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DESIGN AND FABRICATION OF UNIVERSAL SEED SOWING MACHINE

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ABSTRACT

In India, nearly 70% of the people are dependent on agriculture. So the agricultural system in India should be advanced to reduce the manual efforts of farmers. Various operations are performed in the agriculture field like seed sowing, weeding, cutting, pesticide spraying etc.by the farmers manually. The very basic and significant operation is seed sowing. But the present methods of seed sowing are time consuming. The present equipment used for seed sowing is very difficult and inconvenient to handle. So there is a need to develop a machine which will reduce the efforts of farmers. To overcome the difficulties in this paper efforts are taken to develop an universal automated seed sowing machine which introduces a control mechanism to drop the seeds at a particular position with specified distance between two seeds and lines while sowing. It will automatically close the seeds after sowing using the four wheel drive. This technology in the farming system reduces the manual efforts of farmers, saves time, energy and labor cost

KEYWORDS : Agricultural Equipment, Automation, Control Mechanism, Seed Sowing Techniques, Seed Sowing Mechanism.

I. INTRODUCTION

The major occupation of the Indian rural people is agriculture and both men and women are equally involved in the process. 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% of world population from 2.3% of world geographical area and 4.2% of world's water resources. The basic objective of sowing operation is to place 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 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. The agriculture has always been the backbone of India's sustained growth. As the population of India continues to grow, the demand to produce grows as well. Hence, there is greater need for multiple cropping in the farms and this in turn requires efficient and time saving machines.In the past, various types of design have been developed with different design approaches which have their own advantages and disadvantages and also operational limitations. Kumar et, al.[1] developed a manually operated seeding attachment for an animal drawn cultivator. The seed rate was 43.2 kg/hr while the field capacity was 0.282 ha/hr. Tests showed minimal seed damage with good performance for wheat and barley. Molin and Dagostine [2] developed a rolling planter for stony conditions, using 12 spades radially arranged with cam activated doors and a plate seed meter. Performance evaluation showed important improvement in the planting operation with reduction in human effort, more accurate stands and high field capacity. Ladeinde and Verma [3] compared the performance of three different models of Jab planters with the traditional method of planting. In terms of field capacity and labour requirement, there was not much difference between the traditional planting method and the Jab planters. However, backache and fatigue were substantially reduced while using the planters.Mahesh R. Pundkar et al [4] studied the performance of seed sowing devices by using image processing algorithm using MATLAB software. They also studied the effect of seed depth, seed spacing, miss seeding ratio and performance seed sowing device on germination of seed and efficiency of yield crop. Laukik et. al.,[5] studied about the food requirements of the growing population and rapid industrialization, modernization of agriculture is inescapable. D. Ramesh and H. P. Girish [6] Kumar presented a review to provide 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 seed in rows at desired depth and seed to seed spacing, cover the seeds with soil and provide proper compaction over the seed. Pranil V. Sawalakhe et. al.[7] investigated 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. Swetha S. and Shreeharsha G.H[8] addressed on the use of solar panels for seed sowing machines. Manjesh.M and Manjunatha.K, [9] discussed about solar seed drills and sowing of seeds

II. TRADITIONAL METHODS OF SEED SOWING

Traditional methods include broadcasting manually, opening furrows by a country plough and dropping seeds by hand and dropping seeds in the furrow through a bamboo/metal funnel attached to a country plough. For sowing in small areas dibbling i.e., making holes or slits by a stick or tool and dropping seeds by hand, is practiced. Multi row traditional seeding devices with manual metering of seeds are quite popular with experienced farmers. In manual seeding, it is not possible to achieve uniformity in distribution of seeds. A farmer may sow at desired seed rate but inter-row and intra-row distribution of seeds is likely to be uneven resulting in bunching and gaps in field.

III. SOWING METHODS

The different types of seed sowing methods are broadcasting, dibbling, seed dropping behind the plough, seed drilling and transplanting.

3.1 BROADCASTING

Broadcasting is otherwise called as random sowing literally means “scattering the seeds”. Broadcasting is done for many crops. Broadcasting is mostly followed for small sized to medium sized crops. This is the largest method of sowing followed in India, since; agriculture was started. It is the easiest and the cheapest method of sowing and requires minimum labors. To have optimum plant population in unit area certain rules are followed that is only a skilled person should broadcast the seeds for uniform scattering and the ploughed field should be in a perfect condition to trigger germination.

3.2 DIBBLING

This is actually line sowing. Inserting a seed through a hole at a desired depth and covering the hole. Dibbling is practiced on plain surface and ridges and furrows or beds and channels. This type of sowing is practiced only under suitable soil condition. Rice fallow cotton is dibbled on a plain surface. The seeds are dibbled at 2/3rd from the top or 1/3rd at bottom of the ridge. Before sowing, furrows are opened and fertilizers are applied above which seeds are sown. The seeds do not have contact with the fertilizers. This is done for wider spaced crops and medium to large sized seeds. Ex. Sorghum, maize, sunflower, cotton are dibbled on ridges and furrows.

3.3 SEED DRILLING

Drilling is the dropping of seeds in a definite depth covered with soil land compacted. In this method, sowing implements are used for placing the seeds into the soil. Both animal drawn gourmand power operated (seed drill) implements are available. Seeds are drilled continuously or at regular intervals in rows. In this method, depth of sowing can be maintained and fertilizer can also be applied simultaneously. It is possible to take up sowing of inter crops also. It requires more time, energy and cost, but maintains uniform population per unit area. Seeds are placed at uniform depth, covered and compacted.

3.4 TRANSPLANTING

This method of planting has two components, namely Nursery bed and Transplanting. In nursery, young seedlings are protected more effectively in a short period and in a smaller area. After the growth of the seedlings it is transplanted to the main field which is very laborious and expensive method.

3.5 SOWING BEHIND THE PLOUGH

Sowing behind the plough is done by manual or mechanical means. Seeds are dropped in the furrows opened by the plough and the same is closed or covered when the next furrow is opened. The seeds are sown at uniform distance. Manual method is a laborious and time consuming process. Seeds like red gram, cowpea and groundnut are sown behind the country plough.

IV. PROBLEM STATEMENT

Based on the literature review results none of the authors had designed a mechanism to sow the multiple seeds in equally spaced rows. Also the authors had not devised any mechanism to close the seeds with soil after sowing it. Hence in this project an attempt has been made to automate the multiple seed sowing process and close the seeds with soil. To automate the process suitable design is done and the model is fabricated as Universal seed sowing machine which reduces the labour cost and time to a great extent.

The world's population is expected to grow rapidly and an estimated 70% increase in food production is required in just a few decades. Smart technology should be designed to meet up the strategy. Equal spacing of seeds will provide rich plantation. Large and heavy machinery will damage the wet soil and will also get stuck into the muddy fields. So that the Universal seed sowing machine is designed in low cost and light weight.

V. COMPONENTS OF THE SEED SOWING MACHINE

The following components are used in the fabrication of the universal automated seed sowing machine. They are classified under two categories

MECHANICAL COMPONENTS

1. Gear 2. Motor 3. Seeding box and seeding feeder 4.Bearing 5.Wheel 6. Sprockets 7. Chain drive

ELECTRICAL COMPONENTS

1. Battery 2. Battery charger 3. Motor drive board 4. DTDP switch

5.1 GEAR

The most common gears are spur gears and are used in series for large gear reductions. The teeth on spur gears are straight and are mounted in parallel on different shafts. Spur Gears of module 20mm is used in this model. The gear mounted is as shown in the Fig 5.1

Figure 5.1 Spur Gear

5.2 MOTOR

Trail run was made with many motors but only the wiper motor worked out, it is the only motor which is easily controlled by the motor drive which has been used. It also works at low voltage (12v and 5amps). The wiper motor is permanent- magnet direct current (DC) one. Wiper motor, is the core of the whole wiper system. Therefore, the quality of the wiper motor must be guaranteed to ensure performance. The technical Specifications of the wiper motor are

Rated torque =71.85 Nm, Maximum wattage =50W/12VDC , Unload high speed =50rpm, 1.5A

Motor noise = < 45dB, Unload low speed =35rpm, 1.0A, Spindle/post thread size = M-6

Figure 5.2 Wiper Motor

5.3 SEED BOX AND SEED FEEDER

In this machine seeding box is the important part of seed sowing machine. Seeding box is used to store the seed. This seed box is made up of aluminum. The special feature in this is that it has 3 seed feeders which feeds different seeds at the same time. It operates through the shaking of the seed box and the seed falls through the unique built holes for 3 different seeds. In this project seed feeder is used to feed the seed in a particular time period.

5.4 BEARING

In this model there are about 7 ball bearings, 5 ball bearing in the chain drive assembly, and two in ploughing. It increases the stability and turning power of the chain drive.

5.6 SPROCKET

A sprocket or sprocket-wheel is a profiled wheel with teeth, cogs, or even sprockets that mesh with a chain, track or other perforated or indented material. The sprocket helps the chain driver motor to drive it easily. It is a 4 wheel drive mechanism. It give the power to turn in muddy region or farms. The material chosen for the sprocket is cast iron with a pitch of 10.82 mm, Number of teeth is 10, and width of 50mm is used in this machine as shown in Fig.5.3

5.7 CHAIN DRIVE

It is a way of transmitting mechanical power from one place to another. It is often used to convey power to the wheels of a vehicle, particularly bicycles and motor cycles. It is also used in a wide variety of machines besides vehicles as shown in Fig 5.4

5.8 BATTERY

The Smart Battery 12V 100AH Lithium Ion Battery is the Ultimate High Performance solution for virtually any application. This battery features an automatic built in battery protection system (BPS) that keeps the battery running at peak performance and protects the cells for thousands of cycles as shown in Fig.

Figure 5.3 SprocketFigure 5.4

Chain DriveFigure 5.5 Battery

VI. DESIGN OF VARIOUS COMPONENTS

6.1 CALCULATION OF TORQUE TRANSMITTED ON THE WHEEL

$T_W = K_w \times W_t \times R_w$

Where,K_w = Coefficient of the rolling resistance (0.3 for metallic wheel)

W_t =Active weight of the machine (12kg approx.)

R_w = Radius of the ground wheel

K_w = 0.3, W_t = 12 kg = 12×9.81 = 117.72N R_w =150mm = 0.15m

T_w =0.3×117.72×0.15 = 5.2974 N-m

6.2 CALCULATION OF POWER OF THE MOTOR

$P = \frac{2\Pi NT}{60}$

$P = \frac{(2\Pi \times 250 \times 5.2974)}{60000}$ = 0.1386 KW

6.3 DESIGN OF CHAIN DRIVE

Centre distance, a = 800mm

Maximum speed, N = 250rpm

Minimum speed, n = 20rpm

STEP: 1 SELECTION OF TRANSMISSION RATIO

$i = \frac{N}{n} = \frac{Z_2}{Z_1}$ $i = \frac{250}{20}$ i = 12.5

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STEP: 2 SELECTION OF NUMBER OF TEETH

From PSGDB 7.74,

For, I = 12.5 Corresponding, Z_1= 11

STEP: 3 CALCULATION OF NUMBER OF TEETH

$$Z_2 \ = i \times Z_1$$

$Z_2 \ = 12.5 \times 11 \ Z_2 \ = 137.5 \ \simeq 138$

STEP: 4 CALCULATION OF PITCH

From PSGDB 7.74,

Optimum center distance, a = (30 to 50) P

$$\text{Thus, P } = \frac{a}{30} \ = \frac{800}{30} = 26.67\text{mm}$$

$$\text{P } = \frac{a}{50} \ = \frac{800}{50} = 16\text{mm}$$

From PSGDB 7.74, Standard pitch value, P = 15.875mm

STEP: 5 CALCULATION OF LENGTH OF THE CHAIN

From PSGDB 7.75,

$$l_p \ = 2a_p + \frac{(Z_1 + Z_2)}{2} + \frac{\left(\frac{Z_2 - Z_1}{2\pi}\right)^2}{a_p}$$

Where,$a_p \ = \frac{a_0}{P}\,(a_0 = a\,)a_P \ = \frac{800}{15.875} \ = 50.39mm$

Therefore, $l_p \ = (2 \times 50.39) + \frac{(11+38)}{2} + \frac{\left(\frac{138-11}{2\pi}\right)^2}{50.39}$

Length of the chain, l $=l_p \times P$

=183.38 × 15.875 = 2911.15mm

STEP: 6 CALCULATION OF CENTRE DISTANCE

PSGDB 7.75,

$$a \ = \frac{\left(e+\sqrt{(e^2-8m)}\right)}{4} \times P$$

Where, $e \ = l_{p-}\left(\frac{Z_1+Z_2}{2}\right)$

$= 183.38 - \left(\frac{11+138}{2}\right) = 108.88mm$

Where, m $= \left(\left(\frac{Z_2 - Z_1}{2\pi}\right)^2\right) \ = \left(\frac{138-11}{2\pi}\right)^2$ = 408.55mm

Then, a $= \frac{\left(108.88+\sqrt{108^2-(8\times 408.56)}\right)}{4} \times 15.875$= 799.87mm

STEP: 7 CALCULATION OF SERVICE FACTOR

From PSGDB 7.76,

$$K_S = K_1 \times K_2 \times K_3 \times K_4 \times K_5 \times K_6$$

Where, $K_1 = 1.25$, $K_2 = 1$, $K_3 = 1$, $K_4 = 1$, $K_5 = 1$, $K_6 = 1.25$

Therefore,

K_S = 1.25×1×1×1×1×1.25= 1.5625

STEP: 8 CALCULATION OF BEARING STRESS

From PSGDB 7.77,

Power, N $= \frac{\sigma A v}{102 K_S}$

Where, $v = \frac{Z_1 \times P \times N}{60}$

$$v = \frac{11 \times 15.875 \times 10^3 \times 250}{60} = 0.727\ \frac{m}{s}$$

From PSGDB 7.72,

We Choose 10A2DR50 Chain,

Where Area A = 1.40 cm^2,

$$N = \frac{\sigma A v}{102 K_S}$$

231.142 = $\frac{\sigma \times 1.40 \times 0.727}{102 \times 1.5625}$

STEP: 9 CALCULATION OF TOTAL LOAD

$\sum P = P_t + P_C + P_S$

Where, $P_t = \frac{1020 \times N}{v}$

$$= \frac{1020 \times 231.142}{0.727}$$

$= 324.29 \times 10^3$N

Where, $P_C = mv^2$

From PSGDB 7.72, 10A2DR50 is selected, where W=1.78

$$P_C = 1.78 \times 0.727^2$$

$$P_C = 0.940N$$

Where, $P_S = K.W.a \times 10$

From PSGDB 7.78 (K=6, For Horizontal)

$$P_S = 6 \times 1.78 \times 10 \times 799.89$$

$$P_S = 85.42 \times 10^3$$

$$\sum P = (324.29 \times 10^3) + (0.940) + (85.42 \times 10^3)$$

$$\sum P = 409.71 \times 10^3 N$$

STEP: 10 CALCULATION OF THE PITCH DIAMETER OF THE SPROCKET

$d_1 = \frac{P}{\sin\left(\frac{180}{Z_1}\right)}$ = 56.69mm

$d_2 = \frac{P}{\sin\left(\frac{180}{Z_2}\right)}$ = 721.59m

6.4 SLIDING VELOCITY OF THE SEEDS

$$v = \frac{\pi dN}{60}$$

$$v = \frac{\pi \times 300 \times 10^{-3} \times 250}{60}$$

$$v = 3.926\frac{m}{s}$$

6.5 SPEED OF THE GROUND WHEEL

$$N_W = \frac{(speed\ of\ the\ machine \times 100)}{60\pi}$$

$$N_W = \frac{(3.926 \times 100)}{60\pi}$$

$$N_W = 2.08rpm$$

Where, Angular velocity,$\omega = \frac{2\pi N}{60}$

$$\omega = \frac{2\pi \times 250}{60}$$

$$\omega = 26.17\frac{rad}{s}$$

ANGULAR VELOCITY TO LINEAR VELOCITY FORMULA

$$v = r \times \omega$$

Where, r = radius of the wheel in m

$$v = 0.15 \times 26.17$$

$$v = 3.925\frac{m}{s}$$

6.6 DESIGN OF SPUR GEAR

STEP 1 : SELECTION OF MATERIAL

CAST IRON GRADE 35 is selected,

From PSGDB 1.5,

$$\sigma_u = 350\frac{N}{mm^2}$$

STEP 2 : CALCULATION OF INITIAL TWISTING MOMENT

From PSGDB 8.15,

$$[M_t] = M_t \times K_d \times K$$

$$M_t = \frac{60 \times P}{2\pi N}$$

$$M_t = \frac{60 \times 231.142 \times 10^3}{2\pi \times 250}$$

$M_t = 8.828 \times 10^3 N - m$ $M_t = 8.828 \times 10^6 N - mm$

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Assume $K_d \times K = 1.3$

$$[M_t] = 8.828 \times 10^6 \times 1.3$$

$$[M_t] = 11.476 \times 10^6 N - mm$$

STEP 3 : CALCULATION OF COMPRESSIVE STRESS

From PSGDB 8.16,

$$[\sigma_C] = C_B \times HB \times K_{Cl}$$

$C_B = 23$ HB = 260

$K_{Cl} = \sqrt[6]{\frac{10^7}{N}} = \sqrt[6]{\frac{10^7}{15\times10^7}} = 0.740$

$[\sigma_C] = 23 \times 260 \times 0.740$

$[\sigma_C] = 4425.2 \frac{Kg}{cm^2}$ $[\sigma_C] = 442.52 \frac{N}{mm^2}$

STEP 4 : CALCULATION OF BENDING STRESS

From PSGDB 8.19,

$[\sigma_b] = \frac{1.4\times K_{b1}}{n\times K_\sigma} \times \sigma_{-1}$ $\sigma_{-1} = 0.45 \times \sigma_u$ $\sigma_{-1} = 0.45 \times 350$ $\sigma_{-1} = 157.5 \frac{N}{mm^2}$

n = 2 $K_\sigma = 1.2$

$K_{b1} = \sqrt[9]{\frac{10^7}{15\times10^7}} = 0.904$

$$[\sigma_b] = \frac{1.4 \times 0.904 \times 157.5}{2 \times 1.2} = 83.05 \frac{N}{mm^2}$$

STEP 5 : CALCULATION OF CENTER DISTANCE

From PSGDB 8.13,

a = $(i+1)\sqrt[3]{\left(\frac{0.74}{[\sigma_c]}\right)^2 \times \frac{E\times[M_t]}{i\varphi}}$

From PSGDB 8.14,

E = $1.7\times 10^5 \frac{N}{mm^2}$ i = $\frac{N}{n} = \frac{250}{100} = 2.5$ $\varphi = 0.3$

a = $(2.5+1)\sqrt[3]{\left(\frac{0.74}{442.52}\right)^2 \times \frac{1.7\times10^5\times11.476\times10^6}{2.5\times0.3}}$ a= 678.15 mm

STEP 6 : CALCULATION OF MODULE

m = $\frac{2a}{Z_1+Z_2}$

$Z_1 = 20$ $Z_2 = i \times Z_1$ $Z_2 = 2.5 \times 20 = 50$

m = $\frac{2\times678.15}{20+50}$ m = 19.37mm $\simeq$ 20mm

STEP 7 : REVISION OF CENTER DISTANCE

a = $m\left(\frac{Z_1+Z_2}{2}\right)$ a = $20\left(\frac{20+50}{2}\right)$ a = 700mm

STEP 8 : REVISION OF TWISTING MOMENT

$$[M_t] = M_t \times K_d \times K$$

- **TO FIND "k"**

From PSGDB 8.19,

$\varphi = \frac{b}{a}$ $b = \varphi \times a$ b = 0.3 × 70 b = 210 mm

From PSGDB 8.22,

Pitch diameter, $d_1 = m \times Z_1 = 20 \times 20$ d_1= 400 mm

$\varphi_P = \frac{b}{d_1} = \frac{210}{400} = 0.525$

K=1.03

- **TO FIND "K_d"**

V=$\frac{\pi d_{1av} N}{60 \times 1000}$ V=$\frac{\pi \times 400 \times 250}{60 \times 1000}$ V= 5.23 $\frac{m}{s}$

$$k_d = 1.55$$

$$[M_t] = 8.828 \times 10^6 \times 1.03 \times 1.55$$

$$= 14.09 \times 10^6 N - mm$$

STEP 9 : CHECKING FOR BENDING STRESS

$$\sigma_b = \frac{i+1}{amby} \times [M_t](y = 0.389)$$

$= \frac{2.5+1}{700 \times 20 \times 210 \times 0.389} \times 14.09 \times 10^6$ =43.12 $\frac{N}{mm^2}$

STEP: 10 CHECKING FOR COMPRESSIVE STRESS

$$\sigma_C = 0.74 \left(\frac{i+1}{a}\right) \sqrt{\left(\frac{i+1}{ib}\right)} \times E[M_t]$$

$= 0.74 \left(\frac{2.5+1}{700}\right) \sqrt{\left(\frac{2.5+1}{2.5 \times 210}\right)} \times 1.7 \times 10^5 \times 14.09 \times 10^6$ $= 467.55 \frac{N}{mm^2}$

VII. 2D MODEL OF AUTOMATED UNIVERSAL SEED SOWING MACHINE

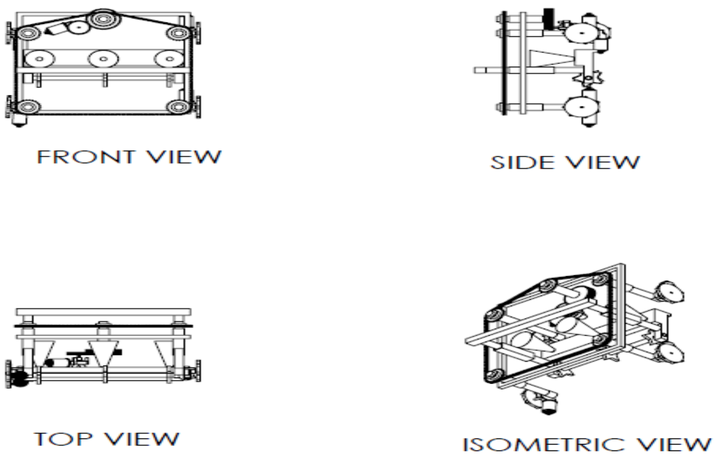

Figure 7.1 Modelling Of Universal Seed Sowing Machine

VIII. MECHANISM AND WORKING

The model works on the basis of a sowing technique called "SOWING BEHIND THE PLOUGH". Here, our seed hopper is specially designed to sow different types of seeds. The Universal Seed Sowing Machine sows 3 types of seeds at the same time. The seed falls at approximate distance from one another due to the vibration created by the motor when driving off-road due to gravitational force. The climbing ability of the12kg machine is due to the specially designed wheels. The wheel is designed in such a way that it provides advanced grip in the slippery region and mostly in small cliffs. The ploughing blades provided with 7 teeth ploughs due to the weight applied on them by the whole body. The working of this particular project mainly depends on the power of the motor and the weight of the total body. Wiper Motors are selected on the basis of their torque power or otherwise known as pulling or pushing force. There are a total of 5 motors which helps the machine to move easily. In the controlling unit we have a total of 2 x 12 volts batteries and when charged they reach 14.4 volts and a total of 28.8 volts, which is more than enough to power all 5 motors. One motor controls the 4 wheel drive (left and right), and other 4 motors controlling the forward and backward motion. There was a difficulty in turning the body towards the right or left. So, one complete battery was hooked up to the turning mechanism and the other for the forward and backward motion.

When the power is switched on, the power is transmitted to all the motors that are fitted to the wheels of the machine. One battery is made separate with the frame which is connected to the chain drive by means of sprocket. The front and back movement is provided by the motors that was attached to the wheels. The rotational movement of the machine, the power is driven by the motor which is connected to the chain drive and then the power is equally transmitted to the wheels so that the machine rotates.

When the machine is moving, the ploughing blade will also tend to plough the land. And also the movement of the machine causes vibration so that seed from the feeder box drop behind the ploughing blade. After the seed is dropped on the land a vertical plate is provided behind the seed feeder box which closes the soil with the seed inside it. Thus the mechanism of seeding is done in this machine.

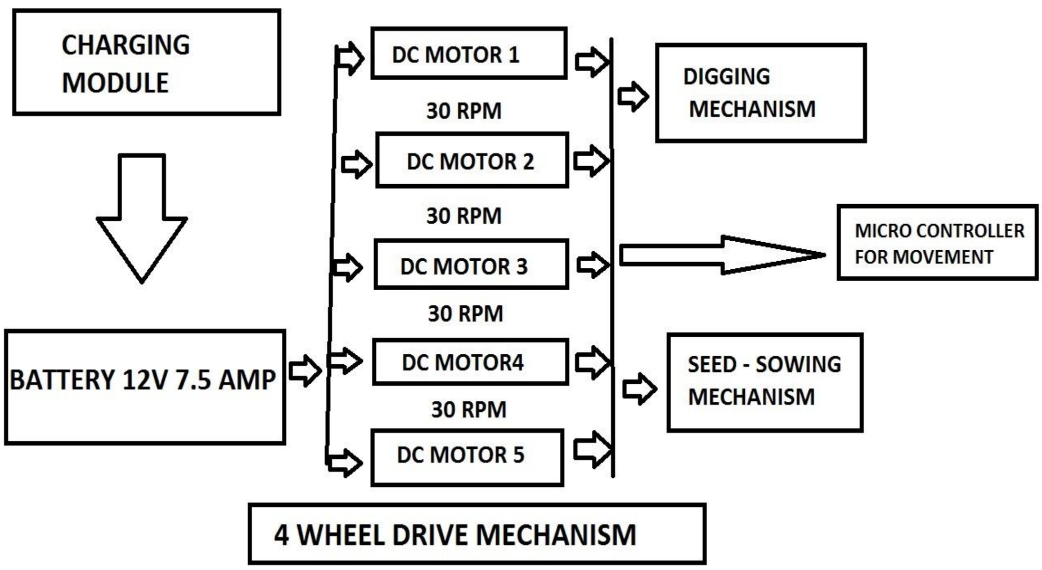

Figure 8.1 Block Diagram of Seed Sowing Machine

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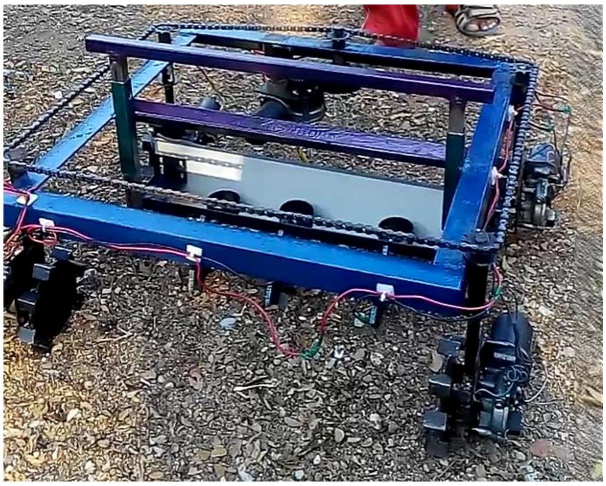

Figure 8.2 Fabricated model of Universal Seed Sowing Machine

IX.CONCLUSION

Based on the design calculations the universal seed sowing machine was fabricated**.** After considering different advantages and disadvantages of the existing machine, it is concluded that the seed sowing machine for farmers can Maintain row spacing, Proper utilization of seeds can be done with less loss, 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.In conventional machining, for 1acre land a tractor takes about 2hr for ploughing but the time in universal seed sowing machine is reduced by 50%.

The developed seed sowing machine is a full-fledged example of agricultural automation. However since the field of agricultural is very large, further improvements can be done in thismachine to make it smarter and multipurpose.This machine may be added with other sensors such as soil pH sensors and temperature and humidity sensors which are other factors in farming. The machine can be added with mechanism to remove the weeds, thus the single machine can be used for sowing as well as preparing the soil.Also addition of rainfall sensors can be used to detect and calculate the amount of irrigation to the crops in addition to the moisture sensor. Thus this platform which has been fabricated in the project can be used to expand the flexibility of the project by adding more application to the machine and also leaves the space for future research.

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