Rice Planting & Seedling

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ABSTRACT

India is widely known in the world for its agricultural activities. Farming is one of the important commercial businesses. Still in our country enough importance is not given to the improvements in the agricultural field. The traditional methods of farming are not able to satisfy all the need of the farmers effectively. The current growth in the agriculture sector is not very satisfactory as compared to other sectors. The farmers are much dependant on bullocks or tractors and are unable to bear up with its increasing cost. Hence we can see large number of suicide cases of farmers now days. Thus there is need to mechanize this sector with the least possible cost.

This project attempts to introduce a modern technology that can be proved to be effective in seed sowing operation. It is observed that the conventional method requires bullock and skilled operator during peak season for sowing the seed in the right quantity at right distance. Thus, the necessity of skilled operator increases the overall cost of this operation. Hence we are developing a "Low Cost Manually Operated SeedDrill for Sorghum "; as in the Solapur district Rabi Sorghum is taken on the large scale.

Sowing, planting and transplanting are basic and one of the most important farming operations. The placement of seedat proper depth in the soil and placement of planting is very important as far as germination of seed is concerned. Here planting should not be placed over the seed to avoid chemical injury to the seed which affects its germination. It is also essential to keep the plant population optimum in the field to have maximum yield. To achieve the maximum output, it is necessary to place seeds at desired spacing and depth by avoiding the wastage of the seeds by using it in right quantity.

This seed drill attempts to fulfill the voids in the traditional methods of sowing operations by taking care of major variable factors.

Keywords— automatic rice planting and seedling , fork arm .

INTRODUCTION

India is a country of villages, having large population around two third of its population are dependent on agriculture. Although agro industry is accreted of lingering peace. The sole culprit for slogging in pace of accretion (in agro industry) is " dependency on traditional approaches and equipment. For enhancing the per capita agricultural production, various innovative efforts are made at national level under the name "Agricultural Revolution."
Revolution is confined to economic growth which may result from various economic factor but technological progress have been and will continue to be the primary source of development. Technology refers to the application of scientific knowledge for practical purpose as well as industrial process for enacting and enriching goods and services.
Sorghum is the most important crop in Maharashtra occupying the highest area of 55 lakh hectares with 36 per cent of the total cropped area under cultivation. Sorghum is grown both in Kharif and Rabi seasons. There is more area in Rabi season (about 32 lakh hectares than in Kharif about 23 lakh hectares). In these two season we get two different type of crop as like rice-nachani in kokan these time remaining Maharashtra get groundnut then jwari,bajara etc.but in our agriculture machinery not operating all season planting factor because we are operating different method of planting and seed sawing process.
Sorghum is grown in a variety of soils in India. Soils with clay loam or loam texture, having good water retention capacity are best suited for sorghum cultivation. It does not thrive in sandy soils but does better on heavier soils. It does well in pH range of 6.0-8.5 as it
For the production of rice and onion, which is gradually a major production crop in kokan the rice should be dropped at a regular interval. But the existing equipment does not fulfill these criteria in India. In existing system, plant are dropped manually at the cross point of longitudinal and lateral cultivation which increase the cultivation time as well as labor cost. But by this device both the operation i.e. cultivation and rice planting can be done simultaneously. In this system there is no need to drops the rice plant more than one times and no wastage of costly rice plant s. And we save the production cost as well as cultivation time and labor cost. And, get more yields. In existing system there was a possibility to germination of more than one plant at a single position, and transplantation of that extra plant was necessary. But in this system of drilling, this type of problem considered as negligible.
In future, this device will help the rice planter farmers of kokan to change his life style.
The rice transplanted consists of prime mover, transmission, engine, float, lugged wheels, rice ling tray, rice ling tray shifter,

pickup fork and pickup fork cleaner. It is a walk behind type rice transplanted using mat type nursery and it transplants the rice ling uniformly without damaging them. The planting depth and hill-to-hill spacing can be adjusted. Automatic depth control helps in maintaining uniform planting depth. The machine has safety clutch mechanism, which prevents break down of planting device from the impact against stones in the field. For operation, the machine is transported to the field and mat type nursery is loaded in the tray of the transplanted. The machine is put in transplanting mode and operated in the puddle field. The performance of the transplanted is checked within 2-3 m of travel for transplanted rice lings for hill-to-hill distance, depth of placement and number of rice ling per hill. If the transplanting is in order the machine is operated in normal transplanting operation.

The performance of the seed- metering device was investigated field conditions to optimize the design and operating parameters for cotton seed planting. The effect of operational speed of the disc, and shape of the entry of seed hole were evaluated by examining the mean seed spacing, precision in spacing (coefficient of variation) , miss index, multiple index, and highest quality of feed index, For picking single seeds, the planter disc had a seed hole of 1.0cm in diameter. The entry cone angle of the hole was varied from 90 to 150, the speed varied from 0.29 to 0.69 m/s.

1.5 Present Practices: -

Following are the different methods of sowing and planting adopted currently in agriculture practices-

1) Row sowing:

Row sowing of grains, commercial crops ,vegetables and other plants is done in furrows with identical inter row spacing varying from 12 to 15 cm with an average seed spacing of 1.5 to 2 cm in the furrow. The shape of nutrient area of the plants is rectangle; the ratio of its sides varies from 1:6 to 1:10.

e.g.-Vegetables and commercial crops.

2) Cross sowing:

It is done by passing the seed drill in two mutually perpendicular directions. In such pass, half the seeds are sown. This type of sowing improves the uniform distribution of seeds over the crops. The inter row spacing is same as in row sowing and the minimum distance between the seeds is kept 3 to 4 cm.

e.g. - Grains, vegetables, commercial crops.

3) Narrow row sowing:

It is in contrast to row sowing and is done with a smaller inter row spacing, that is, from 5 to 8 cm. For such sowing, the shape of the nutrient area is close to square, which enhances the yield. It becomes most effective when the rate of seed sowing is increased by 10 to 15 % over that of row sowing.

e.g. - Vegetables.

4) Wide row sowing:

It is mainly used for growing row crops and to plant tubers, bulbs and seedlings. Depending upon the type of crop, the soil the climatic conditions as well as technical and economical factors, inter row spacing is 30 to 100 cm.

5) Strip sowing:

It is a variation of wide row sowing. In this method several rows are sown close to each other (15cm).These rows form a strip. The spacing between such strips of several rows is greater than 45 cm that between individual rows.

6) Single grain sowing:

It is used for sowing the sugar beet. Here the seeds are distributed in the rows at equal intervals from each other; this prevents their crowding and bunching, reduces the quantity of seeds used and decreases the expenditure involved in raising the plants.7) Hill drop sowing:

It differs from the wide row sowing in that in this method the seeds are not planted individually but severally in a cluster. All efforts are made to keep equal spacing between clusters in a row (15 to 25 cm) and between rows (30 to 100 cm).

e.g.: - corn. Sunflower, cotton.

8) Square and square hill drop sowing:

This method of planting tubers and seedlings provides an optimal nourishment area for the plants. This rectilinearity of the rows in two directions perpendicular to each other facilitates mechanization of soil working in the inter-rows in both directions; this greatly reduces the labor in raising the plants since the efforts can be mechanized to great extent.

9) Random sowing:

This method of sowing is used to sow seeds in a wide strip of 90 cm or more; this helps to obtain uniform spread of seeds over a field.Grippers, and the most modern adhesion technique based robot are biologically inspired robots. According to their works that has to be done they are made.

OBJECTIVES

a) To design a rice planting and seedling machine to reduce farmers effort.
b) To make it portable
c) To design in purely mechanical manner to avoid use of electricity .
d) Should be easy to use.
e) To assemble and testing of the machine.

METHODOLOGY

1. Literature study.
2. Project identification.
3. Literature study.
4. Design.
5. System drawing.
6. Material procurement
7. Manufacturing.
8. Fabrication of assembly
9. Trials and troubleshooting.
10. Testing
11. Conclusion
12. Report and project presentation.

COMPONENTS OF RICE PLANTING DEVICE

The different type of part that have be assembled to fabricate the Rice planting Device are viz.

i. Frame
ii. tray
iii. Shaft
iv. Disc
v. Chain sprocket
vi. Crank mechanism

vii. Gear train

The following are the uses of various primary and secondary components of the above parts:

Frame: It is made up of C. I. angle bar of dimension 35mm x 35mm x 4 Mm on which other components like tray, disk, shaft etc are mounted.

ii. Tray: tray is made by mild C. R. Sheet which contains Rice plant . There are two sided plant is store with help of supporter plate supporter plate is mounted on frame on each side..

iii. Shaft: It is made of C. I. on which disc and gear sprocket is mounted. It is used to transfer the power from hand wheel to each disc.

viii. Gear train: these gear train is transmit the power disc shaft to crank shaft gear train is mainly use to transmit the power clock wise to antilock direction on another shaft we arrange the sprocket mounted these shaft is connected crank mechanism shaft.

iv) Disc. : It is made up of m.s. which is circular in shape.

v) Chain: the chain are made up of no. of rigid links which are hinges Together by pin joints in order to provide. The necessary flexibility for wrapping round the driving & driven wheels. These wheels have projecting teeth of special profile a fact into the corresponding recess. Links of the chain. The toothed wheel are known as sprockets wheel.

Concept of Combining Seed Sowing

As far as traditional methods are considered the sowing and the dropping the planting operations are carried out separately. This unnecessarily consumes more time causing ultimate reduction in the yield. Also the requirement is that the seed should be nearly 2 cm offset to each other, , which is not exactly possible with the conventional methods.

By developing the concept of combining sowing and fertilizing in a single operation, much of the time is saved and the purpose of the dropping of planting as per the requirement is also fulfilled. The required depth of the seed to be sown is achieved by modifying the outlet opening of the seed tube that is both these outlets are spaced in such a way that the distance between these two openings is maintained at an offset of 2 cm.

3.2 General Components of Seed Drill: -

The major component of the seed drill and their functions are as-

1) Hopper:

The hopper contains seed and planting. The metering unit is attached to the hopper. There may be individual hopper for seed or a common hopper may have compartments for seed. In same seed hoppers are provided for each row.

2) Furrow opener:

It is the soil working component of a seed drill that penetrates the soil and a furrow is opened in which the seeds are placed.

Seed beet are attached behind the furrow opener to which the seed tubes are connected. They help in proper placement of seed in the soil.

The role of the furrow openers is very important in a seed, planting drill so far as placement of seed in the soil is concerned. The seed should be placed in moist soil and covered for proper germinations. Plantings may be placed:

1) Agitator with adjustable gate.

2) Fluted roller

3) Roller with cells-

--Vertical roller or plate with cells.

--Horizontal plates with cells.

--Inclined plate with cells.

4)Cup feed type metering.

5) Pneumatic metering system-

3) Seed tubes:

Seed tubes carry the seeds and planting from the metering units to the furrow opener. They may be simple transparent plastic/ polythene tubes or flexible metallic tubes. The former is preferred because of low cost and visibility of seeds and planting dropping through them.

4) Metering unit:

It is the functional unit in a seeding machine which determines and drops the desired amount of seed in the field.

5) Ground Drive Wheel:

As the name suggests the ground drive wheel drive power from the ground for transmitting power to the metering unit.6) Power Transmission system:

The power from the ground wheel is transmitted to the metering unit through the transmission system. It may be a chain and sprocket system, gear system, belt drive, crank mechanism or a combination of two or more of the above system.

8) Agitator with Adjustable Gate

Agitators over an adjustable gate or opening provide simple metering system for seed and planting. It is inexpensive device and widely used for planting seed distribution pattern by an agitator system is not of good uniformity. However for close growing crop this system may be suitable. The agitator is usually a circular disc of rubber-impregnated canvas, for seeds and metal for planting. The weight may be of diamond shape with one fixed diamond and one sliding diamond gate so to provide an adjustable opening size to vary the seed or planting rate. A rate with caries of holes of different sizes may also be provided for varying the seed or planting rates.

9) Fluted Roller

Fluted rollers are widely used for metering seeds and many seed drills are provided with fluted roller type metering system. The flutes exposed to meter the seeds can be varied for varying the seed rate. The distribution pattern of seeds is quite uniform by a fluted roller and the system is quite suitable for metering the close growing crops. The fluted rollers are mostly made from aluminum and their specifications have been standardized. Fluted rollers are also suitable for metering granular plantings.

10) Roller with cells

Rollers with cells are suitable for dropping seeds one by one. Thus seed to seed distance in the field can be maintained. This system is suitable for planting of seeds like maize, pea, sorghum, groundnut etc.

In this system the rollers have to be changed for different crops. The cells sizes in the rollers for in hand are

separated from the seeds. Following are some of the commonly seed furrow openers used with seed planting drills.

History of Planter Development: -

Broadcasting seeds over the broken soil and covering them with some type of harrow was the common method of planting until about 1840. Willium T. Pennock of East Marlboro, Pennsylvania, was the first to start manufacturing grain drills, although the first patent was granted to Eliakim in 1799. The earliest type of row-crop planter was perhaps a wooden keg with holes around the centre to permit seeds to drop out.

Classification of Planting Equipments: -

Planting equipment is here considered to be any power operated device used to place seeds, seed pieces or plant parts in or on the soil for propagation and production of food, fiber and feed crops. It is classified as follows.

Row crop planters
Trailing
Drill
Hill-drop
Narrow-row
Rear tractor mounted
Drill
Hill-drop
Transplanter or plant setters
Broadcast crop planters
End gate seeders
Narrow and wide track and weeder mulcher
Airplanes
Grain drills
Planting attachments for other equipment

1) Row crop planters: -Planters designed and developed to plant seeds in rows far enough apart to permit cultivation of the crop are termed row-crop planter. Many row-crop planter are designed to plant seeds of only one certain crop, while others can be adapted to plant more than one crop by means of interchangeable hoppers, agitators, plates, and the speed control mechanism of the seed metering parts. Generally row crop planters can be divided into 5 classes, named according to the kind of crop the planter is specially designed to plant. The classes are corn, cotton, sorghum, vegetable, beet and potato.Equipment for placing growing plants or plant parts in the soil is called as transplanter.

2) Sorghum, pea and peanut planter: -

The eminent scientist Hurlbut found that more satisfactory seeding rates were obtained by using plates made especially for sorghum rather than by attempting to use a regular or revamped corn plate. He also found that the lower part of the plate seed hole should be taper-reamed to prevent sorghum seeds sticking in the hole and clogging it. A 15° bevel of the seed hole on the upper side helped to prevent the seeds from wedging between the sharp edge of the hole and the cutoff.

The number of seeds per pound varies with different varieties of sorghum.

3) Grain Drills: -

The grain drill is a machine designed and built to place the seeds of small grains and grasses in the ground inch & narrow rows spaced at 6 to 8 in 15.2cm apart a uniform depth. The principal parts are the main frame, transport and drive wheels, a box for the seed, a device meter the seed out of the hopper in uniform quantities, furrow openers to open the furrows for the seeds and covering devices.

Grain drills are classified as plain drills and planting drills. A plain drill has a hopper and feeds for the drilling of seeds only, while the planting drill has a large seed box which is divided lengthwise into two compartments one for seed and other for planting. Some drills are provided with grass seed attachments. The fluted force feed and the double run feed are used on both the plain and planting drills.

CALCULATION

DESIGN OF FRAME:
Let us assume that,
Weight of rice plant=5kg,
Weight of frame & other accessories=20kg,
Therefore,
Total weight of the model=25kg …….. (Assuming)
Force =W x g
=25 x 9.81
=981N
There are 4 key points as shown in the figure where total weight acts. So, considering load is distributed equally at the each point i.e. on each each link. Force acting on each link(F1)= 981/4
F1 = 245.25N
Let,
L1=Length of link 1=910mm
So, Bending Moment (M) for link 1 is given by, M =F1 x L1
=245.25 x (910/1000)
=223.17 N-m

We are using MS angle over MS flat cause MS angle has comparatively high stenght in twisting & bending than MS flat. So, Selecting MS angle of (22 x 22 x 2) mm dimension.
Calculating Moment of Inertia for MS angle (I), IG= (bd3/12)
σpermissible= (Sut/Nf)= (650 / 2) = 325 N/mm2

IG1= (22 x 23)/12 =14.666mm4
IG2= (203 x 2)/12 =1333.33mm4
y=C.G. of the system= (A1y1+ A2y2)/(A1+ A2)
y= [{(22 x 2) x 2} + {(20 x 2) x 10}] / {(20 x 2) + (22 x 2)} y= 15.76mm
Now, IP= Moment of Inertia about parallel axis.
= (IG+Ah2)
So,
IP1= (IG1+A1 h12)
= 14.666 + {44 x (21-15.76)2} =1222.80 mm4
IP2= (IG2+A2 h22)
= 1333.33 + {40 x (15.76 - 10)2} =2660.434 mm4
So, Moment of inertia (I),
I= IP1 + IP2
= 1222.80 + 2660.434 I = 3883.234 mm4
We know that,
(M/I)= (σ/y)
σactual= (M x y)/ I
= (223.17 x 103 x 15.76) / 3883.234
= 90.572 N/mm2
As, σactual < σpermissible
Design is safe.

SHAFT DESIGN:

Total Force acting on frame = 981N
As, power is transmitted to rear axle only the force acting on frame is equally distributed into rear wheel.
RA= RB =981/2 = 490.5 N
Now, considering F.B.D. of tyre,

Where,μ=Frictional force = 0.33
RN= Normal Reaction.
F1=μ x RN
=0.33 x 490.5
=161.865 N
For 2 rear wheels Resultant force,
FR= 2 x F1
= 2 x 161.865
= 323.73 N
Torque transmitted (T),
T= FR x r
=323 x (300/2000)
T=48.45 N-m
Maximum Torsional shear stress (τmax):

For shaft we are selecting C45 material.
So, for C45
Syt=Yield strength of shaft material= 330 N/mm2,
Sut=Tensile strength of shaft material= 60 N/mm2,
According to A.S.M.E. code,
(τmax)= 0.18 Sut = 0.18 x 600 = 108 N/mm2
OR
= 0.3 Syt = 0.3 x 330 = 99 N/mm2
τmax = 99 N/mm2 (Selecting minimum value),
so,
τmax = 99 x 0.75
= 74.25 N/mm2
Now,
(τmax / R)= (T / J)
Where, τmax = maximum torsional shear stress, N/mm2 R= Radius of shaft, mm
T =Torque transmitted, N/mm2
J = Polar moment of Inertia, mm4
So, substituting values we get,
(74.25 / [d/2])= ([48.45 x 103] / [πd4/32])
d3=3330.1430
d= 14.933mm
So, for safety we are selecting the shaft diameter d= 20mm.
As, Intermediate shaft also had to transmit same torque & also its length is smaller than that of rear shaft. We are selecting same material & Same Diameter of shaft 20mm.

SELECTION OF BEARING:
As load acting on bearing consist of two components Radial & Thrust.
So we have used single row deep groove bearing. This bearing has high load carrying capacity & suitable for high running speed.
Designation selected : 6204
Now, P0 = X0 For + Y0 Foa
OR
= For
Where, P0=equivalent static load, N
For = Static radial load, N
Foa = Static thrust load, N
For Single row deep groove ball bearing, X0 =Static radial factor=0.6
Y0 = Static thrust factor=0.5
Substituting the values we get,
P0=245.25N
As, C0 > P0
Design is safe.

Design of Gear.
SPUR GEAR
Module: 2 mm
Diameter: 120 mm
Number of teeth: 60
Width of tooth: 16 mm

SPUR PINION
Module: 2 mm
Diameter: 60 mm
Number of teeth: 30
Width of tooth: 16 mm
Where,
P = pitch
D = pitch circle diameter of sprocket
α = the pitch angel
α = 360/Zi.e. 360/13= 27.7
Z = number of teeth on sprocket.
Sin α /2 =
The velocity ratio of chain is given by
Where I = nl/n2 = Z1 /Z2
n1, n2 = Speeds of driving and driven shafts (R.P.M.)
Z1, Z2 = Number of teeth on driving and driven shaft the average velocity of the chain is given by

V= π x D x n/60 x 103
V = Z x p x n/60 x 103
V = average velocity in meter/sec.
The length of chain is always expressed in terms of numbers of clanks. L= Ln x P
Where
L = length of chain in mm
Ln = number of link in the chain

The numbers of links in the chain are determined by the following relations Ln = 2(a/p) + (Z1 + Z2 / 2) + (Zn- Z1 / 2xπ) x p/a
Where
a = center distance between axis of driving and driven Sprocket.
Zl = Number of teeth on Smaller sprocket.
Z2 = Number of teeth on larger Sprocket.
a = P/4{[Ln -(Z1 – Z2 / 2)] + ([Ln - (Z1 + Z2 /2)]2 - 8 [Z2-Z1/2Xπ]2)A1/2}
2.2) Power retaining of roller Chain
The power transmitted by the roller chain can be expressed by the elementary equation
KW = Pl X V/ 1000
P1 = Allowable tension in chain
V = average velocity of chain
In automobile the chain is lubricated by oil and grease. But after some time the dust particle adhere on chain and goes in between roller and bushing and pins.
Therefore it's necessary to clean the chain and re-lubricate it to improve its life.
The wearing of chain also happens due to the following reasons.

Design of shaft
The shaft is subjected to fluctuating Loads, so shaft is under combined Bending and Torsion.
Therefore,
The equivalent Twisting Moment.
Te = [(km× M) 2 + (kt × T) 2] l/2
The equivalent Bending Moment.
Me= ½ [km × M + {(km x m) 2 + (kt X T) 2} l/2]
Where,
Km = Combined Shock and Fatigue factor for bending.
Kt = Combined Shock and Fatigue factor for torsion.
For Rotating Shaft

Gradually Applied Load	1.5Km	1.0Kt
Suddenly applied load with minor shock	1.5 to 2.0km	1.5 to 2.0Kt
Suddenly applied load with Major Shock	2.0 to 3.0km	1.5 to 3.0Kt

So we consider the load on chain drive maximum 15kg.

SELECTION OF BEARING:
As load acting on bearing consist of two components Radial & Thrust. So we have used single row deep groove bearing. This bearing has high load carrying capacity & suitable for high running speed.
Designation of bearing : 6000 .

Conclusion

The economy is the most highlighting feature of this machine as it does not require any electric power & is independent of tractor or bullocks which are unaffordable to poor farmers. Farmers face the problem of non-availability of bullocks as well as tractors during the peak period of sowing. Hence, they are tempted to hire them at an increased cost. By making use of manually operated seed cum planting drill, the yield loss can be substantially decreased. The most important advantage of manually operated seed cum planting drill is that - it can be easily driven by a single person. There is hardly any problem of manpower in rural areas where the average size of the family is large. Thus, if 2 to 3 people are employed for the sowing operations, the area coverage can be increased. The low cost of the machine as well as its ability to carry out planting, is certainly a boon to the farmers thereby saving much of their time.It results in almost 60 % saving in operational cost and 15% saving in plant requirements. If the machine is commercially exploited, it can be proved to be beneficial to poor farmers**.**

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