

Design and Development of Single Pass Seedbed Preparation Attachment for Low Power Tractors

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Abstract – Since 1960 the technology is being used in agriculture sector. India have approximate 80% of small and marginal agriculture land holders (farmers). Small land farming (less than 5 acres) has limitations with respect to the use of existing instruments which are designed for comparatively bigger farms. Presently low powered tractors and their attachments are being used. eg. Cultivator, rotavator and sowing unit etc. In farming the seedbed preparation is the key procedure which includes removing of residual crop, spreading compost manure, cultivating and loosening of hard land. Presently all these processes are carried out separately. This leads to loss of time and increase in cost for seedbed preparation.

This project an attempt is made to reduce the time and cost required for seedbed preparation. designing attachment to the existing rotavator unit which will combine three operations i.e. Cultivation, spreading of compost manure and mixing- loosening land by rotavator. This attachment will reduce the cost and time for seedbed preparation.

This paper deals with design analysis and optimization of single pass seedbed preparation attachment for low powered tractors.

Keyword- low power tractor, seedbed, single pass cultivator, rotavator, compost manure.

I. INTRODUCTION

India has 59% population depends on agriculture activities. Out of that 80% are having small or marginal lands. Targeted population has limitation in used of modern technologies/instruments for farming. This leads to poor farming results in less production. Existing machines are designed for big farms these instruments cannot be used by small land holders.

Prior sowing seedbed preparation is being done which includes the removal of residual crops, mixing of compost manure and loosening of land. Presently these processes are done separately by cultivating, manual collection of residual crop, manual spreading of compost manure and rotavating the farm. These processes are rigorous, laborious and costly.

In present scenario shortage of skilled and timely availability of labor and cost of land preparation are serious problem faced by farmers.

II. CONCEPT, CONSTRUCTION AND WORKING

In view of above mentioned problem an effective machinery to be designed for small land holders in affordable price, which can perform several operations together by using existing low power tractors.

The attachment developed in this project is a combination of cultivator, hopper and rotavator in series. Cultivator which will first plough the land then hopper will drop the compost through feeder driven by track wheel, the lumps of soil and compost will mixed together by rotavator.

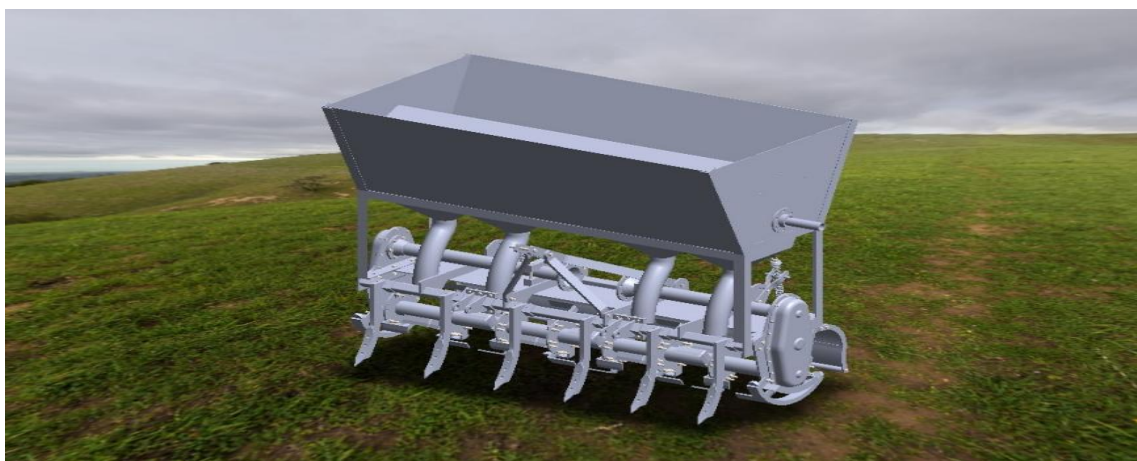


Figure 1. CAD Model of modified rotavator (Combocator) in solid works

III. DESIGN

For design, first the field work carried out, taken parameters of the existing rotavator. Material for different elements has been decided. Manual design calculations for critical element of Hopper, Frame, Shaft for the screw, cultivator (chisel) shares and driving chain being carried out. CAD Model made with the help of solid works. Design has been carried out and dimensions are determined using basic theories of machine design. The dimensions of various elements are given below.

Dimensions of different elements:

A. Hopper and frame:

Length (MM)	Breath (MM)	Height (MM)	Calculated volume (M ³)
1870	957	650	0.733

Angles Bars of 50MM X 50MM.

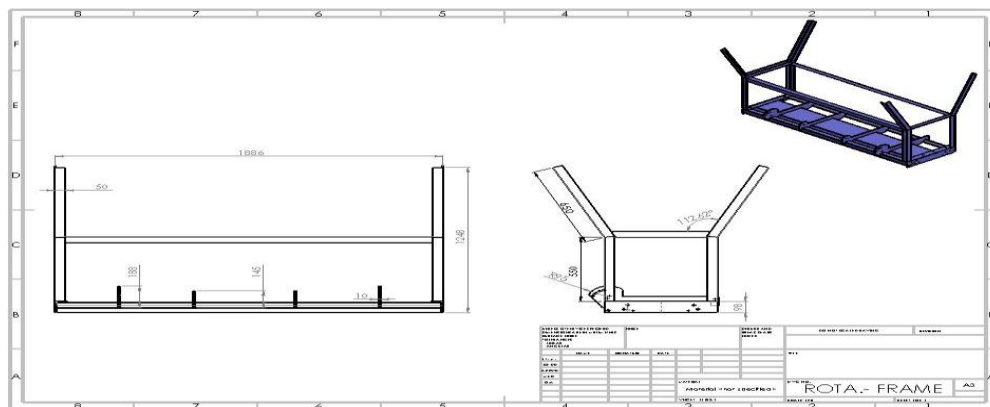


Figure 2.Hopper Frame

A Shaft for the screw (Hollow)

OD = 50MM, ID= 40MM, Wall thickness = 5MM

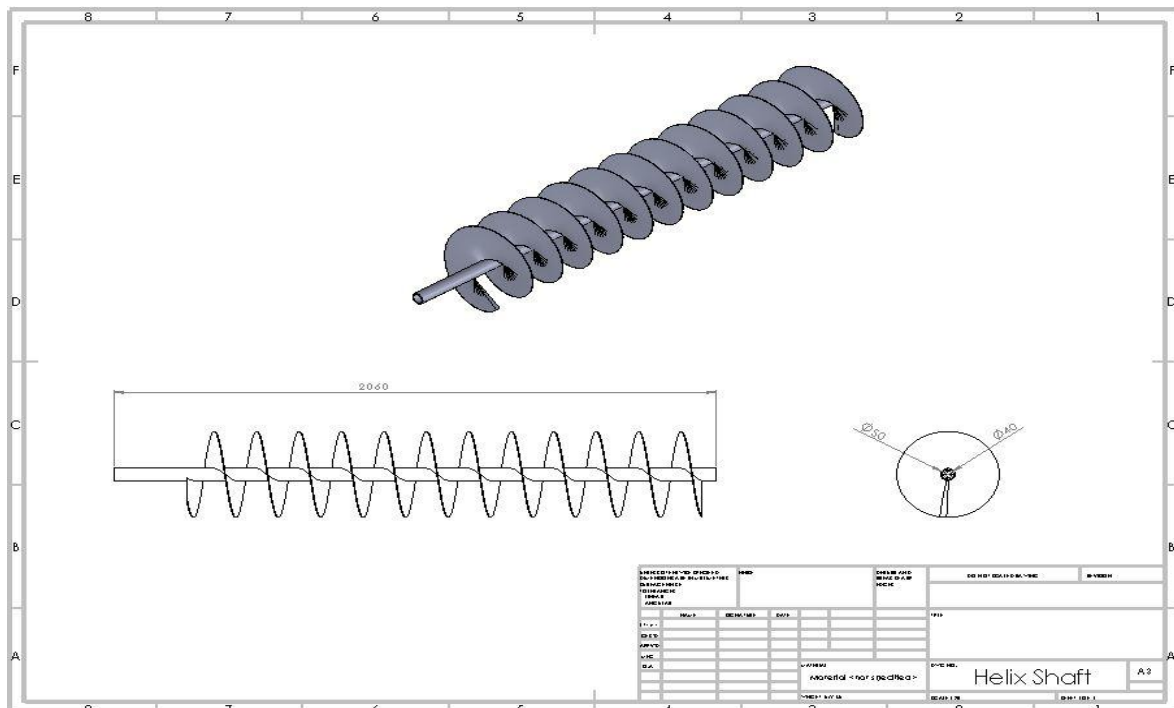


Figure3.Helix shaft

B. Chisel Shares(Leg):

No of chisel	Breath (MM)	Height (MM)	Thickness of chisel (MM)
9	20	100	14

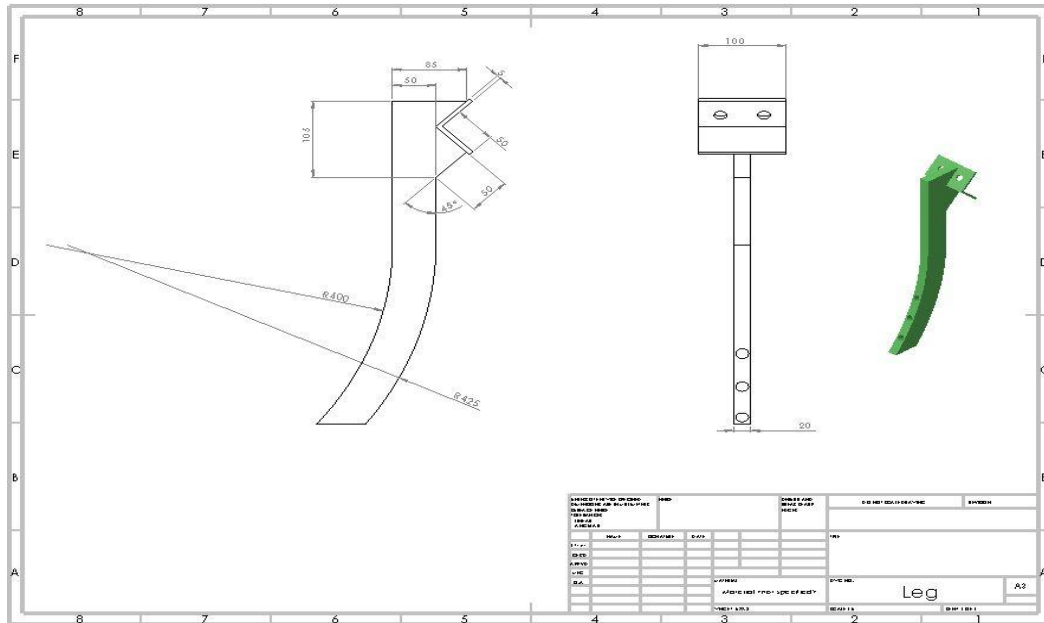


Figure 4.: Chisel Leg

C. Chin and sprockets:

Chain No.	Link Pitch length (MM)	Sprocket Diameter (MM)	No. of teeth on sprocket	Chain Length (MM)
100	31.74	105.39	30	1788

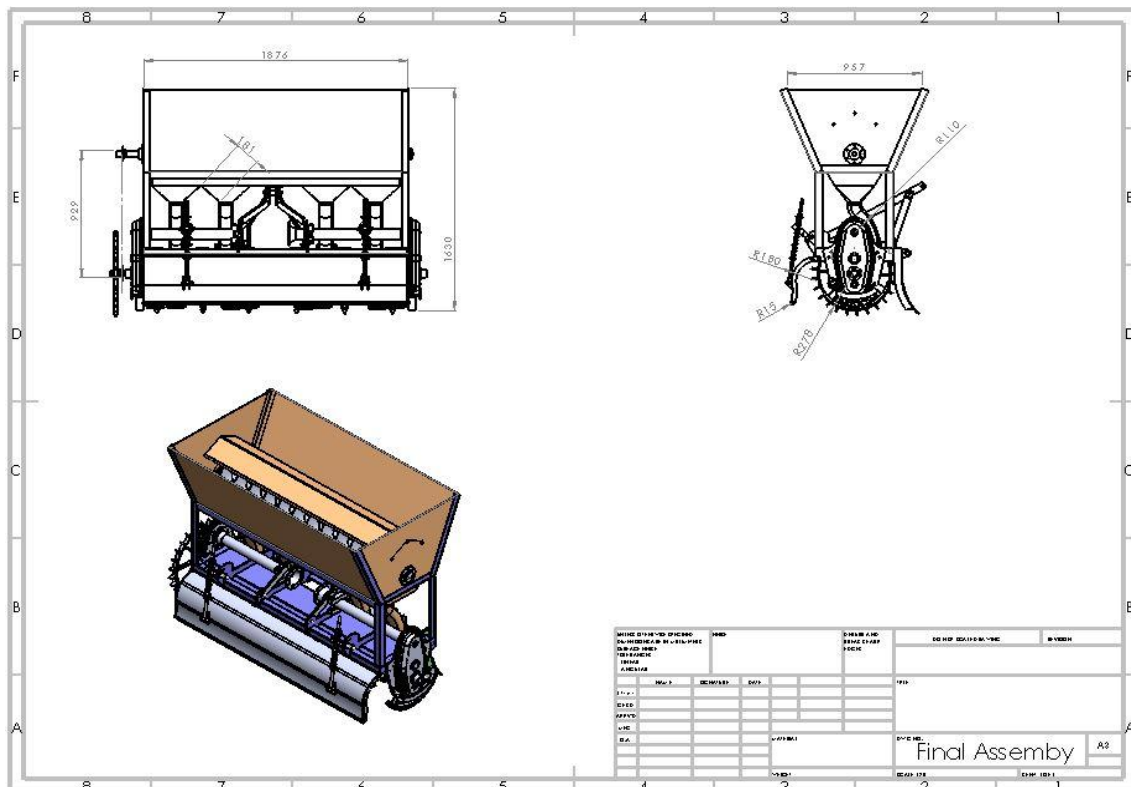


Figure 5:Final Assembly

IV. ADVANTAGES

1. Simple in design, construction and manufacturing.
2. Can be used in small and marginal farms
3. Less time consuming due to the combinations of three operations.
4. Cost effective as three operations are done together.
5. Uniform distribution of compost manure throughout the land.

V. DISADVANTAGE

1. Heavy in weight as compare to the simple rotavator.
2. Hopper will require frequent loading of compost manure as the hopper capacity is limited.
3. Cannot be used in slushy/ wet lands.

VI. RESULT

The design of modified attachment is done and checked with standard materials available in market. It is observed that the design is suitable for different quality of soil.

VII. CONCLUSION

The attachment discussed in this paper is design and develop with reference to low power tractor. It is seen that the design of this attachment unit is feasible.

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