robot at which the robot is expected to sow the seed and initiate the sowing sequence. The data input of the farmer is provided to the microcontroller mounted in the

robot which possesses the input data. Depending on the pitch the robot then moves through the distance specified in the pitch. The distance is calculated using rotary encoders. After that when the robot covers the respective distance, the robot stop to sow the seed. When the robot stops the microcontroller signals the seed sowing mechanism to sow the seed at a required depth. Finally, the entire system is solar powered which helps farmer to concentrate on agriculture without the need to remember to charge this robot. We can conclude that the present version of vehicle as well as future version can be effectively used for increasing the efficiency of Indian agriculture as well as to reduce physical burden on the farmer.

Shinde T. A. et al.: This research paper presents this design and development of automatic seed sowing machine. Hindi design the drive shaft directly controls the seed metering mechanism which eliminates completely attachments such as pulleys belts system, thereby eliminating complexities which increase the cost and the increasing efficiency at a highly reduced cost which is the focus of this project work. In The Seed sowing machine system, they are used battery powered wheels and DC motor in built in these wheels. Received storage tanks are used when the seed RMP it detects the level of storage seed and indicate the alarm. When the any obstacles come in the front of machine or divert the path the seed sowing machine can detect this obstacle very easily. Which complete rotation of rotating will there is seed fall from this seat drum and the seed plantation process can take place smoothly as well as without wastage of seed. The end of system machine reached and it create an alarm. This machine consists of ultrasonic sensor interface with Atmega 328 of seed sowing system.

3. Conclusion

Innovative seed sowing equipment's has remarkable influence in agriculture. By using this innovative project of seed sowing equipment's we can save more time required for sowing process and also it reduces lots of labour cost. After comparing the different methods of seed sowing equipment's with the traditional methods how we conclude that the seed sowing machine can

1. Maintain the row spacing and control seed rate
2. Control the seed depth and proper utilization of seed can be done with less loss.
3. Uniform placement of seed in rope with required distance.
4. Proper compaction over the seed is provided
5. Requirement of labor also decreased.
6. Save energy, money and time of a farmer.

Table 1

Sr. No.	Parameters	Manual	Animal drawn	Tractor drawn or self-Propelled
1	Power transmission	Chain and sprocket	Chain and sprocket	Chain and sprocket
2	Man power	More	Moderate	Less
3	Time period	More	Less	Less
4	Sowing technique	Manual	Automatic	Automatic
5	Distance between seeds	Not fixed	Fixed	Fixed
6	Wastage of seed	Moderate	Moderate	Less
7	Required energy	High	Moderate	High
8	Pollution	No	No	More
9	Alarm and display	No	No	Yes
10	Cost of machine	Less	Moderate	Moderate

7. Application of pesticide can also do simultaneously on field.

8. Multiple operation can be done complete simultaneously.

Above are the advantages of seed sowing equipments when we compared it with traditional methods. But when we compared the manual seed sowing machine with Animal drawn seed sowing equipment and self-Propelled seed sowing machine. Seed sowing machine we find the following results.

As we can see the population of India is increasing day by day. And cropping system of India is extensive type i.e., from small piece of land we have higher productivity. And the whole productivity or income of farmers depends on sowing practice adapted. And to overcome this problems farmer must need automatically operated as they don't know how to operate the machine. And now a day due to increasing pollution and insufficiency of fuel we can adapt the solar power for the agricultural operation.

From the above comparison we can conclude that tractor Drawn or self-propelled seed sowing equipment is best to adapt the farmers.

4. Recommendation

For future design of seed sowing the machine following points we can consider while designing.

- Machine should be automatically operated and it should not be designed with mechanical chain transmission system. Instead of that we can use sensor-based PLC and rotary encoder. So that their will requirement of skills to operate the machine it works automatically.
- The machine should have to operate on the solar power.
- The material used for the design should not be heavy and it should be rust free.
- Tyne should be adjustable so that we can be used to maintain the row to row spacing for different types of crops.
- We should have to provide the seed covering flapper so seed can cover properly that will increase the germination percentage.

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