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REVIEW OF METHODS OF SEED SOWING AND CONCEPT OF MULTI-PURPOSE SEED SOWING MACHINE

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Abstract

Today's era is marching towards the rapid growth of all sectors including the agricultural sector. To meet the future food demands, the farmers have to implement the new techniques which will not affect the soil texture but will increase the overall crop production. This Paper deals with the various sowing methods used in India for seed sowing and fertilizer placement. The comparison between the traditional sowing method and the new proposed machine which can perform a number of simultaneous operations and has number of advantages. As day by day the labor availability becomes the great concern for the farmers and labor cost is more, this machine reduces the efforts and total cost of sowing the seeds and fertilizer placement.

1.0 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 paper is about the different types of methods of seed sowing and fertilizer placement in the soil and developing a multifunctional seed sowing machine which can perform simultaneous operations.

2.0 TYPES OF SOWING

The following are the three different types of seed sowing:-

1. Broadcasting: - A field is initially prepared with a plough to a series of linear cuts known as furrows. The field is then seeded by throwing the seeds over the field, a method known as manual broadcasting. The result was a field planted roughly in rows, but having a large number of plants. When the seeds are scattered randomly with the help of hand on the soil, the method is called broadcasting.
2. Dribbling: - Drill sowing and dribbling (making small holes in the ground for seeds) are better method of sowing the seeds. Once the seeds are put in the holes, they are then covered with the

soil. This saves time and labor and prevents the damage of seeds by birds.

3. Another method of sowing the seeds is with the help of a simple device consisting of bamboo tube with a funnel on it attached to a plough. As the plough moves over the field the tube attached to it leaves the seeds kept in the funnel at proper spacing and depth. The plough keeps making furrows in the soil in which the seeds are dropped by the seed drill.

The above sowing methods have the some disadvantages which are as follows:-

1. No control over the depth of seed placement.
2. No uniformity in the distribution of seed placement.
3. Loss of seeds.
4. No proper germination of seeds.
5. During khariff 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 emergence.

6. More labor requirement.
7. Time required for sowing is more.

2.1 Limitations of Conventional Sowing Methods

The following are the limitations of Existing Machine:-

1. The Weight of the Machine is more.
2. Available for Tractors drive.
3. No Arrangement for depth control.
4. No Arrangement for seed bed preparation.
5. Improper compaction of soil over furrows.
6. Adjustment of row spacing is improper.
7. The cost of machine is more.

An effective sowing method can yield good results for different variety of crops. An effective sowing method should maintain the proper row spacing, plant density, seed rate, plant population etc. When these parameters are controlled there is increase in the yield of different crops.

Some of the parameters which affect the yield of wheat, soyabean and chickpea are sowing date, plant population, plant

density, row spacing, plant spacing seed rate etc.

2.2 Need of Project

So there is the need to make a machine which can perform the following operations,

1. Seed bed preparation
2. Seed sowing
3. Fertilizer placement
4. Leveling of soil

3.0 LITERATURE REVIEW

Gupta et al [1] at Punjab observed significantly higher grain yield of wheat due to wider row spacing(22.5 cm) as compared to normal sowing(15 cm). Sharma and Mahendra singh [2] concluded that wide row spacing (23 cm) caused for significant enhancement in wheat grain yield (5535 kg/ha) than normal sowing of 15 cm (5418 kg/ha). This was attributed to increase number grains per spike. Uttam and Das [3] concluded that at Kanpur under rain fed condition, wider row spacing(25 cm) recorded higher plant height, ear length, ear weight, number of grains per ear, 1000

grain weight and eventually grain yield(16.65 q/ha) of wheat as compared to 20 cm row spacing (15.01 kg/ha).

Umed Ali Soomro et al. [4] in Pakistan has evaluated three sowing methods and seed rate in a four replicated RCBD method and concluded that drilling method of sowing at seed rate 125 kg/ha is optimal for yield and quality of wheat grains, because the said sowing method and seed rate distribute seed uniformly and desired depth which provide appropriate depth for seed germination and crop establishment.

A. U. Malik [5] conducted the field experiment to evaluate the effect of different seed rates on different sowing dates to suggest the appropriate seed rate of wheat for different sowing dates and suggested the farmers that wheat should be preferably sown on 15 November with seed rate of 125 kg/ha for better production.

N. Iqbal [6] studied the effect of seed rate and row spacing on yield and yield components of wheat and concluded that seed rate of 150 kg/ha performed better for late sowing of wheat up to 28 November. Among row spacing 22.5 cm row spacing

produced higher grain yield as compared to 11.25 and 15 cm row spacing.

Mohammed Jamil rajput et al [7] studied the effect of row and plant spacing on yield and yield components in soyabean and concluded that the combination of 45 cm row spacing and 20 cm plant spacing gave the best results.

The Harrow is one of the important agricultural equipment which is used in the fields of agriculture for seed bed preparation and weed control. This is used before the seeds are sown in the field. This helps in the leveling of the soil and seeds can be sown in the prepare bed easily. This preparation also reduces the draft requirement for seed sowing. The harrows are also used to control the weeds. These weeds are unnecessary in the agriculture field.

When the furrows are open in the field and seeds and fertilizers are properly placed in the furrows there is the need to close the furrows so as to prevent the damage of seeds from humans, animals and birds.

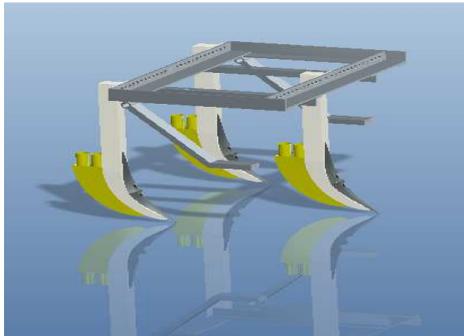
4.0 PARTS OF THE SOWING MACHINES

The sowing machine is available in market do not meet the requirements of future and has to be redesigned and tested for actual application. CAD package like PROE is used to design the conceptual model of new sowing machine. Some important parts of machines are highlighted below.

4.1 Furrow Assembly

Seeds are broadcasted on the soil which results in the loss and damage of the seeds. As the cost of seeds is more and cannot be affordable for the farmers so there is the need for the proper placement of seeds in the soil. The shovel type of furrow opener is used for the furrow opening. The furrow assembly consists of:-

1. Shank
2. Tube holder
3. Tyne
4. Tubes for seed and fertilizer



4.2 Types of Furrow Openers

The design of furrow openers of seed drills varies to suit the soil conditions of particular region. Most of the seed cum fertilizer drills are provided with pointed tool to form a narrow slit in the soil for seed deposition.

1. Shovel type furrow opener
2. Pointed bar type furrow opener
3. Shoe type furrow opener

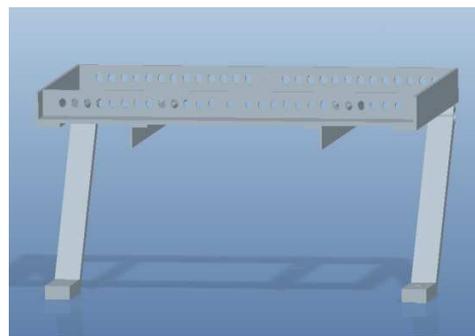
Srivastava [8] evaluated different types of furrow openers of bullock operated seed cum fertilizer drill in the black soils. The study was conducted on the basis of penetration ability of furrow openers, non-clogging of seed a fertilizer in boots, on the amount of soil disturbance and draft. It was reported that the shoe type furrow opener gives the best performance.

Dransfield et al. [9] reported that rake angle of furrow opener was proportional to the force on it. They found that both the horizontal and vertical forces increased with increase in rake angles.

Siemens et al [10] concluded analytically, as well as from experimental analysis that a rake angle of furrow opener of 25° gave minimum draft.

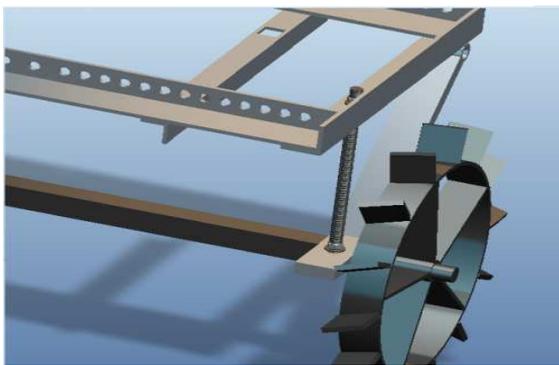
4.3 Base-Frame

The base frame is one of the important parts of the seed cum fertilizer drill. The base frame of seed drill is given 25 number holes and the distance between the holes is 25 mm. The Base frame is made of MS Angle 50 X 50X 5 mm. The Base frame maintains the proper row spacing.



4.4 Depth Control Arrangement

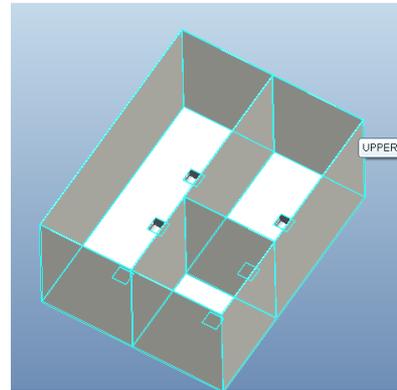
The proper depth of seed and fertilizer needs to be maintained for the proper germination of the seeds. The depth of seed and fertilizer is controlled with the help of a stud on which four numbers of Nuts are given to control the depth. The seeds are to be sown at a depth of 2-3 cm and fertilizer to be placed at a depth of 3-4 cm. The depth control arrangement controls the depth of the seed and fertilizer.



4.5 Seed Box

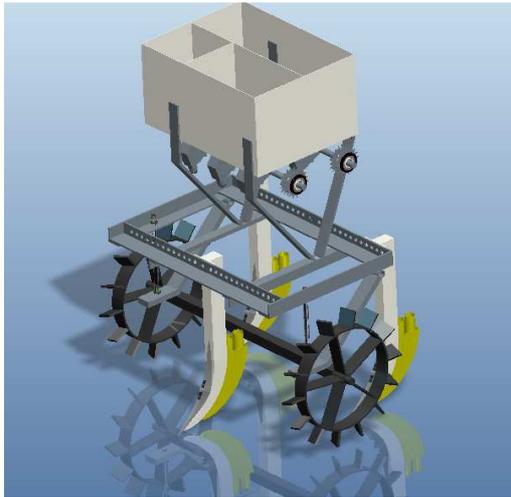
The seed box is made of HR sheet 2 mm thick. The box is designed on the basis of area of land. The box was located above the base frame supporting the furrow openers and transport cum depth control beam. A partition is provided along the length of the box to separate seed and fertilizer. The seed partition is again given one more

partition so that mixed cropping can be done.



4.6 Complete Assembly

The complete seed cum fertilizer assembly is made using PRO-Engineer software with additional mixed cropping arrangement, depth control arrangement, row spacing arrangement. Two Peg wheels are given so that the wheels does not slip on the land as the seed metering device works on the rotation of the ground wheels and maintain the plant spacing and control the plant density.



5.0 WORKING

1. Put the seeds and fertilizer in the box as per its capacity.
2. When a pair of bull pulls the machine, the motion is transmitted to the fluted roller seed cup from sprocket at ground wheel through the chain.
3. The fluted roller seed cup is having the arrangement of seed cut-off and controlling flap to control the amount of seeds and fertilizers.
4. The Shovel type furrow openers open the furrows in the soil.
5. The seeds and fertilizers will get placed in the furrows through the guide pipes.

6. In this way the seeds and fertilizers are placed in the furrows at proper distance and this machine maintains the proper row spacing.

6.0 ADVANTAGES OF PROPOSED MACHINE

The following are the advantages of the proposed machine:-

1. It maintains the proper row spacing.
2. The seeds and fertilizers can be placed at proper depth.
3. The angle of inclination of the seed and fertilizer box can be adjusted according to the height of the bull.
4. Seed rate can be controlled.
5. Many seeds can be sown by this machine.
6. Mixed cropping can be easily done.
7. The loss and damage of seeds is controlled by this machine.

7.0 CONCLUSION

Hence after comparing the different method of seed sowing and limitations of

the existing machine, it is concluded that the multi-purpose seed sowing machine can

1. Maintain row spacing and controls seed and fertilizer rate.
2. Control the seed and fertilizer depth and proper utilization of seeds and fertilizers can be done with less loss.
3. Perform the various simultaneous operations and hence saves labor requirement, labor cost, labor time, total cost of saving and can be affordable for the farmers.

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