A PRESENTATION ON

MODIFICATION AND DEVELOPMENT OF SEED PLANTING MACHINE

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INTRODUCTION

- The seed drill allows farmers to sow seeds in well-spaced rows at specific depths at a specific seed rate; each tube creates a hole of a specific depth, drops in one or more seeds, and covers it over.
- This invention gave farmers much greater control over the depth that the seed was planted and the ability to cover the seeds without back-tracking. This greater control meant that seeds germinated consistently and in good soil. The result was an increased rate of germination, and a much-improved crop yield

PROBLEMS FOUND IN CURRENT SITUATIONS

- The field is seeded by throwing the seeds over the field there was not a right depth nor proper distance Seeds that landed in the furrows had better protection from the elements, and natural erosion or manual raking would preferentially cover them while leaving some exposed. The result was a field planted roughly in rows.
- Seeds that land outside the furrows will not have the growth shown by the plants sown in the furrow, since they are too shallow on the soil. Because of this, they are lost to the elements. Much of the seed remained on the surface where it never germinated or germinated prematurely.

LITERATURE REVIEW

1. Literature Review:- A computer-vision based precision seed drill guidance assistance

The position was measured by a machine vision system and used in a feedback control loop. Sources of systematic errors were also identified as linked to the geometric considerations. Their correction requires an accurate mounting of the camera, which may be possible for a serial montage.

2. Literature Review:- Comparison of vertical and lateral seed distribution of furrow openers using a new criterion

For a furrow opener of a seeder, the ability to place seed at a given sowing depth in the soil is an important factor in evaluating its performance. Furrow openers directly affect sowing depth and lateral seed scatter of seeds. The aim of this study was to compare the performance of furrow openers by characterizing the spatial distribution of seeds within the seedbed. A field experiment was conducted to determine the effect of furrow opener type (shoe, hoe, single disc and double disc) on sowing uniformity according to conventional and developed evaluation criteria.

3. Literature Review:- Evaluation of performance of furrow openers of combined seed and fertilizer drills

A performance index was developed for the furrow openers of combined seed and fertilizer drills on the basis of output, quality of work and energy input. Compaction of soil at seed depth, subsoil distribution patterns of seed and fertilizer, soil coverage and row roughness were considered as measures of the quality of sowing and were correlated with the emergence rate. Laboratory tests were also conducted to compare the performance of seven openers, employing shoe, shovel or hoe designs, on a basis of the performance index. Draft requirement of openers was found to increase with opener width and boot wedge angle, whereas lateral and vertical separations between seed and fertilizer were influenced by transverse tube spacing and boot geometry, respectively. A hoe type opener having 30° wedge angle, 40 mm transverse tube spacing and a baffle plate at its boot performed better than other openers.

DESIGN PARAMETER

Main Components And Its Design

1) Base Frame:

- The main function of base frame is to support the seed box on it.

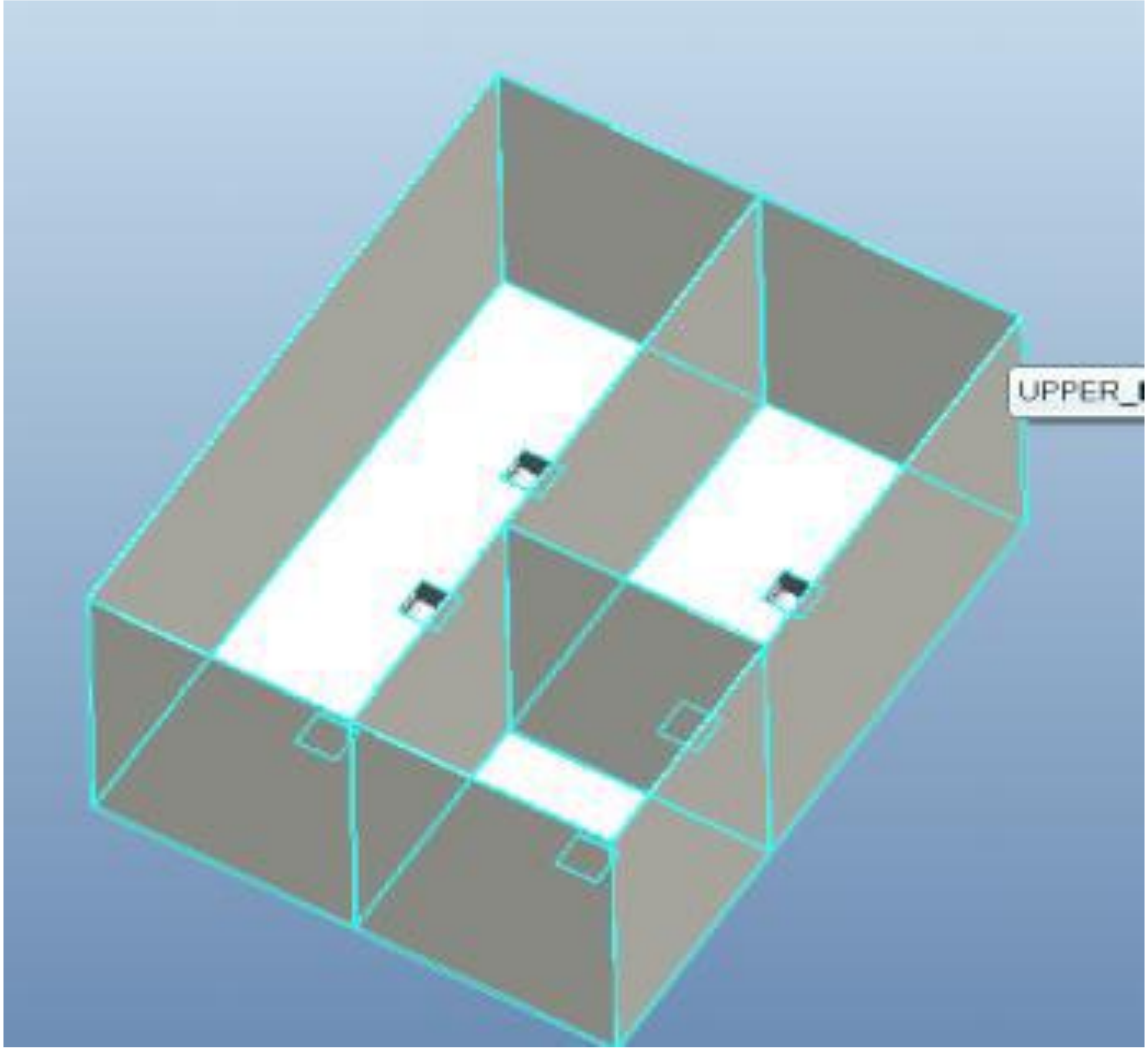
- Base Frame should be made such that it can carry the whole weight of the machine and should remain stable during operation.

❑ Specification Of Base Frame:

- Dimension: 760 x 520 mm
- Material: MS Angle 50 x 50 x 6 mm
- Weigh t/m: 4.5 kg/m
- Total weight of base frame: 9.4 kg

2) Seed Box:

- The seed box is made of HR sheet 2 mm thick.
- The box is designed on the basis of area of land.
- The box is located above the base frame.
- A partition is provided along the length of the box to separate seed and fertilizer.



Seed Box

❑ Specification Of Seed Box:

- Material: Mild steel 2 mm thick
- Dimension: 540 x 420 x 285 mm
- Weight: 7.3 kg

3) Chain Drive:

- Chain drive consist both chain and sprocket wheels.
- The length of chain

$$L = 2C + \frac{N_2 + N_1}{2} + \frac{(N_2 - N_1)^2}{4\pi^2 C}$$

- Where C is center distance for given chain length.

- The exact theoretical center distance for a given chain length, again in pitches, is

$$C = \frac{1}{4}\left[L - \frac{N_2 + N_1}{2} + \sqrt{\left[L - \frac{N_2 + N_1}{2}\right]^2 - \frac{8(N_2 - N_1)^2}{4\pi^2}}\right]$$

- Where N1 and N2 is the number of teeth on small and large sprocket wheel respectively.

- The pitch diameter of a sprocket with N teeth for a chain with a pitch of p is

$$D = \frac{p}{\sin(180^\circ / N)}$$

Chain Drive

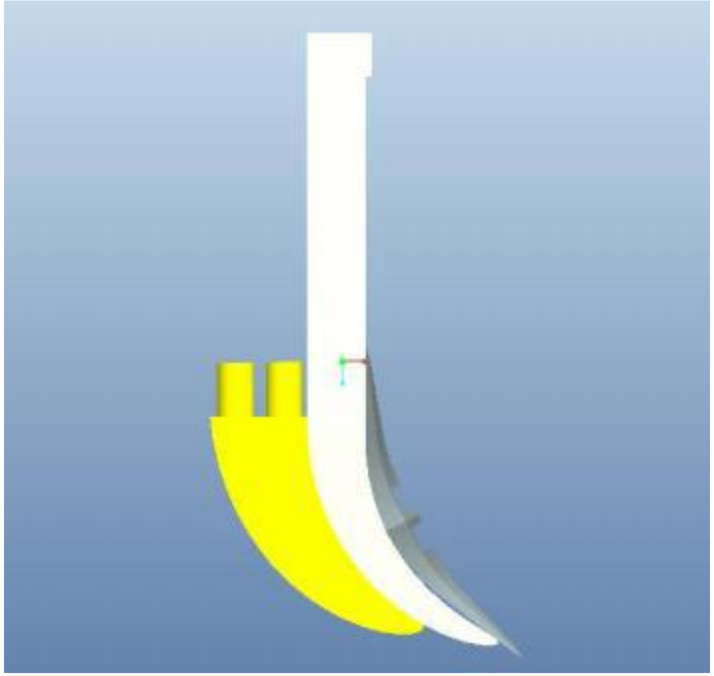
DESIGN OF SHANK FOR SHOVEL OPENER

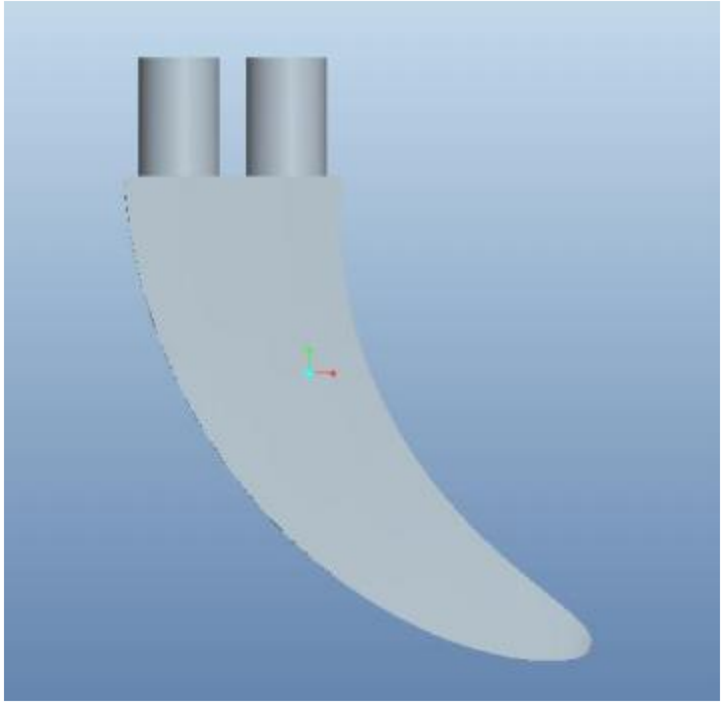
Let,

b = width of shank

h = height of shank

L = length of shank





- Force exert on the opener is
  D = Ko x w x d
  Where,
  D = Draft force, Kgf
  Ko = Specific Soil Resistance = 0.25 kg/ Cm2

Soil Type and its Resistance Offer Values (Ko)	
Soil Type	Soil Resistance, kg/cm2
Light	012
Medium	0.15
Heavy	0.25

- Take K_o = 3 times higher as a factor of safety

  w = Width of opener, cm

  d = Depth of opener, cm

  Take w = 2.5 cm (available in the market)

  d = 10 cm

- $D = K_o \times w \times d$

  $= 3 \times 0.25 \times 2.5 \times 10$

  $= 18.75$ Kgf

- Take factor of safety = 3

  $D = 3 \times 18.75 = 56.25$ Kgf (Total draft)

- Suppose Maximum bending moment for a cantilever length of L cm

- Bending moment (M) = draft force x Length of shank

  $M = 56.25 \times L = 56.25 \times L$ kgf-cm

- We Know that

$$\sigma = \frac{My}{I}$$

σ = Bending stress, kgf/cm2

M = Bending Moment, kgf-cm

y = Distance from the natural axis to the point at which stress is determined, cm

I = Moment of inertia of the rectangular section, mm4

- Now, section modulus

$z = I/y$

- From Bending equation we can also write

$z = M/\sigma$

- For M.S rectangular section

σ = 1000 kgf/cm2

So,

$z = 56.25 \times L / 1000$

- Assume ratio of thickness to width of tine, b:h = 1:2

  b = 14.6 mm

  Take b = 16 mm (availability of standard size)

  So h = 2 x 16 = 32 mm
- Now maximum deflection is given by,

  $Y\ max = DL^3 / 3EI$
- For M.S. material,

  $E = 2 \times 10^4$
- Also,

  $I = bh^3 / 12$

  $= 524288 / 12$

  $I = 43690.66$ mm4

So,

Y max= 56.25 x L^3 / 3 x 43690.66 x 2 x 10^4

- So from above equation we can find out deflection for different length and then we can conclude that for which length the deflection should be maximum and for which length the deflection should be minimum.

Ground Wheel:

Ground Wheel

- Ground wheel transmit motion to the chain drive. This motion utilize for seed broadcasting.
- Diameter is approximates 25.5 cm.

Transport Wheel:

- It is mounted on shaft and it is help to transport the seed from seed box to hole of seed tube.
- Mostly it is made by plastic.
- Approximate diameter of transport wheel is 18 cm to 20 cm

- The procedure of testing the seed drill for correct seed rate is called calibration of seed drill. It is necessary to calibrate the seed drill before putting it in actual use to find the desired seed rate. It is done to get the pre determined seed rate of the machine.
- The following steps are followed for calibration of seed drill.

Procedure:

- Circumference of ground wheel = pi x D = 3.14 x D
- Number to turns the ground wheel make in running 100 m =100 m / Circumference of ground wheel
- Width of seed drill = Number of furrow opener x width of each furrow opener

CALIBRATION

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- Area covered for one revolution = Circumference of ground wheel x Width of seed drill
- Number of turns needed / hectare = Total area / Area covered for one revolution
- Number of grains dropped (assuming the seed hole capacity is 2 seeds) / revolution = 2 grains / hole x 5 holes = 10 grains
- Total number of grains to be dropped = (Number of grains dropped / revolution) x (Number of turns needed / hector)

METHODOLOGY

Project Selection

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Problem Formulation

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Data collection

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Analysis

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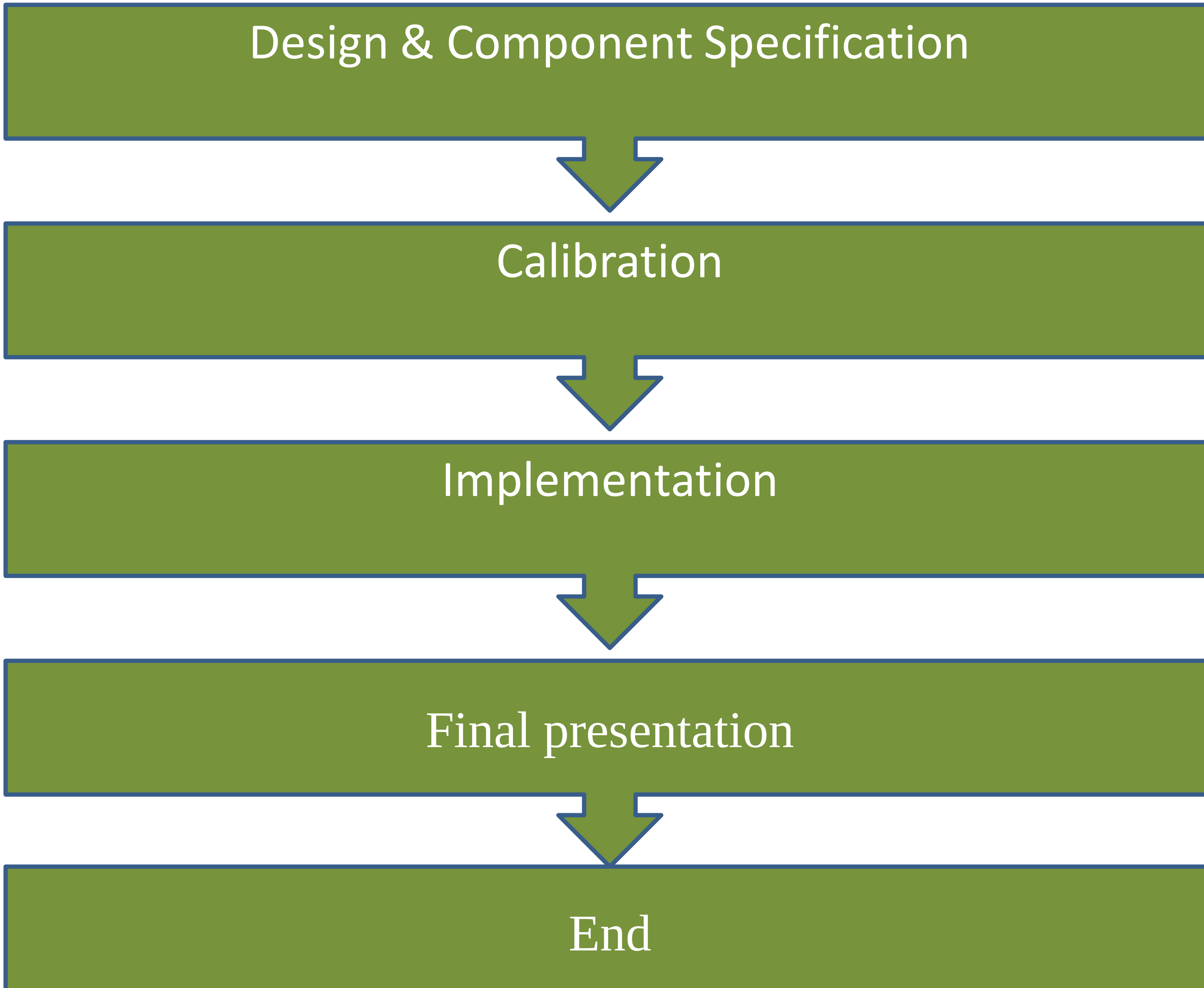
Design & Component Specification
Calibration
Implementation
Final presentation
End

ADVANTAGES

- Improve in traditional machine design
- Precise distribution of seeds and fertilizer
- Reduce wastage of seeds and fertilizer
- Increase Efficiency
- Machine life increase by using ceramics component
- Effective weed control

DISADVANTAGES

- Design of seed box and shovel is difficult.
- More power is required to operate the machine.
- Heavyweight of machine.

APPLICATIONS

- Seed drill
- Granular pesticide distribution
- Fertilizer distribution etc…

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Thank You