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Pneumatic Operated Seed Sowing Machine

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Abstract: ***India's economic security continues to be predicted upon the agricultural sector. Agriculture supports 58% of Indian population. To meet the rapid growth and increased food demand automation is necessary in farms. By using conventional seed sowing methods, the seed wastage is enormous. By implementing our seed sowing system, the wastage is reduced up to 90%. By introducing automation to this process has become convenient. The biggest benefit of automation is that it saves labour, however, it is also used to save energy and materials & to improve quality, accuracy and precision. Some crops are required to grow saplings first before planting them in farm. These saplings are grown in a nursery. We've designed this system for nursery and poly house. The present review provides brief information about the various types of innovations done in seed sowing equipment. The basic objective of sowing operation is to put the seed and fertilizer in rows at desired depth and seed to seed spacing, cover the seeds with soil and provide proper compaction over the seed. The recommended row to row spacing, seed rate, seed to seed spacing and depth of seed placement vary from crop to crop and for different agro-climatic conditions to achieve optimum yields. Seed sowing devices plays a wide role in agriculture field.***
Keywords: Saplings, Polyhouse, Seed spacing, Seed rate, Seed depth, Agro-climatic.

I. INTRODUCTION

Agriculture has been the backbone of the Indian economy and it will continue to remain so for a long time. It has to support almost 17 percent of world population from 2.3 percent of world geographical area and 4.2 percent of world's water resources.
The present cropping intensity of 137 percent has registered an increase of only 26 percent since 1950-51. The net sown area is 142 Mha. The basic objective of sowing operation is to put the seed and fertilizer in rows at desired depth and spacing, cover the seeds with soil and provide proper compaction over the seed. The recommended row to row spacing, seed rate, seed to seed spacing and depth of seed placement vary from crop to crop and for different agricultural and climatic conditions to achieve optimum yields and an efficient sowing machine should attempt to fulfill these requirements. In addition, saving in cost of operation time, labor and energy are other advantages to be derived from use of improved machinery for such operations. A traditional method of seed sowing has many disadvantages. This is about introducing automation system which will be majorly used in nursery.

A. Problem Statement

With current manual seed sowing used problems faced are-
1) Large human labour is engaged.
2) Eats a lot of time for sowing 1-2 seeds in each cavity.
3) Due to high amount of time involved productivity is hampered.
Therefore, vacuum seed sowing machine allows sowing of seeds in much simplified manner and less time.

B. Objective

The basic aim of this project is to study and know the research gap between the use of traditional method and the automation system in India, along with the parameter related to the manual seed sowing. This includes benefits and requirements in order to achieve higher productivity and yield. Hence, we aim to study about vaccum seed sower, there benefits, requirements and help to popularize it amongst the people especially amongst small scale labors in our country so as to minimize cost of production, time and have better quality of plantation.

C. Necessity

India is the most developing country all over the world, it is very important to improve in each and every field. Agriculture is the major business in India and hence there is requirement to develop it. For that we have worked on the plantation process of rice, tomatoes, onions and we find that the manual rice transplantation process is slow and also the cost is more. Hence it is very important to find some automation in this process so that the plantation will be more effective and economical.

D. Present Situation

The present situation of the plant nursery and their way of working are discussed as below.

Nursery is the part of agriculture. So as in farm the feeding of all parts of seeds are not feasible because in the farm proper environment will not present, the wastage of seeds are possible. Also the chances of falling of unnecessary seeds during sowing are possible. Hence in the nursery by maintaining proper environment required for growing of plants care is taken. After growing of plants those plants are taken and then they are used to plant in farm. For this the plants are produced by using a tray which has number of holes as per the requirements in those whole the coco-peat powder is used to fill half of the hole and is followed by the seeds in those holes. Again the powder is filled. As per requirements of customers the nursery produces different kinds of plants. Now a days in Nursery seed feeding is done manually which effects on productivity of the Nursery. The seed feeding activity takes more time which results in less plantations of the seeds.

E. Methodology

The plantation of seeds is being done by manually with the help of labor in the Nursery. The sizes of seeds are very small. What is exactly is being done in nursery to complete the plantation of seed is that first in the box which has number of holes near about 104. The time required for this process is 3 to 4 minutes for 9 to 10 boxes. Then after completing all the process the tray is kept in proper environment and water is being fed when required. The sufficient height of plants in the tray will grow then it is supplied to customers.

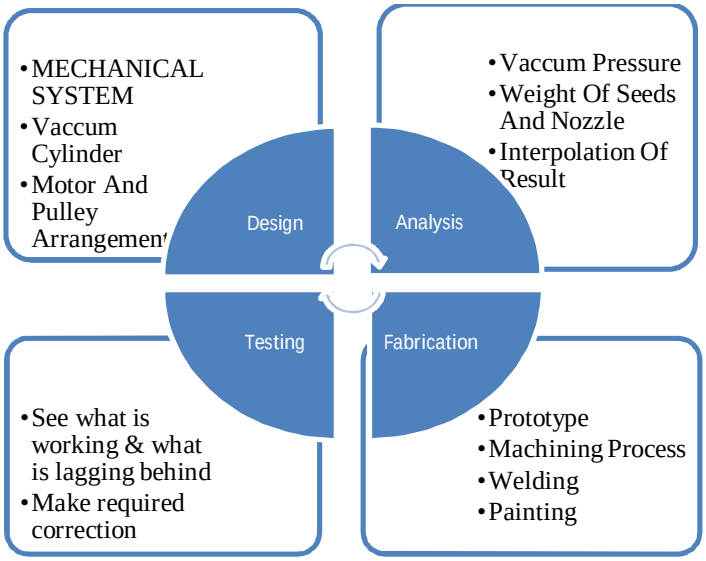

Fig.1.5.1 Methodology

II. LITERATURE SURVEY

A.O.Hannure, S.P.Kshirsagar, V.S.Kodam, O.N.Patange & V.S.Nakod (2016) They found that The mechanism used in automatic seed feeder is reduces manual efforts and also reduces the time required for seed feeding. This results in the increase rate of plantation. This system is partially working. [1]

Atul B. Ekad, Sonal N. Salunke, Sunaina B. Gawde, Archana K. Said, Prof. G. L. Suryawanshi (2016) found that as the existing problem regarding the availability of machine at low cost, workers availability and wastage of seeds in agriculture sector are eliminated with the help of Automatic seed sowing machine. Seed picking and placing of seed at the proper seedling tray is achieved with this machine.[2]

Prerana Pagar, Purva Shinde, Shardul Kale, Sunny Patil, Prof. A. M. Ekatpure (2017) found that Problem eliminated with help of automatic seed sowing machine are as following its cost is less, availability of workers and wastage of seeds is avoided. Exact pick and place mechanism allow seed to drop in proper seedling tray. Space required for automatic seed sowing machine is less hence can be easily placed anywhere accurate and precise positing of seeds in tray allow proper growth of plant. Variety of seeds can be sowed with this system by just changing the nozzles.[3]

Sushant Patil, Vikas Jadhav, Nilesh Kekare, Sanket Chavan, Swapnil Jadhav, Prof. S.S.Methe. (2018) found that Traditional seed sowing has some limitations and to overcome this, innovative seed sowing equipment's are used. It can save more time required for seeding process. This system has been developed for the sowing of seeds in an automatic way. As the existing problem regarding the availability of machine at low cost, workers availability and wastage of seeds in agriculture sector are eliminated with the help of Automatic seed sowing machine.[4]

III. DESIGN CONSIDERATION

A. Mechanical System

1) *Bernoulli's Principle:* Bernoulli's principle can be applied to various types of fluid flow, resulting in various forms of Bernoulli's equation; there are different forms of Bernoulli's equation for different types of flow. The simple form of Bernoulli's equation is valid for incompressible flows (e.g. most liquid flows and gases moving at low Mach number). More advanced forms may be applied to compressible flows at higher Mach numbers (see the derivations of the Bernoulli equation). Bernoulli's principle can be derived from the principle of conservation of energy. This states that, in a steady flow, the sum of all forms of energy in a fluid along a streamline is the same at all points on that streamline. This requires that the sum of kinetic energy, potential energy and internal energy remains constant. Thus an increase in the speed of the fluid – implying an increase in both its dynamic pressure and kinetic energy – occurs with a simultaneous decrease in (the sum of) its static pressure, potential energy and internal energy. If the fluid is flowing out of a reservoir, the sum of all forms of energy is the same on all streamlines because in a reservoir the energy per unit volume (the sum of pressure and gravitational potential $\rho g h$) is the same everywhere. Bernoulli's principle can also be derived directly from Isaac Newton's Second Law of Motion. If a small volume of fluid is flowing horizontally from a region of high pressure to a region of low pressure, then there is more pressure behind than in front. This gives a net force on the volume, accelerating it along the streamline

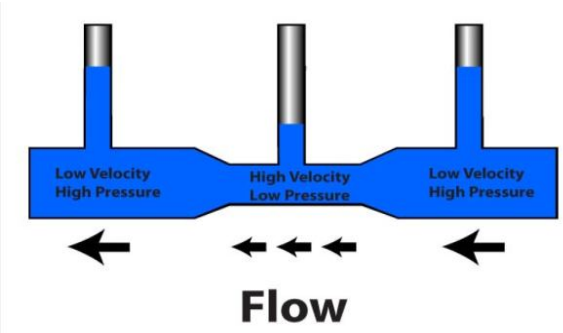

Fig.3.1: Bernoulli's Principal of fluid flow

Vacuum pump works on the Bernoulli's principle. Due to formation of vacuum in pump seed gets sucked through nozzle. Entry of seed in nozzle is avoided by proper selection of nozzle. As nozzle is selected in such a way that nozzle diameter is less than seed diameter.

IV. CONSTRUCTION AND WORKING

The vaccum seed sowing machine consists of basic frame on which various mechanical standard components are mounted viz. vaccum pump,5/2 solenoid operated DCV, stepper motor, pneumatic cylinder pulleys with guide bar and rubber wire. The portray is placed on the ground under the assembly. There are two pulleys (one made up of stainless steel and other is an idler pulley made up of nylon) which are connected using rubber wire. The injector assembly has pneumatic cylinder which is welded to the plate that contains seven nozzles. This assembly is made to slide on the two guide bars with the help of linear bush. Also, the extreme position of this assembly is exactly above the storing tray. Vaccum pump and DCV are bolted on either side of frame. A compressor gives the motive power for the operation of the system. The cylinder movement is controlled by the compressor. The extreme position of the injector assembly is obtained by the setting of the guide ways. Initially at the starting position the cylinder is retracting. When the signal is given by the solenoid operated DCV, the cylinder extends. The vertical movement is controlled by the cylinder and the horizontal movement is controlled with the help of the stepper motor. This extension of the cylinder gives forward motion to the plate on which the nozzle are mounted. At this position the vaccum pump is started which creates vacuum and the seeds in the storing tray

are sucked in the nozzles. The cylinder then retracts. The horizontal forward motion is created by the pulleys which are connected to the stepper motor. After reaching the first-row cavity of portray the cylinder extends and the suction is disabled and the seeds are placed in the portray. This process is followed by each and every row cavity and portray is filled with the seeds. The entire positioning of the setup is programmed using the electronic system.

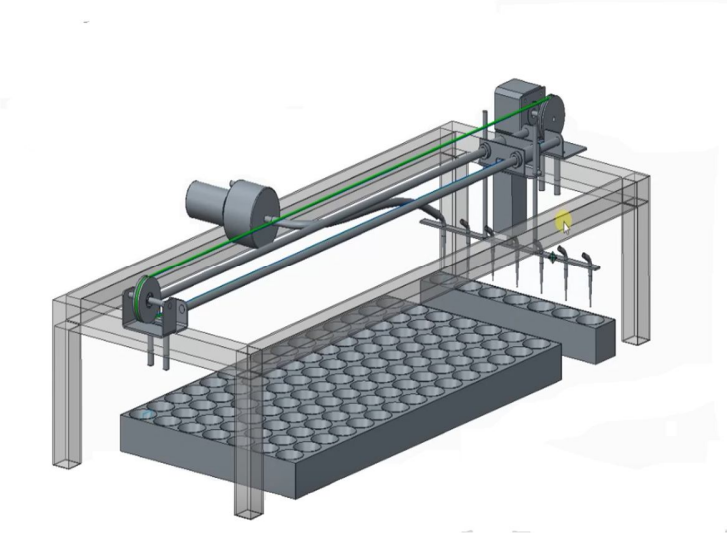

Fig.4.1: Assembly of vaccum seed sowing machine

V. READINGS

A. Manual Time

Manual time for sowing seeds	5 – 6 minutes depending upon the skill and will of labour

B. Time Taken By Pneumatic Operated Seed Sowing Machine

Time taken by pneumatic operated seed sowing machine	1	2 min 25 sec 76 ms
	2	2 min 25 sec 70 ms
	3	2 min 25 sec 69 ms
	4	2 min 25 sec 80 ms
	5	2 min 25 sec 74 ms

C. Holes Which Had 2 Or More Seeds Or No Seeds

Method of sowing	Sr no	No of holes	Error %	Average %
By manual way	1	10 holes	12.9%	12.384%
	2	08 holes	10.32%	
	3	11 holes	14.19%	
	4	10 holes	12.9%	
	5	09 holes	11.61%	
By pneumatic operated seed sowing machine	1	0 hole	0%	0.774%
	2	1 hole	1.29%	
	3	0 hole	0%	
	4	1 hole	1.29%	
	5	1 hole	1.29%	

VI. RESULT

A. Time taken by manual operation: 5 -6 mins depending upon the skill and will of worker.
B. Time taken by using pneumatic operated seed sowing machine: 2 min 25 sec.
C. Error percentage in manual operation: 12.384%
D. Error percentage using seed sowing machine: 0.774%

VII. CONCLUSION

A. Traditional seed sowing has some limitations and to overcome this, innovative seed sowing equipment's are used. It can save more time required for seeding process.
B. This system has been developed for the sowing of seeds in an automatic way.
C. As the existing problem regarding the availability of machine at low cost, workers availability and wastage of seeds in agriculture sector are eliminated with the help of Automatic seed sowing machine.
D. Also, area consumed by Automatic seed sowing machine is very less that allows the machine to work easily. Precise placing of seed also helps in proper growth of plant.

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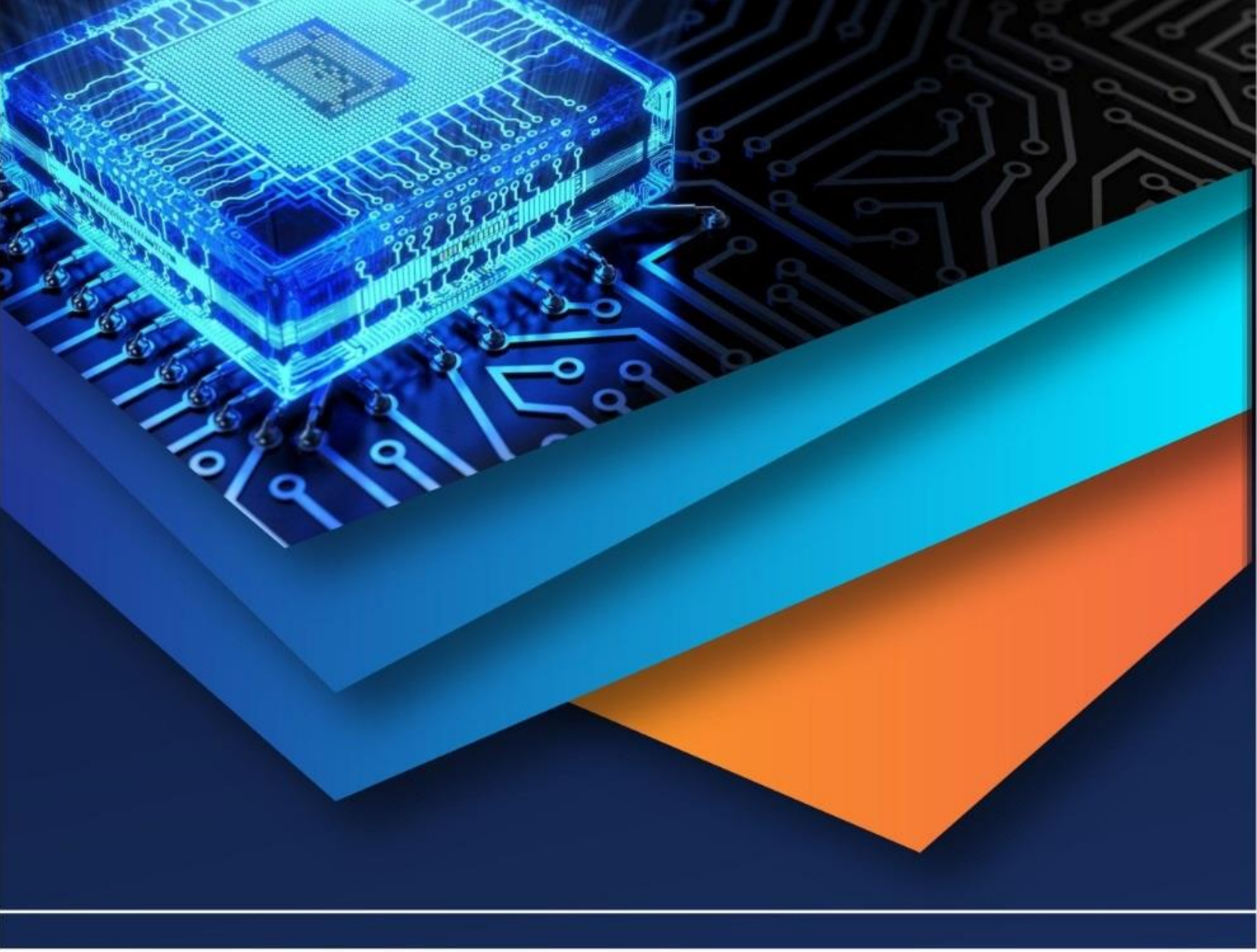

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