

“DESIGN AND FABRICATION OF MUTIPURPOSE MANUALLY OPERATED SYSTEM FOR AGRICULTURE PURPOSE”

¹Saurabh R Thakre, ²Dr.V.B. Vaidya, ³Mrs. S.G. Bawane

¹M-tech Student, ² Assistant Professor, ³Assistant Professor

¹Department of Mechanical Engineering,

¹K.D.K. College of Engineering, Nagpur, India

Abstract - India is an agriculture based country in which, 70% of people depends on the outcome of farming. But if we observe that with increase in population the farm gets distributed among the family and because of this, farmer in India held averagely only two acre farm. Also economically, farmers are very poor due to which they are unable to purchase tractors and other costly equipments hence they use traditional method of farming. Basically, many farmers in India also use bullocks, horses and he-buffalo for farming operation. This will not satisfy need of energy requirement of the farming as compared to other countries in the world. In the farming process, often used conventional seeding operation takes more time and more labor. The seed feed rate is more 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.

So we are thinking that human and animal efforts can be replaced by some advance mechanization which will be suitable for small scale farmer from economical and effort point of view. So we are developing this equipment which will satisfy all this need and to solve labor problem.

Machines are designed for improving the productivity as well as performance. Now a day's world is moving towards rapid growth of all sectors including the agricultural sector. Agriculture is vital source of income of India. About 65-70 % of Indian population depends upon agriculture. So for fulfilling the future demands there is need of advancement in techniques and equipment's of farming at economic cost because in India every farmer can't afford tractor and other high cost sowing equipment's. Seed sowing and fertilizer placement is the main activity in farming. This paper deals with the various methods of seed sowing and fertilizer placement in India. Here is a comparison between traditional methods of seed sowing and newly designed machine which can perform simultaneous operations in less time and has several advantages. The depth at which seed should be sown and distance between seeds can be maintained by proper seed metering device because depth of seeding has great influence on crop yield. Farming process by using conventional methods takes more time and more labor for seed sowing and fertilizer placement. In today's era availability of labor is becoming great concern. This machine does the work with less effort and in less time so it reduces

cost of labor required for seed sowing and fertilizer placement.

1. INTRODUCTION

Agriculture is a vital source of income in India. The Indian economy is based on the Agriculture field and hence there is need of more advancement in the equipment used during the cultivation or during the process of farming. The process of farming includes the main stage as the seed sowing. Seed sowing process in traditional ways includes the bullock driven sowing equipment. Animals are considered to be the back bone of rural economy in India. Apart from the manual labor, the traditional cultivation in India was based on the use of animal power for 97.6 % of farmers (land owners) accounting for 77.2 percent of land holdings. As the Indian economy is based on the animals there is limit of their use in farming due to their efficiency.

Hence to increase their efficiency and ultimately improving the cultivation capacity we have to improve the bullock driven sowing machines or equipments and also the tractor driven equipments. Most of the planter can't achieve equidistance placement between crops causing the less production crops having lack of nutrient. According to researches, equidistance placement of plants or seed with proper environment gives maximum possible yield, quality, and uniformity of crops. The basic objective of seed sowing operations is to sow seed and fertilizer in rows and at desired depths considering different types of seed and their sizes. Hence there is need of inventions of such seed sowing machine and further improvement.

The Design and Fabrication of Advanced Seed Sowing Cum Fertilizer Drilling Machine is a basically seed sowing machine which is the modification of previous model. Bull or tractor is used to pull a machine. With modified machine we can sow the seeds but also the fertilizer. The modified seed sowing machine can sow seed at equidistance and with equal depth but again it is capable of sowing the fertilizer at equidistance and equal depth. The depth of sowing is controlled by the metering mechanism and the equidistance sowing is achieved by the gear mechanism which is run by chain drive driven by ground wheel. The machine is simple and contain less complicated mechanisms this makes the machine more efficient and beneficial to farmer.

Agriculture is the backbone of Indian economy and it will continue to remain for a long time. As India's population is growing so the demand for food will definitely increase for those better techniques of farming will require increasing production of crops. And for those better techniques of seed sowing and fertilizer placement requires. The basic objective of seed sowing is to place seed at desired depth and maintain proper spacing between seeds and cover it with soil for its yielding.

Seed sowing depth and seed to seed distance varies from crop to crop and different agricultural climate conditions. This paper is for designing such machine which should fulfill above requirements with relatively saving of time and labor cost. Conventional method has many disadvantages and if we talk about tractors and other advance sowing devices they are costly and not affordable to medium and small scale farmers. The machine we are designing and developing is multifunctional i.e. it will simultaneously sow the seed and place the fertilizers at desired depth. This machine can be used with either bull cart or mini tractor.

2. REVIEW OF DIFFERENT TYPE OF FARM MACHINE

2.1 ZERO-TILL SEED-CUM-FERTILIZER DRILL NATIONAL AGRICULTURAL TECHNOLOGY PROJECT INDIAN COUNCIL OF AGRICULTURAL RESEARCH

Ashok Yadav, R K Malik, Raj K Gupta, and P R Hobbs Samar Singh N K Bansal

- For enhancing the productivity and sustainability of the rice-wheat system without seriously affecting the natural resource base and the environment, several resource conservation technologies have been developed and are being promoted across the Indo-Gangtic Plains.
- Zero tillage reduces tillage to only one pass. It allows more timely sowing, which raises yields and lowers costs by saving soil, fuel, tractor costs, water, fertilizer and herbicides.
- They have developed combine machine for tilling and sowing of seed and fertilizer driven by tractor only. It is efficient machine for develop farmer

DIAGRAM:



Zero-till seed-cum-fertilizer drill mechanism

PROBLEMS IDENTIFIED:-

- It is not affordable to small farmers.
- It is heavy machine and costly also.
- Used only on cultivation of large scale crop.

2.2 ENGINEERING INNOVATION IN DEVELOPING RURAL LOAD CARRIER OPERATED JUTE SEED DRILL FOR FARM WORKERS

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Narendra Singh Chandel, V. K. Tewari and Vidhu K. P.

- This research paper relates to a self-propelled seed drill, derived from rural load carrier (RLC), which comprises of a self propelled device and a seed drill body.
- The machine was designed and developed to sow jute seed considering agronomic and ergonomic considerations. RLC used a 3.94 kW diesel engine allowing field work forward speed of 1.9 to 2.8 and 6 to 8.3 km/h for rural transportation.
- The effective field capacity at the mean speed of 2.1 km/h being 0.23 ha/h and fuel consumption was 1.4 L/h.

DIAGRAM:



View of eight-furrow jute drill and metering mechanism

PROBLEM IDENTIFIED:-

- This machine can only plant jute seed.
- It has no adjustment of depth and seed distance.
- Continuous refill of seed hopper is needed.
- No arrangement for fertilizer sowing.
- Pollution causing since it mainly made for self propelled vehicle.

3. Equations

1. Design of chain and sprocket:

In rpm

$$\begin{aligned} &= \frac{60 * 10^3 * V}{\pi D} \\ &= \frac{60 * 10^3 * 0.9722}{\pi * 300} \\ &= 61.89 \\ &= 62rpm \end{aligned}$$

$$\therefore N_1 = 62 \text{ rpm}$$

2. Shaft Design

i. Torque

$$T_d = \frac{60 * P_d}{2\pi N_2}$$

ii. Power Capacity of roller chain

$$P = P^2 \left[\frac{V}{104} - \frac{V^{1.41}}{526} (26 - 25 * \cos \frac{180}{t_2}) \right] * K_c$$

iii. Length of chain in pitches

$$Lp = \frac{t_1 + t_2}{2} + \frac{2C}{P} + \frac{PC(t_1 - t_2)^2}{40C}$$

3. Bevel gear design

i. Acute angle gear

$$\tan \gamma_p = \frac{\sin \theta}{\frac{t_g}{t_p} + \cos \theta}$$

ii. Pitch line velocity

$$Vp = \frac{\pi * D_p * N_p}{60 * 1000}$$

4. CONCLUSIONS

After the manufacturing and trail on the “**DESIGN AND FABRICATION OF MUTIPURPOSE MANUALLY OPERATED SYSTEM FOR AGRICULTURE PURPOSE**”) conclusion which we made are as follows:

1. Based on the overall performance of the machine we can definitely say that the project will satisfy the need of small

scale farmer, because they are not able to purchase costly agricultural equipment.

2. The machine required less man power and less time compared to traditional methods, so if we manufacture it on a large scale its cost gets significantly reduce and we hope this will satisfy the partial thrust of Indian agriculture.

3. So in this way overcome the labor problem that is the need of today’s farming in India

5. CAD MODEL OF PROJECT



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