# Design and Fabrication of Seed Sowing Machine

Vaibhav A. Dhopte[1], Shivam G. Rade[2], Sagar P. Surkar[3], Vinit U. Patil[4], Tejas D. Borkar[5]
Asst. Prof. N.U.Kakde[6]

[1,2,3,4,5]*Student, Department of Mechanical Engi., Dr. Babasaheb Ambedkar College Of Engineering & Research, Nagpur, Maharashtra, India*
[6]*Professor, Department of Mechanical Engi., Dr. Babasaheb Ambedkar College Of Engineering & Research, Nagpur, Maharashtra, India*

## ABSTRACT

*In this modern era research in the agricultural field is going on. Manual method of seed planting, results in low seed placement, spacing efficiencies and serious back ache for the farmer which limits the size of field that can be planted. The cost price of imported planters has gone beyond the purchasing power of most of our farmers. Pleasant farmers can do much to increase food production especially grains, if drudgery can be reduced or totally removed from their planting operations. To achieve the best performance from a seed planter, the above limits are to be optimized by proper design and selection of the components required on the machine to suit the needs of crops. This project work focused on the design and fabrication of a manually operated planter sowing for different crop seed that is cheap, easily affordable by the rural farmers, easy to maintain and less laborious to use. The basic requirements for small scale cropping machines are, they should be suitable for small farms, simple in design and technology and versatile for use in different farm operations. A manually operated template row planter was designed and developed to improve planting efficiency and reduce drudgery involved in manual planting method.*

**KEYWORDS**: *Seed planting, efficiency, drudgery, etc*

## I. INTRODUCTION

The history of **Agriculture in India** dates back to Indus Valley Civilization and even before that in some places of Southern India. India ranks second worldwide in farm outputs. As per 2019, agriculture employed more than 50% of the Indian work force and contributed 17–18% to country's GDP. The Indian food industry is poised for huge growth, increasing its contribution to world food trade every year due to its immense potential for value addition, particularly within the food processing industry. Mechanization in agriculture holds the key for sustainable development in the terms of increasing the production by timely farm operations, reducing losses, reducing the cost of operations by ensuring better management of costly inputs and enhancing the productivity of natural resources besides it helps in reducing drudgery in farm operations. Mechanized agricultural practices and operations have been adopted by the farming community at varying level of adoption, which represents the varying scenario across different regions in the country. Conventional seed sowing method is available but it have lot of disadvantages like no control over the depth of seed placement, no uniformity in the distribution of seed placement, loss of seeds, no proper germination of seeds. Conventional seed sowing machines are not suitable for ridge and furrow method and large quantity of seed is necessary. In this study focus is on to reduce the disadvantages of manual and conventional method and develop a seed planting machine which is suitable to plant seed at specific interval and also useful to plant seed in ridge and furrow method.

## II. METHODOLOGY

**Concept Of Project:**

The sowing operation is to put the seed and in rows at desired depth and seed to seed spacing, cover the seeds with soil and provide proper compaction over the seed.

**Steps Taken Out For Selecting The Project:**

1. The first step is to go to the farmers and find the problems faced by them.
2. The second step is to choose a problem.
3. The third step is to visit to agriculture firms.

4. The fourth step is to Analyze the problem& their solution.
5. The fifth step is the selection of materials.
6. The sixth step is to find which mechanism is to suitable in lowest cost.
7. The seventh step is to find all components we require in proper dimension.
8. The eight step to start fabrication.
9. The last step is the testing of machine

Crop planting operations may involve placing seeds or tubers (such as potatoes) in the soil at a predetermined depth, random scattering or dropping of seeds on the surface (broadcasting), or setting plants in the soil (transplanting). Machines that place the seed in the soil and cover it in the same operation create definite rows. If the rows or planting beds are spaced far enough apart to permit operating ground-engaging tools or other machinery between them for inter tilling or other cultural operations, the resulting practice is called row-crop planting; otherwise, it is considered to be solid planting. Thus, grain drilled in rows 15 to 36 cm (6 to 14 in) apart is a solid planting, whereas sugar beets, with rows commonly 51 cm (20 in) apart, are grown as a row crop

## III. MODELING AND ANALYSIS

**The main parts of the project are as follows:**

i. Chain and sprocket mechanism
ii. Wheels (Material – M.S.)
iii. Seed impeller ( Material – Plastic)
iv. Hopper ( Material – Plastic )

**Calculation:**

**1) Pulling Force**

F = μ (coefficient of friction) × W (self weight)
μ = 0.55 for Clay Soil (as per research paper)
W = 147 N (The shaft is subjected to 15 kg of load)
F = 0.55×147
= 81.4 N

**Total Force** (F1) = W (self weight) + F
= 147 + 81.4
= 228.4 N

Maximum force applied by Human Being is 300 N. So any human being can easily pull machine.

**2) Design of Shaft:**


**2.1 Bending Moment**

M= WL/4
= 147*560/4
= 20580 N.mm

**2.2 Twisting Moment**

T = F1R
= 228.4 * 300
= 68520 N.mm

**2.3 Ultimate tensile stress** = Sut = 525 N/ $mm^2$

Permissible stress is given by Applying A.S.M.E code
τper = 0.18 × Sut
τper = 0.18 × 525
τper = 94.86 N/ $mm^2$

(As per the standard permissible tensile stress is 200 Mpa, Hence design is safe.)

A.S.M.E. code for Shaft design is given by,

$(\pi/16) \times d^3 \times \tau per = \sqrt{(KbM)^2 + (KtT)^2}$

$(\pi/16) \times d^3 \times 94.86 = \sqrt{(1.5*20580)^2 + (1*68520)^2}$

d = 15.92 mm

**d = 16 mm** (as per standard dia. available)

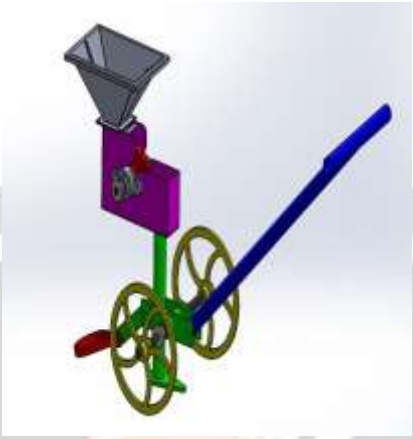

**Figure: 1** 3D view of model**.**

**Working:**

When the equipment is pull forward by using handles, the driving wheel rotates and the pinion is mounted on the axle of the wheel is start to rotate and its rotation is then transferred to the pinion through the chain drive. The chain drive another pinion mounted in seeding mechanism axle and seeding wheel is mounted for axel then rotating seeding wheel. The delivery is connected to the pipe carrying the nozzles. Improved seed-cum-seed drills are provided with seed and seed boxes, metering mechanism, furrow openers, covering devices, frame, ground drive system and controls for variation of seed

## IV. RESULTS

**Table 1: Comparison 3 types of sowing methods**

| Sr. No. | Parameter | Ox Operated | Manual | Tractor |
|---|---|---|---|---|
| **1** | Man Power | Less | More | Less |
| **2** | Time Required | Moderate | More | Less |
| **3** | Sowing Technique | Automatically | Manually | Automatically |
| **4** | Distance Between Seed | Fixed | Not Fixed | Fixed |
| **5** | Wastage of Seed | Less | Moderate | Less |
| **6** | Pollution | No | No | More |
| **7** | Cost of Machine | Moderate | Less | Very High |

**Table 2: Cost Comparison**

| Sr. No. | Parameters | Conventional Method | Seed Sowing Machine | Tractor Mounted Sowing Machine |
|---|---|---|---|---|
| **1** | Cost per Acre | Rs. 600-700/- | Rs. 100-150/- | Rs. 900-1000/- |
| **2** | Time per Acre | 3hrs | 2 hrs | 0.5 Hrs |
| **3** | No. of Labours | 6-10 | 1 | 1 |

By taking trials on the field of our machine and gathering all information of other possible methods we have got following results.

1) The goal was to build a system which is efficient to perform a various applications with the help of Manually Operated Seed Sowing Machine. With the scope of improvement, the project is done to fulfill the demands of agricultural applications. The main objective of our project was to fulfill the need of farmers suffering from the problems of increasing cost of Fertilization, labor cost and availability as it is operated by single person. With this machine, percentage reduction in time required for Sowing was observed to be 50%. And reduction in labor cost as compared to conventional method was 80%.
2) It has solved the problem of traditional way of Sowing. Since the capital cost is essential factor while selecting type of equipment for farming. This machine has very less capital cost as compared to other type of machines and also principal advantages of having Eco friendliness and easy troubleshooting. By undergoing all this discussion and undergoing all the factors associated with Sowing, this machine will be great boon for the Indian Agriculture.

**Advantages:**

1) Less maintenance cost
2) Dependency on labour also decreased. Also it saves time of sowing.
3) Uniform placement of seeds in row with required distance.
4) Proper compaction over the seeds is provided.
5) Easy to operate, as no skilled operator required
6) Easy to assemble
7) Improvement in planting efficiency

**Disadvantages:**

1) Difficult to operate in moist condition.
2) Machine requires more effort in hard soil.
3) Operating force varies from person to person.

## V. CONCLUSION

Current methods of sowing of cotton seed, cultivation of crops and some traditional existing equipment were studied. Also some new technology aspects implemented. Overall the project was very enriching in terms of technical fabrication and design process along with mechanical knowledge. The knowledge gained during progress of project by solving and understanding the complexities, concepts, etc helps in professional life. At the start of this project, first priority is gives to research over the methods of sowing the cotton-seeds and to study on existing equipment for sowing process. And then move towards the requirement like frame, wheels, hopper, seed container, seed metering device, etc. and their assembly. After forming groups various designs comes in front of but best suitable design chosen which is easy to fabricate and efficient by costly to small farmers.

**Scope:**

[1] After installation and establishing successful working of the machine, it is proposed to concentrate on value engineering to increase the future value of the machine in all aspects.

[2] Presently, full focus is given only to design modification in seed metering mechanism for the benefit of the small farmers.

[3] At present, seed metering mechanism is used for sowing different types of seeds with single metering mechanism.

[4] We can use separate metering mechanism for every seeds. Thus, we can increase the value of the machine in future.

## VI. REFERENCES

[1] A.R. Kyada & D. B Patel,DEC 2014 "Design And Development Of Manually Operated Seed Planter Machine" of Lecture 5th International & 26th All India Manufacturing Technology, Design and Research Conference (AIMTDR 2014) , IIT Guwahati, Assam, India. Vol 2.

[2] D. Ramesh , H.P. Girishkumar,JULY 2014" Agriculture Seed Sowing Equipments: A Review" , ISSN N0.:2278-7798,Volume3.

[3] A.Kannan , K. Esakkiraja , S. Thimmarayan, JAN 2014 "Design And Modification Of Multipurpose Sowing Machine" VOL:2 ,ISSN (ONLINE): 2321-3051.

[4] Roshan V. Marode, P.Gajanan, and K.Swapnil ,OCT 2013 "Design & Implementation of Multiseed Sowing Machine", Vol : 2,No. 4, ISSN No.: 2278-0149, patented.

[5] A.Rohokale , 2004 "International journal of advanced agriculture system with proper seed spacing".

[6] B.Shivprasad, M. Ravishankara, B.Shoba.,2010 "Design And Implementation Of Seeding And Fertilizing Agriculture Robot" , Volume 1(3)190-213.\

[7] P. Bhargavi, Dr.S.Jyothi.,2011 "Soil Classification Using Data Mining Techniques : A Comparative Study", Vol:2,ISSN:2231- 5381(IJETT).

[8] Prof.C.H.Chavan, Mr.P.V.Karande., "Wireless Monitoring of Soil Moisture, Temperature & Humidity Using Zigbee in Agriculture", Vol:11,ISSN:2231:5381(IJETT).

[9] Prof. M.W. Andure, Rajiv Indani, Nikesh Jadhav, Vaibhav Kawde, Rahul Khamankar, 'Design and Fabrication of Manual Seed Sowing Machine with Fertilizer" International Journal for Research in Applied Science & Engineering Technology (IJRASET) ,Volume 6 Issue I, January 2018

[10] Prof. Mayuri Wandhare "Seed Sowing Fertilizer Drilling Machine" IJISET - International Journal of Innovative Science, Engineering & Technology, Vol. 3 Issue 4, April 2016

[11] Ani, O. A., B. B. Uzoejinwa and N. F. Anochili (2016) design, construction and evaluation of a vertical plate maize seed planter for gardens and small holder farmers. Nigerian Journal of Technology (NIJOTECH) Vol. 35, No. 3, July 2016, pp. 647 – 655.

[12] D.Ramesh "Development Of Agriculture Seeding Equipment" International Journal Of Informative & Futuristic Research An Enlightening Online Open Access, Refereed & Indexed Journal Of Multidisciplinary Research Volume -1 Issue -10, June 2014.