

Design And Development Of Manually Operated Cotton Seeding Machine

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Abstract

India is a developing country and agriculture field is backbone of Indian economy. The involvement of technology in agricultural field will have great impact in reducing the consumption of input resources and effective utilisation of them. Cotton is one of the major plant taken in India. Conventional cotton sowing methods requires much physical efforts, labour, money and time. Also it has specific requirements has to be fulfilled such as depth of sowing, distance between two crops as well as rows has to be maintained. There are various machines available for separating cotton from cotton lint. But no machine is available for cotton sowing. So the invention is related to design of manually operated cotton sowing machine by which we can maintain distance between two crops and two rows, depth of sowing seed, and also adjust the distance for variety of seeds with the help of chain sprocket mechanism.

This machine hence will not only fulfil all the requirements but also it will be affordable to the farmers.

Keywords: Cotton plantation, Reduction of input sources, chain and sprocket, efficient economy.

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I. Introduction:

India is developing country and agriculture field is backbone of Indian economy. The involvement of technology in agricultural field will boost the field with maximum outputs such as production of agriculture and efficiency but with minimum inputs. The inputs can be in the form of money, man power, material, equipment and energy used etc. So it will have great impact in reducing the consumption of input resources and effective utilization of them.

Cotton is one of the major plants taken in India. There are various machines available for separating cotton from cotton lint. But no machine is available for cotton seeding. There are machines available like tractors or bullock driven carts for cotton sowing but they are very robust, not economical for the small area farmers and has wide limitations. Hence to have cotton plantation with minimum efforts and energy, a need arises for a machine which will fulfill all the requirements of cotton sowing and which will overcome the limitations of available traditional machines. Hence with this technology farmers will able to complete the cotton plantation in minimum time, money, labor and efforts.

The machine is manually operated and having two wheels at its two ends for support and as a prime mover. With the help of chain and sprocket mechanism it will drive driving shaft which contains seed carrying and distributing mechanism. Also simultaneously digging and covering of soil is carried with the help of digger and planer.

Hence, it reduces expenses with good amount of production and less labor, money and time. In future, it can be automated and expanded from two seed carrying mechanisms to multiple. It can be attached to tractors for larger areas and mass production is also possible.

II. Optimum planting conditions:

Environmental conditions:

a) Temperature:

For optimum cotton germination, the soil temperature should be at least 20 degree Celsius.

Along with warm soil temperatures, it is important to plant cotton seed when there is a favorable five day forecast. If cotton seed does not receive warm favorable conditions in the first five days of after planting, the potential for delayed emergence increases which can lead to reduced stands, yield loss and increased risk of seedling diseases. The time required for germination of seed will depend on soil texture, color, moisture and ground cover.

b) Moisture:

Along with soil temperature adequate soil moisture and high soil oxygen concentration are favorable for germination. Saturated soils can inhibit the root growth, leaf area expansion, and photosynthesis process. Young plants may developed yellow leaves due to slowing of photosynthesis. The longer an area may remain saturated, the higher the risk of plant death.

c) Soil:

Soil compaction takes place when soil particles are pressed together resulting in less pore space and increased soil density which will decrease seed germination, root and plant growth. Soil crusting occurs when a crust layer forms on the soil surface as wet soils dry. A rotary hoe can break up the crust and aid seedling emergence.

Requirements of cotton sowing:

- Land preparation
- Mapping of land
- One seed should drop at a time.
- Distance between two rows and two seeds should be fixed which will vary from variety of seeds.
- Covering of soil after sowing.

Cotton planting parameters:

- Type of land: Fertile land
- Depth of sowing: 5 cm
- Only one seed at one place
- Distance between two crops is 1.5 feet=45 cm
- Distance between two rows is 3.5 feet=105 cm

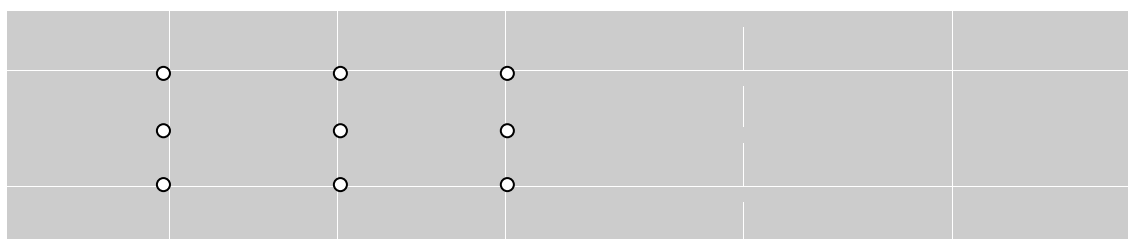


Fig. No. 1 Land Mapping

III. Problems with existing machines:

The traditional machines like bullet carts are available but they are very robust. Another is Padgilwar Private Ltd. which is private agricultural equipment manufacturing company. It is portable cotton seeding machine. It is hand pump type and pick and press machine.

It has following limitations:

- Mapping
- Lifting and locating of machine
- Covering of soil
- Multi seeding (Wastage of seeds)
- More time consumption
- More physical efforts involved
- Time and money consuming process

IV. Mechanism of manually operated cotton seeding machine:

The technology is designed in such a way that all the operations like digging, sowing of seed and covering of soil over seed will be done continuously in an appropriate sequence. The model created on modeling software 'Solid works' of manually operated cotton sowing machine is shown in fig.no.4 It rests on driving wheel, consists of two shafts-one is driving and another is driven. Chain mechanism is used to drive the shaft. A disc is mounted on driven shaft in which seed will be placed. Casing will cover the disc which is rotating with shaft. A seeds carrying hopper around one or two kg is mounted on a casing. On the front side of the machine diggers are mounted and on rare side planers are mounted on a frame which is a supporting structure of a machine

When person pushes machine with the help of handle, driving wheel rotates and when it completes one revolution, driving shaft makes one revolution. With the help of chain drive mechanism driven shaft will also make one revolution and seed will be dropped at a required distance. According to companies of seeds distance between two crops along the rows as per the requirement is maintained by having number of sprockets on driven shaft. Hence shifting the chain required distance between two rows is obtained.

First the digger mounted will dig a straight line on a land. Hopper carrying seeds will shake due to vibrations and seed will be dropped in a cavity. Once the seed is dropped in a cavity on a disc from hopper, the disc will carry it downwards as it is rotating with driven shaft. Below the disc one pipe is attached to provide further path to a seed. Seeds will be dropped in a line on some distances. Machine will move forward and planer will cover the soil on a dropped seed. Likewise whole area will be sowed easily with less human efforts and in less time very effectively.

V. Solid Modeling on Solid Works:

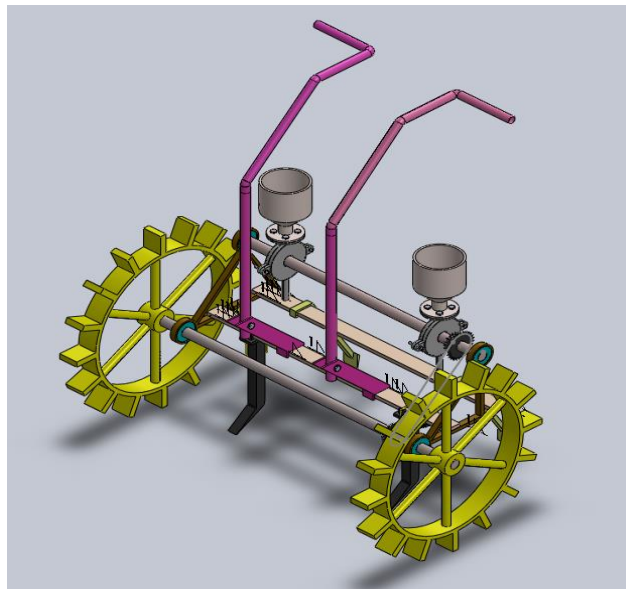


Fig. No. 2 Solid Model of Cotton Seeding Machine

VI. Design Methodology:

Widely used Cotton Seeds in Maharashtra

Table no. 1 Distances between rows and crops according to companies.

Sr. No	Name of Company	Distance between 2 Crops (C),mm	Distance between 2 rows (R), mm
1	Mahyco	600	1500
2	Kaveri	600	1200
3	Nuziveedu	300	900

These distances are the references for designing of our mechanism.

Design Specifications:

- For designing, first we fix two constraints
 1. Wheel diameter by taking circumference of wheel as equal to distance between two crops = 900 mm.
 2. By measuring sizes of different types of seeds by vernier caliper we got average range of size of seeds
Height= 6 to 10 mm
Width =4 to 6 mm
From that we decide size of cavity on disc.
- With reference to size of cavity, diameter and thickness of disc is designed.
- With minimum clearance, casing is designed to cover the disc.
- Chain-sprocket is designed as per required speed ratios.
- Shaft is designed considering 70% load acting on driving and driven shaft.
- From the digging force required, digger and planer is designed.

- For supporting whole structure, frame is designed and remaining 30% load is considered to be acting on frame.
- Height of handle is decided by taking in consideration of ergonomics of machine.
- Length of machine is designed by fixing one of the distances between two rows and according to ergonomics of machines. Remaining distances are made adjustable.

Designed dimensions:

Diameter of wheel=350mm

Diameter of disc=150 mm

Thickness of disc=30 mm

Diameter of driving shaft =30mm Diameter of driven shaft=20 mm

VII. Selection of Materials:

Various parts of machine and selected standard materials are as follows:

- Shaft , Digger , Planer , Handle , Frame : Mild Steel
- Casing , Hopper : Aluminium Alloy
- Disc : Nylon

VIII. Future Scope:

Increment in number of rows

- Seeding with fertilization
- Coupling to tractors
- Advancement in materials
- Automation of machine

IX. Advantages:

- Continuous digging, sowing and covering itself by machine
- Crop distance will be maintained automatically
- Only one seed sowed at a time, wastage of seeds avoided
- Mapping time can be eliminated
- Multiple rows seeding can be possible
- Effective man hours and cost reduction

X. Conclusions:

Various machines available for cotton seeding but this technology will really helpful to farmers in having higher amount of output in terms of productivity and less consumption of resources.

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