Human Effort

Environment Degradation

Proper Gap Between Rows of Plants

A Manual operated device for farmer

Multipurpose Weeding Tool

OBJECTIVE:

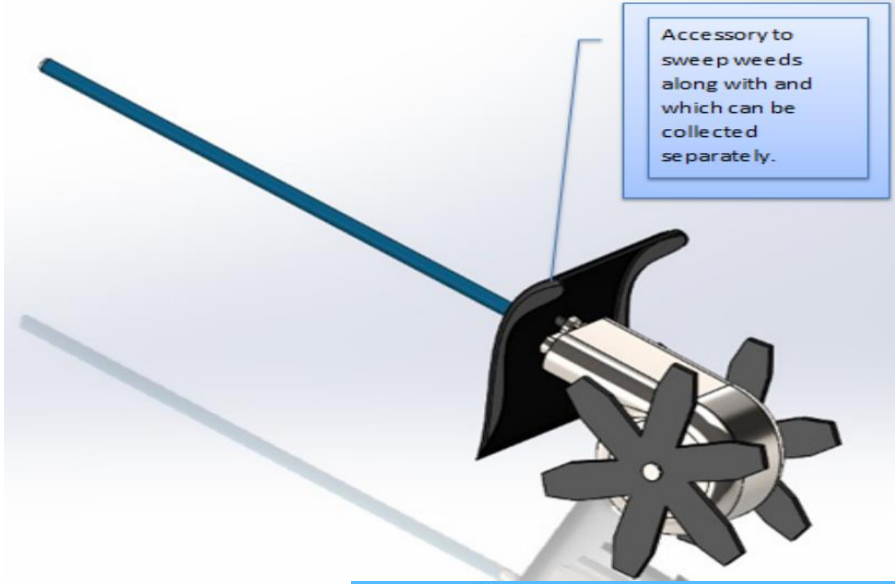
- Improving Manual Tilling
- Removing weeds in scientific manner
- Reducing Labor Force
- Environment Friendly Tool
- Affordable Tool

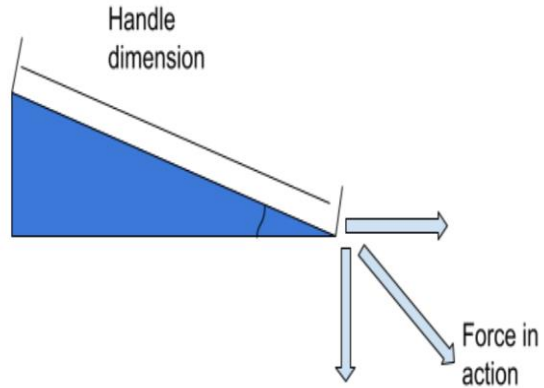
SOLUTION

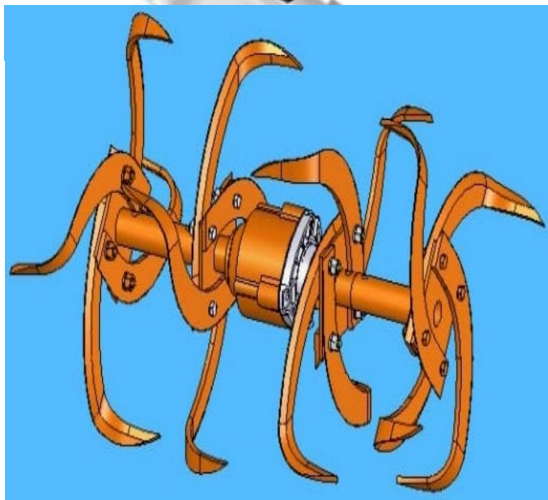
- Mounting Twisted L-shaped blades on the roller.

- Portable with space between plants.

- Twisted L-shaped blades can cut the weed and invert the topsoil simultaneously.







ADVANTAGES:

- It is a great saver of expenses and time on farm activities.
- The system is compact so that it is removing the weed from complex places.
- The system requires minimum inspection and maintenances.
- Both tiller and cutter operations can run independently and it will depend on the operator.

DISADVANTAGES:

- Care should be taken according to different soil textures.
- Certain orientation and force application should be taken care in order to get better results and long tool life.

STATE OF ART:

- At Present, the farmers are using the mentioned tool to remove weed with not much effective engineering applications.
- Building Mechanical Tool having no need of any fuel to operate, which is easy to move the wheel as well as also remove weeds through the blade

EQUIPMENT

Brush Cutter (Blades)

Estimated Cost: 3500

STATIC AND DYNAMIC ANALYSIS

SPEED

Speed of device calculated amount distance covered within record time.

$$\text{Speed (kmph)} = \frac{3.6 \times \text{Distance traveled (m)}}{\text{time(s)}}$$

0.72kmph for 12m in a min.

Draft

It is used regarding power calculation, The_draft force of weeder can be determined by

$$D = F_i [\, A + B\,(S) + C\,(S^2)] \, wd$$

Where: D = implement draft (N)

Fi = a dimension less soil texture adjustment parameter i = 1 for fine,

A, B & C = machine specific parameters

A=91, B=5.4 , C=0[N/m2];

Width (w)=12.8cm, depth of cut (d)= 1.7cm:

Hence, Draft (D)=0.2429 [N];

Power

It was the power requirement to the implement by the man with average pushing force and spe

$$\text{Power (hp)} = \frac{\text{draft (kg)} \times \text{speed} \frac{\text{m}}{\text{s}}}{75}$$

Hence power required is 0.00233 hp, in general a man can produce 0.05-0.1 hp operated for day long work.

Plant damage

Where

Q = plant damage

q = number of plants in a 10 m row length after weedi

p = number of plants in a 10 m row length before wee

$$Q = \left[1 - \frac{q}{p}\right] \times 100$$

p=25, q=23 ;

Q= 8;

Weed efficiency

The number of weeds present in one m2 area before and after weeding operation was counted. The weeding efficiency was calculated by using the following formula.

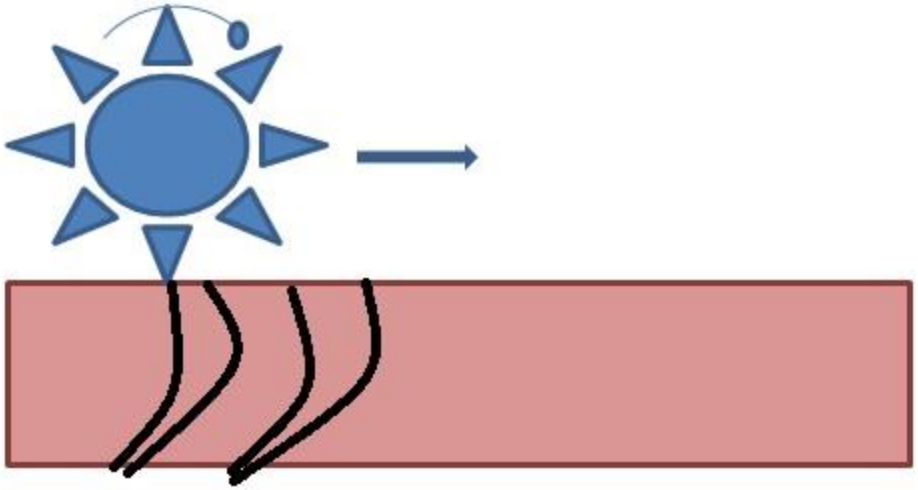
$$\text{Weeding efficiency (\%)} = \frac{W_1 - W_2}{W_1} \times 100$$

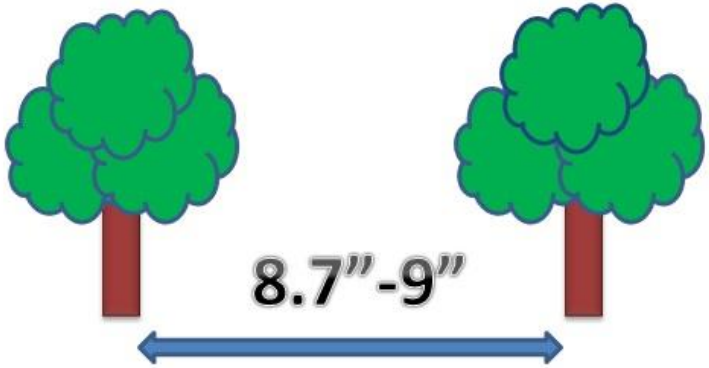
Where,

‘W1’ Number of weeds counted before weeding =473

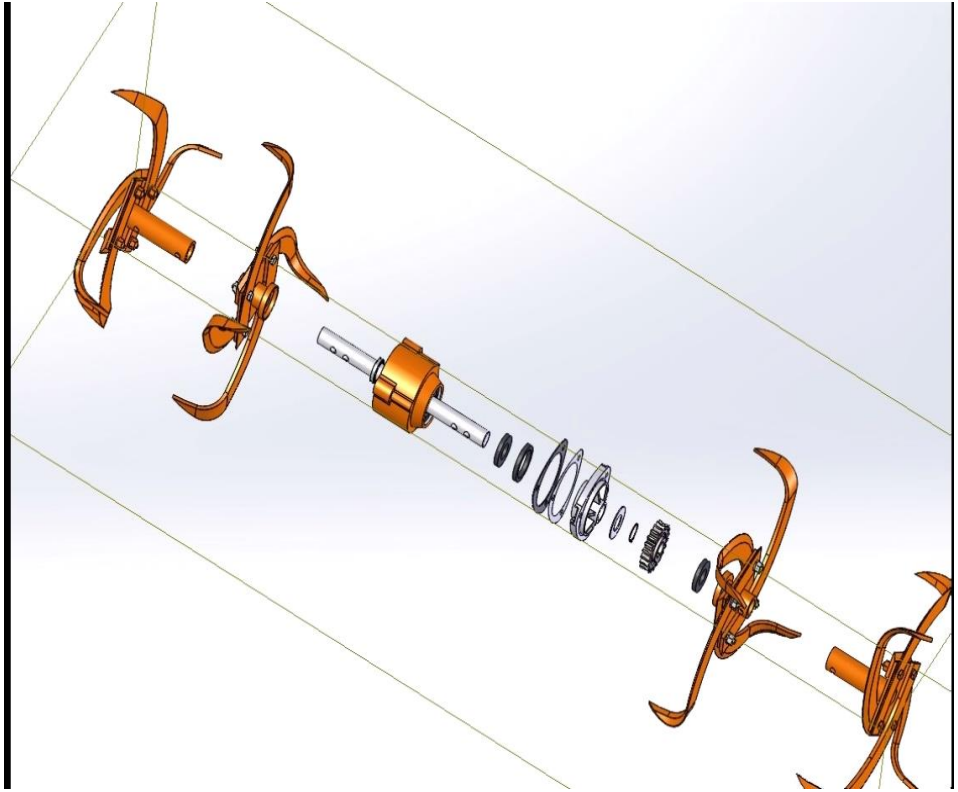
‘W2’ Number of weeds counted after weeding =87

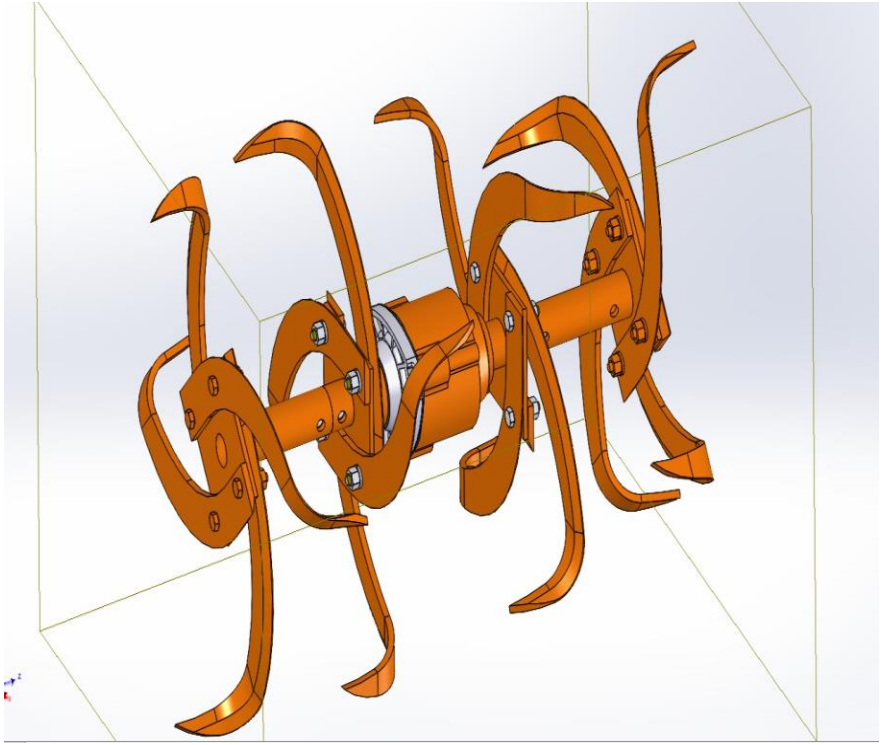
Weeding efficiency =81.6%

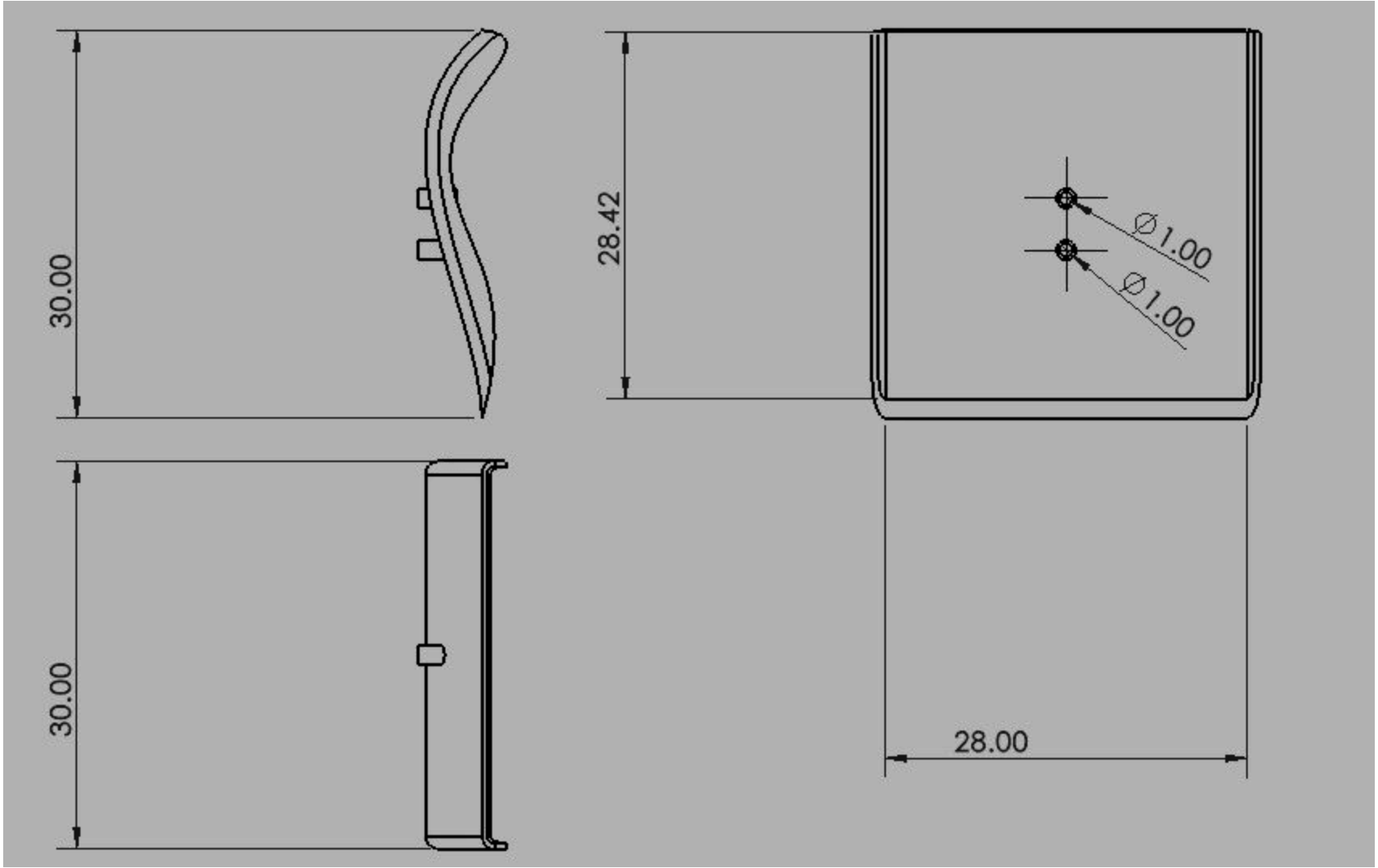


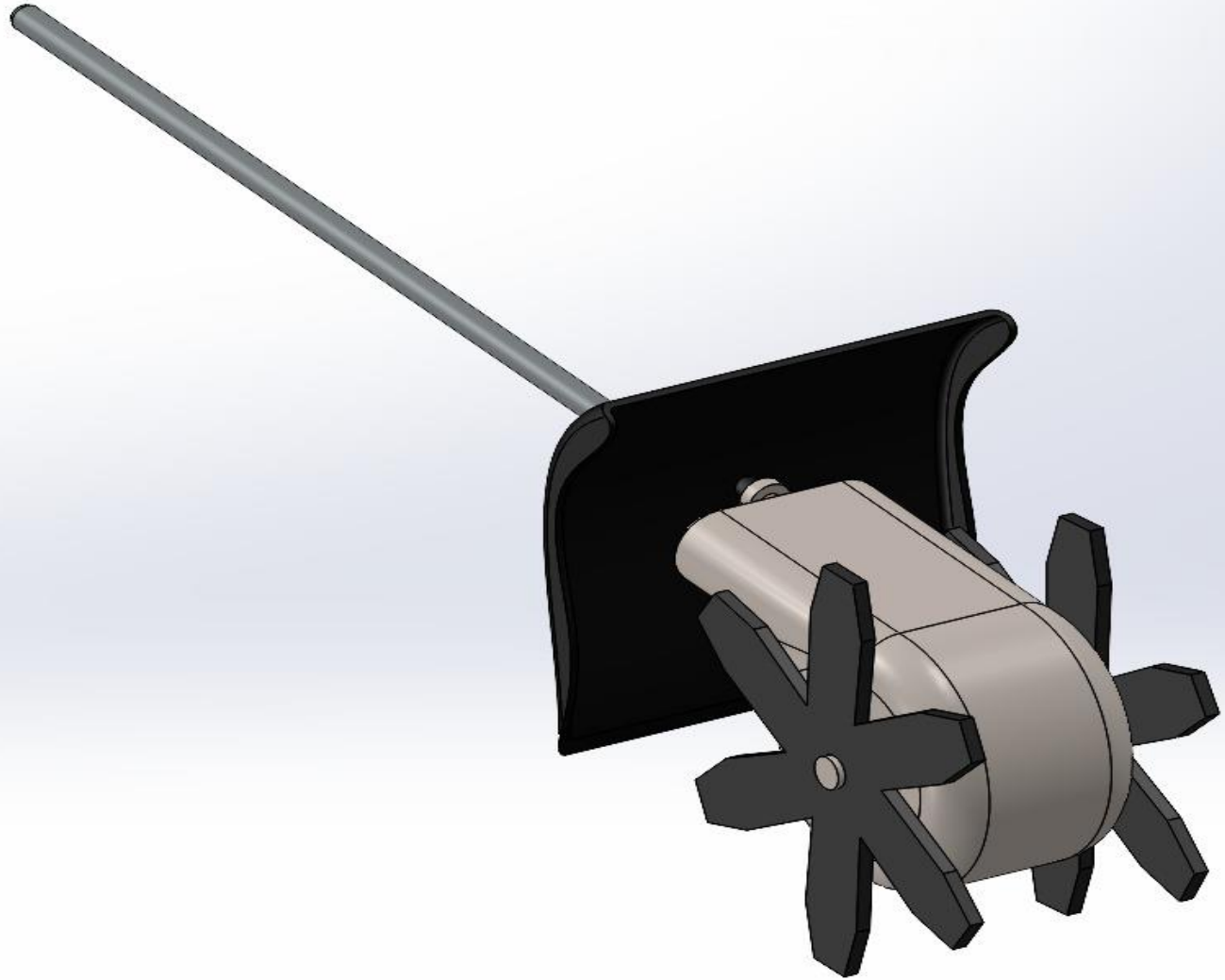

8.7”-9”

Design






30.00
30.00
28.42
Ø1.00
Ø1.00
28.00

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Video

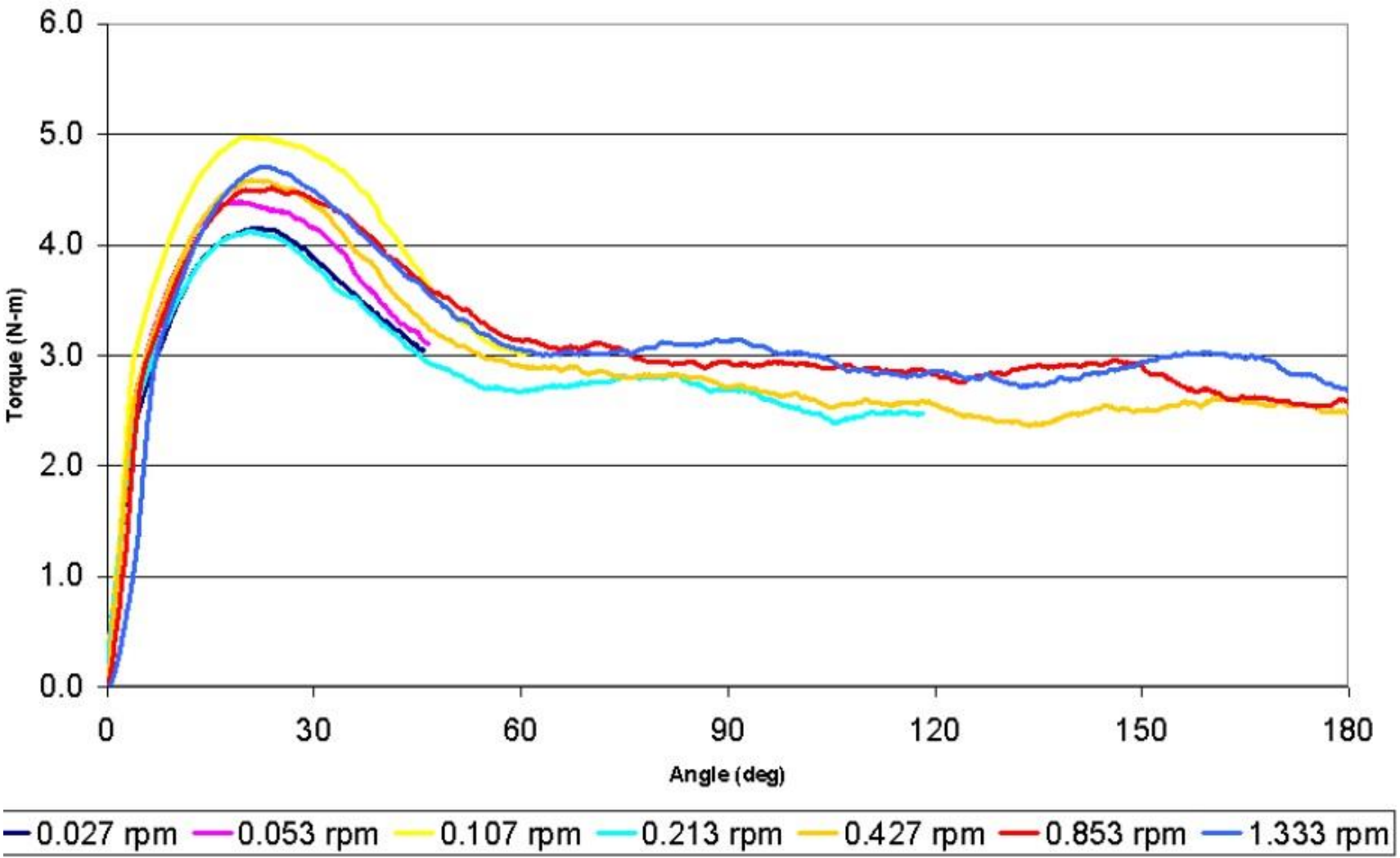
Simulation

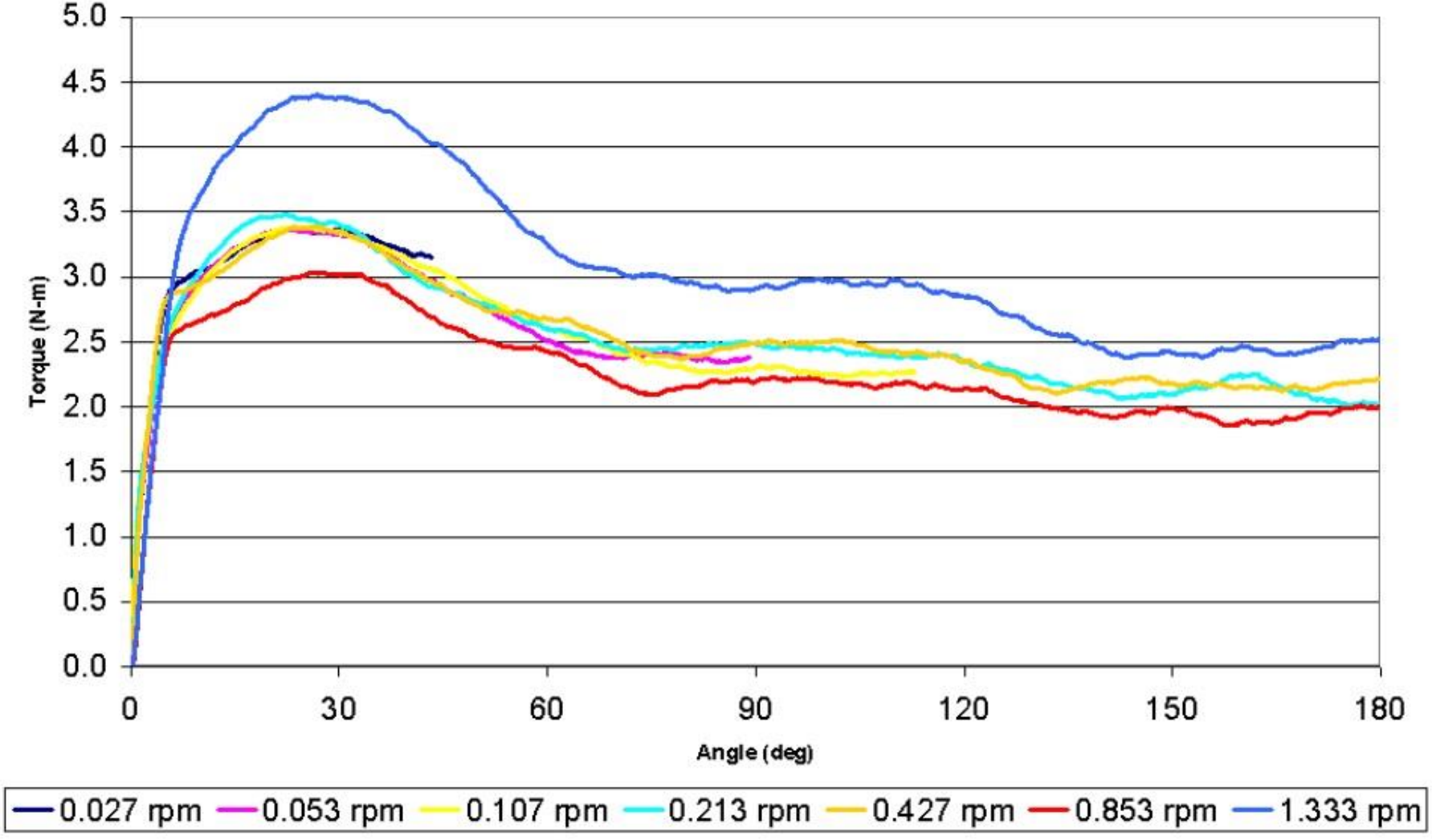
Formulation for matlab

$$M\ddot{a} + C\dot{a} + Ka + f = 0$$

where f is the external load vector,a ,.a, a are the nodal acceleration, velocity and displacement vectors, respectively, and M , C , K the mass, damping and stiffness matrix, respectively.

Soil moisture content (12-14%) parameters like rotary and forward velocity , depth and width of flange is considered.


6.0
5.0
4.0
3.0
2.0
1.0
0.0
Torque (N-m)
0
30
60
90
120
150
180
Angle (deg)
0.027 rpm
0.053 rpm
0.107 rpm
0.213 rpm
0.427 rpm
0.853 rpm
1.333 rpm


5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Torque (N-m)
0
30
60
90
120
150
180
Angle (deg)
0.027 rpm
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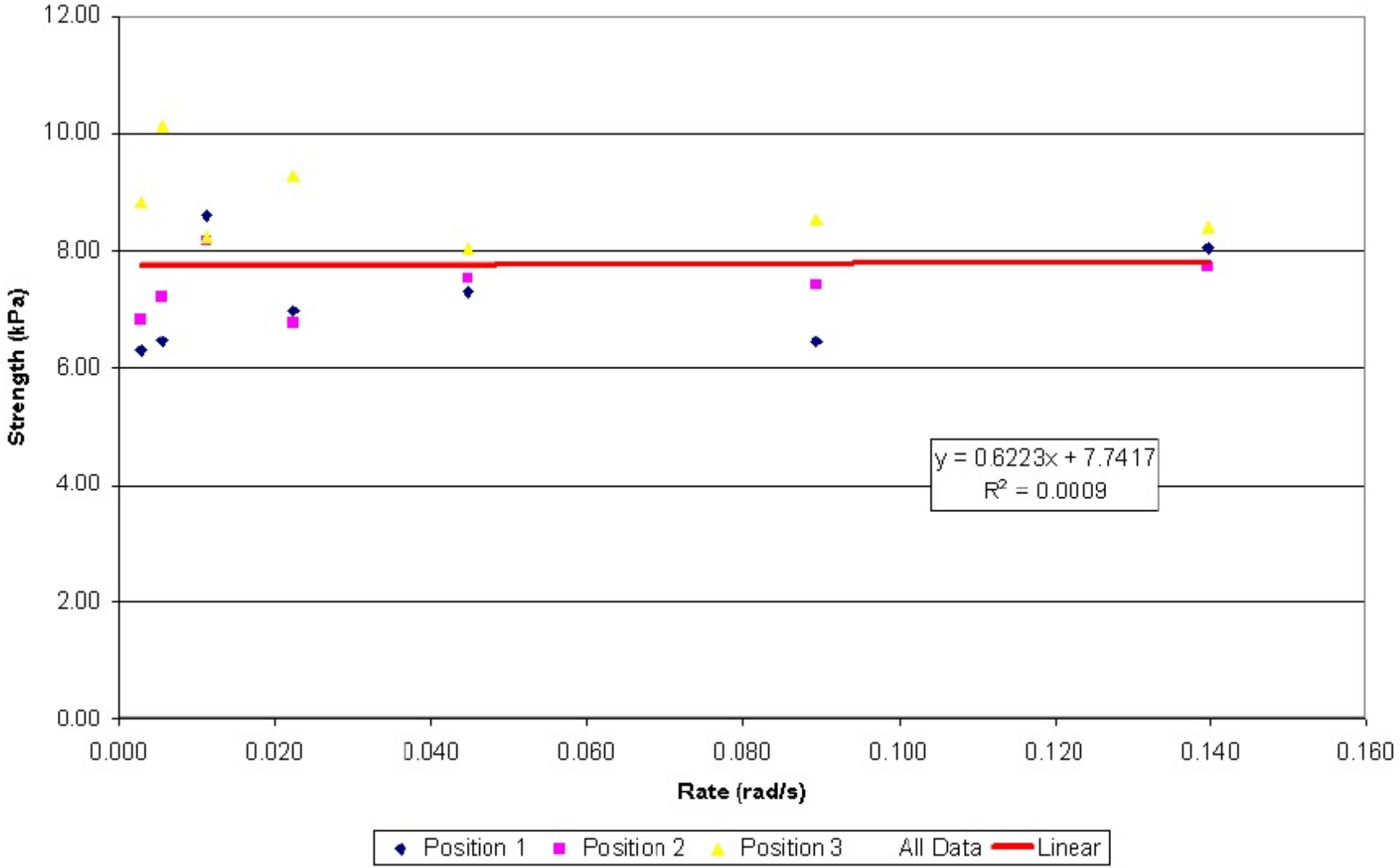
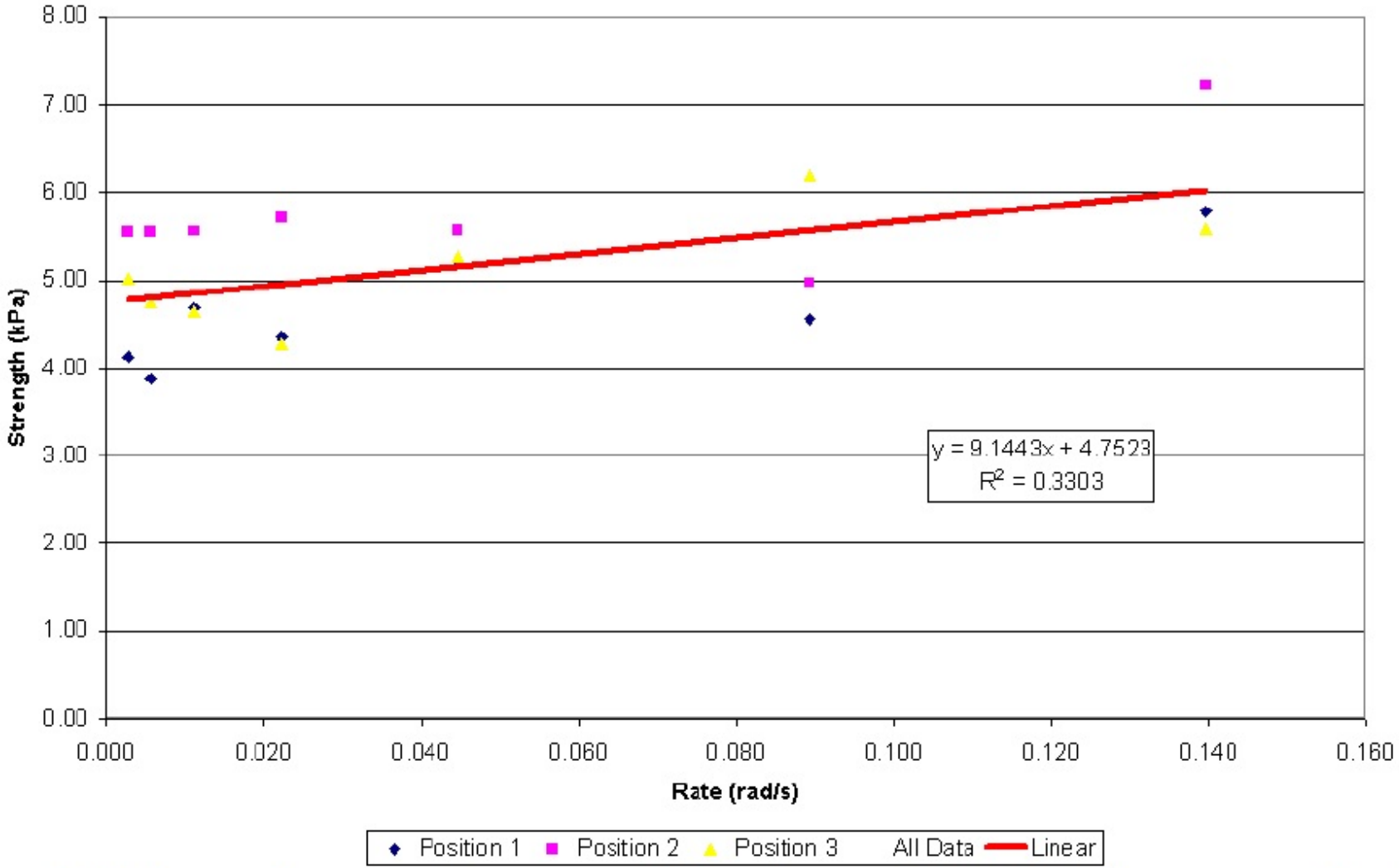
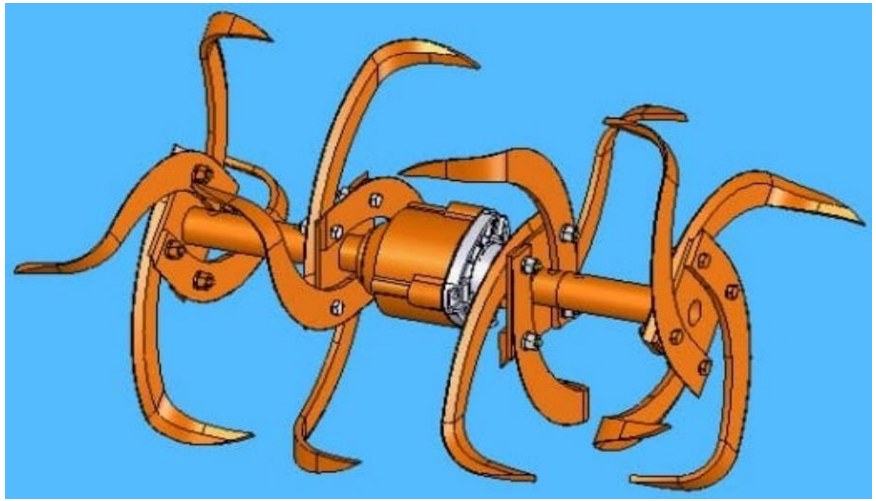

12.00
10.00
8.00
6.00
4.00
2.00
0.00
Strength (kPa)
0.000
0.020
0.040
0.060
0.080
0.100
0.120
0.140
0.160
Rate (rad/s)
y = 0.6223x + 7.7417
R² = 0.0009
Position 1
Position 2
Position 3
All Data
Linear


8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Strength (kPa)
0.000
0.020
0.040
0.060
0.080
0.100
0.120
0.140
0.160
Rate (rad/s)
y = 9.1443x + 4.7523
R2 = 0.3303
Position 1
Position 2
Position 3
All Data
Linear

Future Scope

- Use motors (12hp) and gears to reduce human effort this may affect costing.
- To make is adjusting suit by aable different crop and field by adding pairs of blade also the flap . (Sample Design).



OutCome

Increasing forward speed led to decrease the applied stress.

Increasing rotary speed led to increase the applied stress .

increasing forward speed decreased the stress applied to the soil, increasing rotary speed of the rotor increased the stress applied to the soil and increasing the soil moisture content increased the stress applied to the soil.

Novelty & Patentability

- **Weeding efficiency =81.6%**
- **Hence power required is 0.00233 hp,** in general a man can produce 0.05-0.1 hp operated for day long work.
- Material are used here readily available with tested durability.

Bibliography

- Acharya Narendra Deva University Of Agriculture And Technology, Kumarganj, Ayodhya.
- CSIR durgapur(journal on applied Mechanical Engineering for SWM analysis).
- Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh.