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Development of Ginger Sowing Machine

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ABSTRACT: Agriculture is the most important sector in India and the most important source of employment. In farming process, all farmers often used conventional seeding operation takes more time and more labour. The ginger feed rate is more but the time required for the total operation is more and the total cost is increased due to labour, hiring of equipment. The conventional ginger sowing machine is less efficient, time consuming. 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. Agriculture in India has a significant history. Today, India ranks second worldwide in farm output especially in ginger production. This report deals with the sowing methods used in India for ginger sowing. As day by day the labour availability becomes the great concern for the farmers and labour cost is more, this machine reduces the efforts and total cost of sowing the seeds and fertilizer placement. This project work focused on the design and fabrication of a manually operated planter sowing for different crop seed that is cheap, easily affordable by the rural farmers, easy to maintain and less laborious to use.

KEYWORDS: Ginger sowing machine, Cultivation, Agricultural technology, Objectives, CAD Model, Transplanter.

I. INTRODUCTION

Despite India is leading country in agriculture but still being using the traditional agricultural technology. The farmer in India still doesn't use the modern machines in their production whether it may be in crop yielding or seed sowing. The use of hand tools for land cultivation is still predominant in India because draft animals and tractors require resources that many Indian farmers do not have easy access to. The need for agricultural mechanization in India must therefore be assessed with a deeper understanding of the small holder farmer's activities. Considering ginger planting in India, here a farmer follows manual operation like sowing ginger in furrows and taking it out from the ground by his own hands. This seems to be tedious and unwanted job for a farmer and it also consumes more time. The result of which is low productivity of the ginger crops. It is therefore necessary to develop a low-cost ginger planter that will reduce tedium and boring and frustrating work and enable small holder farmer to produce more yield and also environmental friendly. The multi-crop planter has the capability of delivering the seeds precisely with uniform depth in the furrow, and also with uniform spacing between the seeds. The ginger planter consist of the main frame, adjustable handle, seed hopper, seed metering device, furrow opener, furrow closer, drive wheels, seed tube and ball bearings.

II. LITURATURE SURVEY

1. Design and Fabrication of Ginger Harvesting Machine. This machine has three main parts namely, ginger digger, screener and power transmission system. The screener will not only separate ginger from soil but also not let the ginger get harmed. The screener also uses for collectible part, to make this machine need some power transmission

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system from the engine. This machine needs Auto front petrol engine with rotation speed 20 - 25 rpm approximately with the aid of gear reduction.

2. The Design and Fabrication of a Manually Operated Single Row Multi - Crops Planter This project work focused on the design and fabrication of a manually operated planter sowing for different crop seed. The multi-crop planter has the capability of delivering the seeds precisely with uniform depth in the furrow, and also with uniform spacing between the seeds.

III. PROBLEM DEFINITION

Ginger is important spice crop in India and accounts for 45% of the worlds ginger production. Presently plantation of ginger is done manually, for sowing of ginger 15 cm depth in the soil is required. Conventionally, labours have to dig the soil to sow ginger. This is tedious, time consuming and back breaking task due to regular bending posture at the time of sowing. After detail study of ginger plantation process we have decided to work on this problem and came up with a ginger sowing machine. This machine will not only used for ginger sowing but it also will be used for sowing of potato and turmeric.

OBJECTIVES

Ginger planter can perform following functions:

- Open a furrow;
- Meter the seed (ginger);
- Deliver the seed (ginger) and place it appropriately in the furrow.

IV. PROPOSED DESIGN

- The designed ginger sowing transplanter is motor operated machine developed for sowing ginger or some other seeds in the furrows. It seems well easy to operate even for farmers in the rural areas.
- The ginger planter is consisting of the adjustable handles, seed hopper, furrow opener or plough, transport wheels, seed discharge tube, Furrow covering device, and seed metering wheel housing, chain and sprocket, which are explained below;

V. METHODOLOGY

- This two-row ginger sowing machine ensures the proper sowing of ginger seeds in the furrows by the two furrow openers.
- It is provided with the two metering tubes upon the furrow after the plough tool (furrow opener). This also ensures the uniform placement of the ginger seeds in the furrows in row by row spacing.
- The ginger seeds can be placed 15 cm apart from each other or can be adjusted as required so the plough tools are kept adjustable making it efficient for various kinds of works.

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➤ MATERIAL SELECTION

Table 1: Specification of Sowing Machine

Sr. No.	Components	Material	Qty.
1	Frame	M.S. flat bar	1
2	Seed Hopper	M.S. Sheet Metal	1
3	Seed Discharge Tube	Plastic	2
4	Adjustable Handle	M.S. Flat bar and Circular pipe	1
5	Plough (Furrow Opener)	M.S. flat bar	2
6	Furrow Closer	M.S. Sheet Metal	2
7	Wheels	CI	2
8	Sprocket	Medium Carbon Steel	9
9	Chain Drive	Malleable Links	3
10	Engine	Std.	1
11	Silencer	Std.	1
12	Carburettor	Std.	1

VI. PROPOSED DESIGN

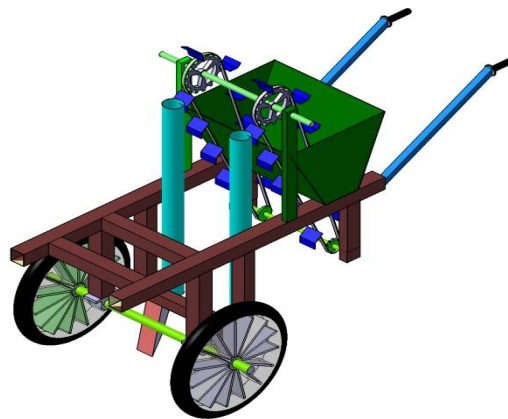


Fig 1: CAD Model of Ginger Sowing Machine

This is a CAD model of ginger sowing machine. The machine is power driven. The engine is mounted on the front. The capacity of the hopper is about 10 kg. We provided a SUZUKI 150 cc engine.

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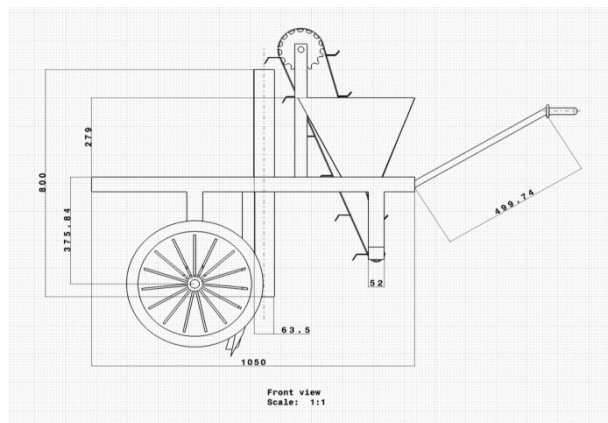


Fig 2: Side View of Ginger Sowing Machine

This is a side view of ginger sowing machine. The wheels are made of cast iron and have diameter of about 900 mm. All other dimensions are as shown in Fig 2. Gear and clutch arrangement is also provided for easy working in the farm.

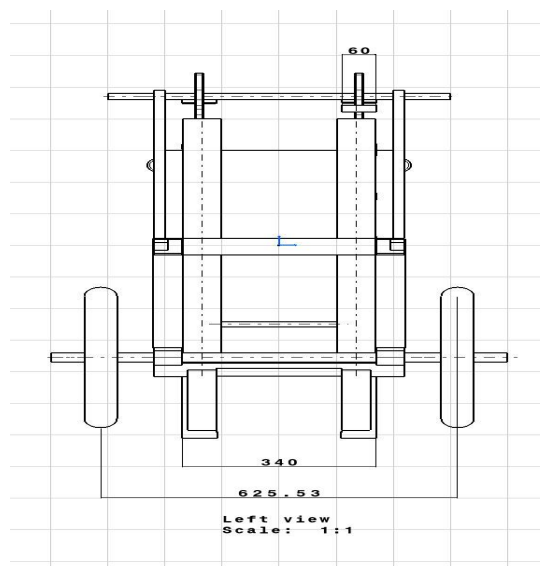


Fig 3: Ginger Sowing Machine

The fig. 3 shows the front view of the ginger sowing machine. As shown the pipes and plough tools are 300 mm apart as requirement. The cups are made of MS sheet metal and width of these plates is 600 mm to carry ginger from the hopper and throws them in pipes.

VII. COMPONENTS DESCRIPTION

- Hopper is made of M.S. sheet metal which approximately holds 15 kg of ginger. The hopper is welded on a frame as per the design model. The length of the hopper is about 430 mm and the upper width is 380 mm. As being it is

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conical the lower width of the hopper is 130 mm in length. The hopper is made such that it has two square holes of about 70 mm length and 300 mm apart. We selected aluminum sheet as it has low weight. The chain in drawn in between the square holes and collects the ginger with the cups welded to the chain.

- The shaft is attached to the main frame with bearings which takes the whole weight of the overall body. The tire wheels are provided at some distance apart as they run through the furrows without damaging them.
- The ginger sowing machine has two plough tools for digging the soil and open the furrow as required for the sowing of ginger. The distance between these two plough tools is 300 mm as we required the ginger to be placed 300 mm apart. These plough tools have been welded to the main frame rigidly. The plough is made of MS flat bar as it bears the load and stress by the soil.
- The ginger sowing machine is provided with two PVC pipes as shown. They are approximately 700 mm long and approximately 60mm in diameter. The pipes are bolted behind the two plough tools which exhibits proper ginger feeding as the plough tools open the furrows. On the upper side of the pipes two sprockets are provided which rotates and alternatively collects and feeds the ginger into these pipes with the help of the cups welded to the chain. This plastic pipe feeds the ginger properly into the furrows. The sprockets rotate in such a way that the ginger send to the pipes that they will drop in the furrows at 300 mm apart periodically

VIII. FINAL ASSEMBLY OF THE MACHINE

This is our final assembly of the ginger sowing machine. The plough tools are provided in front for digging of soil or making furrows to dig the gingers. The two pipes are provided behind the plough tools which are 30 cm apart. The chain mechanism collects the ginger from the hopper and throws them in pipes dropping them in furrows as required. The soil feeder is assembled at the rear to cover the ginger seeds. Fig. 4 shows the final assembly of ginger sowing machine.



Fig 4: Final assembly of Ginger sowing machine

IX. SPECIFICATIONS

Type: Two rows, Power drawn
Overall length: 2000 mm
Overall height: 1500 mm
Overall width: 600 mm
Approximate weight: 100 kg
Hopper capacity: 10 – 12 kg
Row to row spacing: 300 mm

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Metering mechanism: chain, wheels and cup arrangement through pipes
Power transmission: Through chain and sprocket from ground wheel
Furrow opener: Shovel type

X. RESULT AND DISCUSSION

Table 2: Comparison with Traditional Process

SPECIFICATION	LABOUR	GINGER SOWING MACHINE
Man power	About 5 - 7 labours required per acre	1 labours required
Time	Take more time	Less time as compared with labours and same as tractors do
Stresses	More stresses on labours in the farm	Less stresses on machines
Labour Cost	In today era the labour cost is more	Labour cost is less since machine is handled by only one person
Total cultivation time	Over 20 labours required for sowing ginger per acre in a day	Approximately 3-4 hours needed to sow ginger per acre
Cost	Labour cost can be over Rs.2000 per acre	For fuelling, this costs around Rs.500 per acre
Types of Machines	----	Developed ginger sowing machine
Purchasing cost of machines	----	Estimated cost is Rs. 25000
Rated Power	----	9hp

Results are graphically shown below;

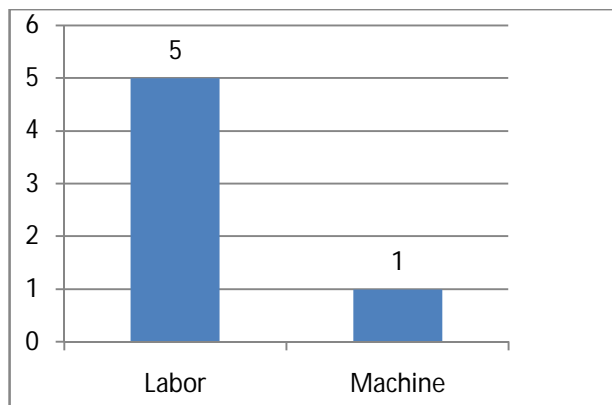


Fig 5: Manpower require in manual ginger sowing process and using machine

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The fig. 5 shows the graph shows the graph of manpower required in manual ginger sowing process and using machine. Only one man required for driving the ginger sowing machine where as more than 5 people required for each type of work like digging the soil , make furrows, dig the gingers and cover them up eventually.

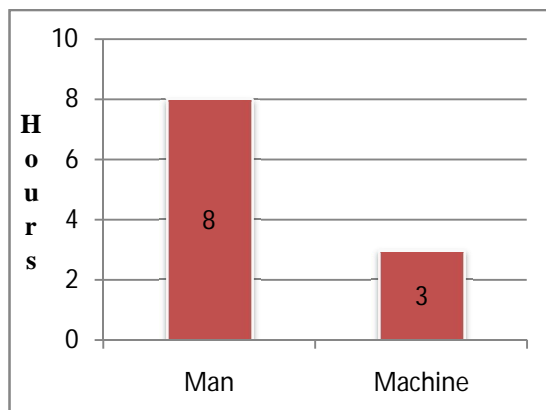


Fig 6: Total cultivation time in manual ginger sowing process and using machine

The fig. 6 shows the graph of cultivation time in manual ginger sowing process and using machine. As the ginger sowing machine is fast and do all work required for sowing the ginger, it takes less time as compared with the man who do each work independently.

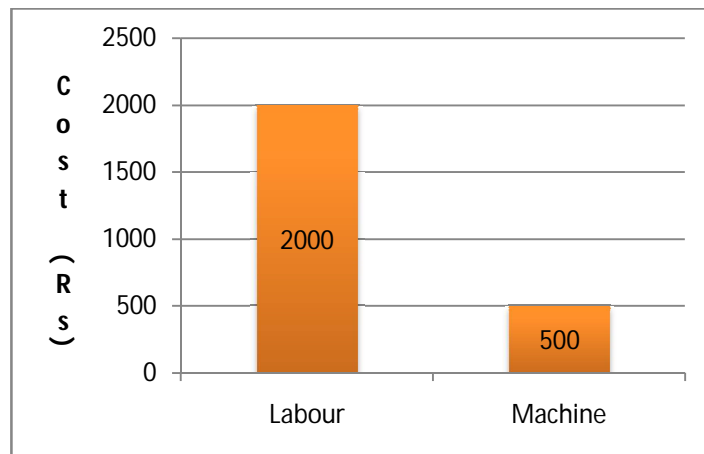


Fig 7: Total cost required for manual ginger sowing process and using machine

The fig. 7 shows the graph of Total cost required for manual ginger sowing process and using machine. As in manual process more men are required for each work the cost expenditure is more. But for machine only we have to spend money on fuel which is less than the labour cost.

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XI. CONCLUSION

This work focused on the design and development of ginger sowing machine that is cheap, easily affordable, easy to maintain and less laborious to use. This will make farming more attractive and increasing agricultural output. Thereby eliminating complexities which increase cost and increasing efficiency at a highly reduced cost. The mechanization of agriculture not only reduces the overall cost of production but increases total agricultural yield. The ginger sowing machine is one of the mechanizations. It is suitable for sowing other seeds like turmeric, garlic and even potato.

This sowing machine is cost effective to the rural farmers as to expend only Rs/- 25000- 30000. This is very less compared with the power tillers and tractors which cost over Rs/- 50000 and even above 3 to 4 lacks.

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