

Operational Improvement with Advanced Design of Agri Robot in The Era of Agriculture

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ABSTRACT

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In the Indian Academy, Agriculture plays a important role. Over the last few decades, Indian agriculture has recorded good growth. Implementing done in this area. The multipurpose farming robot is a fundamental a new ideas in this field is very important, although a lot of work has been major agricultural machine for full yield. A laborious technique is the conventional method of weeding, sowing seeds and spraying pesticides. In India, bullocks, horses, and buffalo are still used by many farmers for agricultural operations. This would not satisfy the need for agricultural energy needs, in comparison to other countries around the world. We assume that human and animal efforts can be replaced from an economic point of view by some advanced mechanism that will be ideal for small-scale farmers. We are therefore designing this prototype and assume that it will fulfil all requirements and problems in real life. India is a country focused on agriculture in which 70% of individuals rely on the results of farming. But if we observe that with population growth the farm is spread among the family and because of this, farmers in India kept only two acres of farm on average. Economically, farmers are still very poor because they are unable to afford tractors and other expensive machinery, so they use conventional farming methods. So, we are designing this machinery that will fulfil all this need and solve the problem of labor. The paper deals with multi-purpose agriculture machine for seed feeding, spraying pesticides, fungicides, and fertilizers and cutting. Thus paving way for a more economical and multi-usable equipment for farmer which is also easy to clean and maintain, easy to handle and do not require fuel, hence cost gets reduced and helping farmers to a great extent in their fields

Keywords: Agricultural robot, Design of robot, Seed box, Feed shaft, Mass flow metering device, Ground wheel ,Furrow opener

I. 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 labour, 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 and development in such development.



Figure1. : View of eight-furrow jute drill and metering

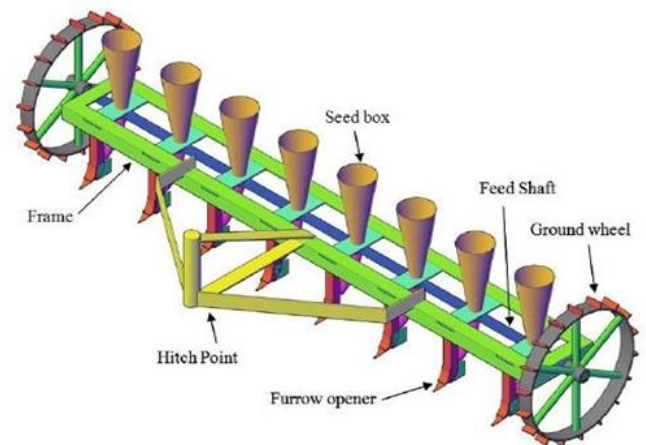


Figure2. : Design of eight-furrow jute drill and metering

The Design And Fabrication Of Roller Seed Sowing 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 that better techniques of farming will require to increase production of crops. And for that better techniques of seed sowing and fertiliser 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 fullfil above requirements with relatively saving of time and labour cost. Conventional method have 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.

II. 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 sawing.
- Pollution causing since it mainly made for self propelled vehicle.
- Due to less power self propelled vehicle the depth of sawing is restricted

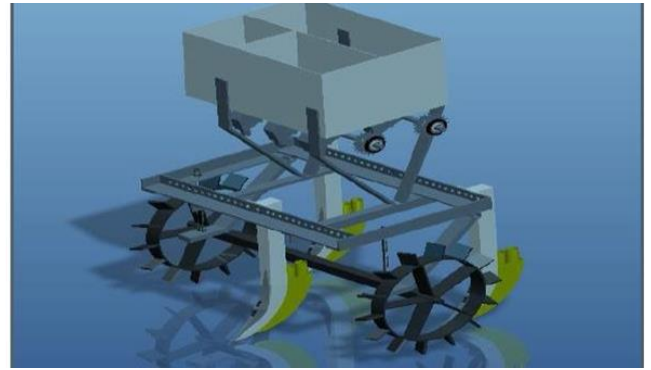


Figure3 : Seed sowing machine

III. MATERIALS AND METHODS

The experiment was conducted at PCSIR laboratories, Quetta during the winter season 2005- 2006. In this regard land was given three ploughs for the purpose of good seed bed preparation. The experiment was laid out in Randomized Complete Block Design having four. were thoroughly irrigated 25 days interval. Data Recording: 100 plants were selected randomly from each treatment and subjected for recording data using standard methods Following two strategies were adopted for experiment. Crop Management: All the required agronomic practices were followed uniformly in all the plots throughout the growing period.

IV. DESIGN CONCEPT

The basic of seed sowing operation is bowing a seed in proper row, by considering different types of seed and their sizes. Hence there is a need of inventing a seed sowing machine for further development and improvement. The design and fabrication of roller type of seed sowing machine is that sowing the seeds into the soil with the help of various tooth on the periphery of wheel with proper penetration in the soil. Sowing is the procedure in which seeds are placed in the soil for the better germination in the field. The components containing seeds that are been

planted it is defined as seed sowed.. Due to this machine we are able to plant seeds with proper distance between them. So, amount required to sowing of seed per hector are fix. This also helps to increase the germination of seed, because seed to seed space is proper so plant get space to grow up. Reduce Time is the most important objective for this invention is to reduce the time of sowing seeds with fertilization. In the conventional method the sowing by means of hands (manually) which take too much time to complete the sowing in the whole farm. Reduce in time result in increasing efficiency. Due to this invention the total work done by the farmer for sowing is decreases, because the farmer has not to carry the heavy bag of seeds and fertilizer and throughout the sowing process and the work of sowing by means of hands also gone reduce

V. EXPERIMENTATION OF CONCEPTUAL DESIGN

The roller seed sowing machine is a machine which is used for seed sowing process in agriculture works. This machine can be used for sowing various types off seeds having various size and diameter. The hopper of the machie is filled by the seed which is sowing into the soil the hopper is filled above 70% of its total volume. When the machine gets pulled by using tractor or manually its first task is drill the soil by hollow knife edge tooth on the roller wheel at a depth of the tooth which is also known as soil drill. When the machine gets move the wheel start rotating and hollow tooth can drill the soil. By this drilling process get completed when machine is moved, due to gravitational force and certain vibration created in machine the seeds are dropped into the channel pipe. As the channel pipe is connected to the hollow axle rod of a machine which support to the wheel. From this hollow axle rod the seed are dropped into the roller wheel of the machine. The both wheels are roteted at a same speed due to bearing is mounted on wheel there are number of holes are drilled on the periphery of the wheel at equal pitch distance. The or teeth mounted on the wheel above the this drill hole on this wheel due to this the seed drop inside the roller wheel is supply or drop into hole tool through this hole. So when tool is driil the soil at a same time the seed sowing into the soil

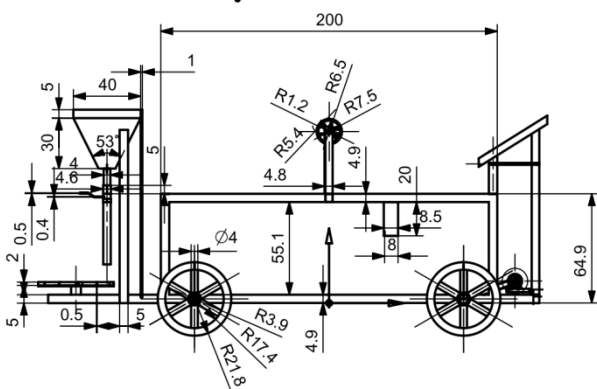


Figure 4 : Front View of Model

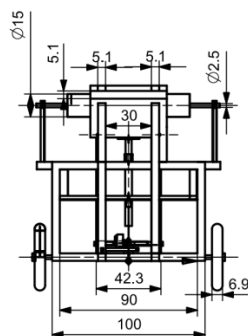


Figure 5 : Top View of Mode

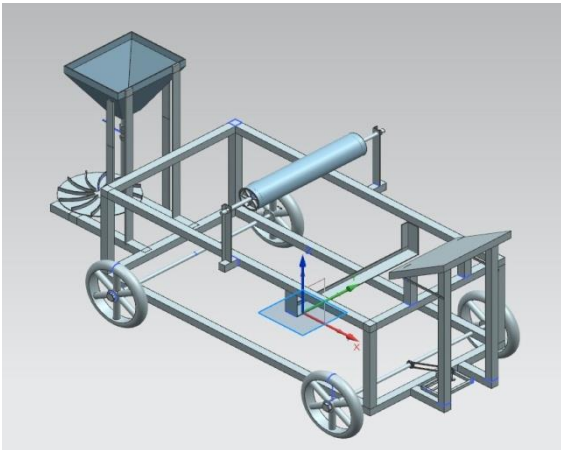


Figure 6: CAD Model

VI. DESIGN AND CALCULATION OF MACHINE

Total weight of machine = weight of machine + capacity of Hopper

The capacity of Hopper is 5kg but we will feel the hopper only 40%

Assume weight of seed in copper is 2kg $W = 20 + 2 = 22\text{kg}$

$W = 22 \times 9.81 = 215.82 \text{ N}$ $R_n = 215.82$

Friction force $F = u \times R_n$

$F =$ friction force , $u =$ coefficient of friction , $N =$ normal force Assume coefficient of friction $u = 1$

$F = 1 \times 215.82 = 215.82$

DESIGN OF CHANNEL PIPE :

Force = yield strength \times Area $A_p =$

$\pi / 4 (D^2 + d^2)$

Assume yield strength = 276 Mpa $215.82 = 276 \times / 4$

$\times (2.54 + d)$ $D = 2.54 \text{ cm}$, $d = 2.35$,

$t = 0.20 \text{ cm}$

VII. DESIGN OF BEARING

Design of Bearing Axial force = $F = 215.82 \text{ N}$. Radial force = 2000 N

Equivalent load on bearing

$F_e = [X.F_r + Y.F_a] . K_s . K_o K_p K_r$

$F_a / F_r = 0.085$, $e = 0.25$ for deep groove ball bearing $X = 1$, $Y = 0$, Moderate shock $K_s = 2$

Non-constant rotational condition , $K_o = 1$

Non preloaded bearing $K_p = 1$ $F_e =$

$(1 \times 2000 + 0) \times 2 \times 1 \times 1 \times 1)$

$F_e = 4000 \text{ N}$.

Average life of bearing :- $L = (c / F_e) \times k_{rel}$

For 50 % reliability

$K_{rel} = 5.0$, $C = 1100$, $n = 3$

for roller bearing Assume ball bearing 6204

$L = (18000 / 4000) \times 5.0$

$L = 7910 \text{ hours}$.

Sr. no.	Name of seed	Distance between two crops (cm)	Seed diameter (mm)	cropping depth (cm)
1.	Wheat	10-12	3	2
2.	Bajra	8-10	2	3-4
3.	jowar	8.89	3-4	3-4
4.	Corn	15-25	13.5	2.5
5.	Gram	7.62	5-10	3-4

Table 1 : Diameter of different types seeds with distance between two crops

VIII. CONCLUSION

The highest concentration of our design in the case of small farm units is the cost and operational ease. Therefore, this multipurpose equipment is intended to reduce the expense of processing, spraying, and feeding the seeds. We use past data and techniques in the production of multipurpose equipment. The design of multipurpose agricultural equipment is thus healthy. Such human-powered machine systems will make a major contribution to raising production per acre and to boosting the profitability of small and middle-class farmers. A new type of multipurpose mechanism that is distinct from other devices is manufactured and operates on a non-conventional energy source powered solely by humans. Such systems are of great importance in Asian countries, as almost all Asian countries face

shortages of energy and electricity, resulting in the shedding of twelve to fourteen hours of cargo in rural areas, especially in India. Therefore, a multiple multipurpose agricultural robot needs to be created locally.

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