Received Date: 4th June, 2024
Revision Date:5th July, 2024
Accepted Date: 19th July, 2024

Design, Fabrication and Testing of Portable Hand Driven Ploughing Tool for Maize Farm

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***Abstract*— This paper provides insight into the performance of portable hand-driven ploughing tools on a maize farm. The focus is on the effect of ploughing blades on the soil and aims to replace traditional ploughs like spades and hoes with hand-driven tools. The goal of this paper is to reduce human effort by showing that the working velocity of the Ploughing tool is four times that of the Traditional Tool and ensure a comfortable posture for the farmer during ploughing while also offering a simple, economical, and efficient solution for ploughing and weed removal. The hand-driven ploughing tool aims to offer a suitable mechanization option for small-scale farmers, providing a solution that satisfies their needs and labor problems. The tool features a ploughing blade with a blade angle and rake angle of 45 degrees, designed to achieve the required depth of cut for the maize farm efficiently. However, it's essential to consider potential limitations or challenges associated with using the hand-driven ploughing tool, such as its effectiveness in different soil types, the physical exertion required by the farmer, and any maintenance or durability concerns. The design and simulation of the plough are developed in SolidWorks.**

Keywords— Hand Driven Plough Tool, Maize farm, Soil Property, Blade Profile, Blade angle, Design and Simulation of Ploughing Tool, Rake Angle, Coefficient of Drag., SolidWorks

Introduction

Farming to feed families is becoming increasingly complex, time-consuming and labor-intensive in village communities. With difficulty obtaining and carrying equipment to the field, farmers rely on traditional hand equipment, which is laborious and time-consuming. To help overcome this problem, we have introduced a light, simple structure, inexpensive metal plough, a 'Portable plough'. This paper aims to transition from traditional hand equipment to a modern approach to farming. The pace at which the production is going is not enough to meet the demands of the population. Farmers must use modern technology to produce more crops and meet the demand. Access to modern technology is complicated for most farmers in rural hills and mountains. Traditional tools and methods are still used as a necessity. The most time-consuming area is ploughing the field because of conventional methods. Modern machines are enormous and cannot reach hilly and mountainous regions, and they are expensive. Introducing a portable ploughing tool will be a cost-effective farm tool that will save peasants time in the production of crops. The device will be such that the peasants can use it in rugged terrain and plough the field with minimum manual effort.

In particular, the ploughing tool is required to protect crops from other small weeds and maintain their proper growth. Maize farming is still traditionally carried out in developing countries such as Nepal. Old traditional ploughs or oxen are the primary sources for the weeding and cultivating maize farms, mainly in tropically challenged places. Still, in the Terai region, which is very rich in the infrastructure of development, farmers use tractors and high-quality tillage ploughs. From top to bottom, it is unusual management in farming, directly affecting the maize production rate. The agricultural industry is growing fast worldwide, but Nepal needs to improve its advancements. Nepal is an agricultural country, but people depend on traditional hand tools daily. The advancement of 17 technologies has yet to reach mountainous and hilly rural areas, which has resulted in stagnated crop production. One of the main reasons for stagnated production is field ploughing. People use beasts of burden, like ox's, donkeys, etc., to plough the field with traditional tools, which are laborious and time-consuming. The efficiency of production declines, and the farmers will always get less for what they have produced. Thus, farmers need to move from traditional tools to modern tools accessible to them to achieve efficiency in production and a stable economic standard. Introducing portable ploughs will help bring efficiency to the field at a low cost and small

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size. The portable hand-driven ploughing tool always helps to maintain the body posture of the farmers in such a way that while using the traditional plough like a spade, they used to work with such a tool with much more bending of their backbone. Still, with the specially designed blade in the portable plough, it is significantly easier to plough on the farm.

Overview Of Design:

A. Material selection:

Mild steel is a type of low-carbon steel. Carbon steels are metals that contain a small percentage of carbon (max 2.1%), enhancing pure iron's properties. Low-carbon steels contain carbon in the range of 0.05 to 0.25 percent. There are different grades of mild steel. But they all have carbon content within the limits mentioned above. Other elements are added to improve useful properties like corrosion resistance, wear resistance, and tensile strength. Higher carbon steels contain more carbon, resulting in different properties like high strength and hardness values compared to mild steel. As in Table 1, the below table illustrates the mechanical and thermal properties of mild steel.

TABLE 1

PROPERTIES OF MILD STEEL. [1]

Name	Mild Steel
Phase at STP	Solid
Density	7850 kg/m3
Ultimate Tensile Strength	400-550 MPa
Yield Strength	250 MPa
Young's Modulus of Elasticity	200 GPa
Brinell Hardness	120 BHN
Melting Point	1450 °C
Thermal Conductivity	50 W/mK
Heat Capacity	510 J/g K

B. Selection of Blade Profile

The prime purpose of ploughing is to turn over the uppermost soil, bringing fresh nutrients to the surface while burying weeds and crops. So, the blade profile plays a vital role in achieving the objective of our paper. After having the depth study of maize farm, inter-row cultivation technique, study of soil, types of blades available and their depth of cut and blade angle, we finally selected the ridge plough (A rigid plough is a type of farm implement used for breaking and turning over the soil to prepare it for planting) which not only achieves the suitable depth of cut but also turns the soil in two directions. The traditional ploughing tool "HALO "blade angle is approximately 45 degrees. As in Figure 1, depicts the classification of the blade profile.

from SolidWorks

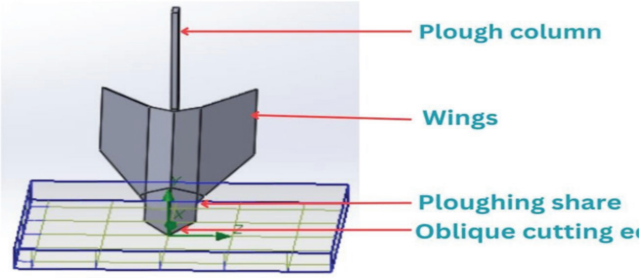

Figure: 1 selection of blade profile

C. Design of cutting blades

Different parameters used in this study have been taken into consideration to give safe strength and bending values for manufacturing the cutting blades.

Size of the cutting blade

Push (KGF) = Width * depth of cut * unit draft [2]

25 = W * 7* 0.37 W = 10.6~10 cm

The unit draft of the light to medium soil ranges can be taken as 0.37 kg /cm^2

The soil reaction on a plough blade can be estimated using the following equation:

R = k * A * Y * f * S (1)

Where R is the soil reaction on the plough blade (in Newton's or pounds)

K is the soil reaction coefficient (dimensionless)

A is the plough blade surface area in contact with the soil (in square meters or square feet)

Y is the soil cohesion (in Pascal's or pounds per square foot)

F is the angle of internal friction of the soil (in degrees)

S is the depth of ploughing (in meters or feet). We can estimate k using the following formula:

k = 1 + 0.2 * (s/d) (2)

Where s is the depth of ploughing and d is the blade width. Let's assume the blade width is 10 meters. Plugging in the valves, we get:

k = 1 + 0.2 * (7/10) = 1.14

Ploughing loamy soil in the working field with a cohesion of 20,000 Pascal's and an angle of internal friction of 30 degrees.

Hence,

R=1.14*0.0867*20000*tan30*0.07

=79.88N

So, horizontal force on blade=R*Cos 45=79.88*cos45=56.49 N

D. SolidWorks Simulation of Cutting Blade at Different Angles

Selection of Rake Angle for Blade (Using SolidWorks Flow Simulation)

Here, we set the equation of coefficient of drag on Equation Goal as:

Cd=(2*Fd)/ (ρ *U^2*A) [3]

Where, Cd=drag coefficient,

Fd=Drag Force (calculated from simulation result) ρ =mass density of fluid(2000kg/m^3)

Flow speed of the object relative to the fluid (0.33m/s)

TABLE 2

RAKE ANGLE

Rake angle (degree)	Force (N)	Shear stress (N/m)	Coefficient of drag
20	38.23	16226.1	5.39731
30	39.5897	17786.6	5.82052
40	43.1996	19879.8	6.43877
45	**48.7576**	**10588.3**	**4.37312**
50	42.3108	12267.2	6.50817
60	44.9782	12105.7	7.55416

As in Table 2, The table presents data on the relationship between rake angle and several mechanical properties, including force, shear stress, and the coefficient of drag. As the rake angle increases from 20 to 60 degrees, the force experienced generally rises, peaking at a 45-degree angle. Correspondingly, shear stress exhibits a similar trend, with the highest value at a 40-degree rake angle. The coefficient of drag also tends to increase with rake angle, indicating higher resistance at larger angles, though there is some variation at intermediate angles. Hence, from this simulation results, we have found that a 45-degree rake angle is the best because at 45-degree shear stress is less which means the deformation of the blade is less. Also, the coefficient of drag is less which means less energy is required at 45 degrees.

Selection of Blade Angle for Blade (Using SolidWorks Flow Simulation)

TABLE 3

BLADE ANGLES

Blade Angle	Force (N)	Shear Stress (Pa)	Coefficient of Drag
30	49.2883	21161.8	4.39408
40	49.9258	17528.8	4.4196
45	**48.7576**	**10588.3**	**4.37312**
50	47.9837	11345.2	4.37215
60	44.6112	12325.6	4.51765

As in Table 3, The table confers the relationship between blade angle, force, shear stress, and the coefficient of drag for a given system. As the blade angle increases from 30 to 60 degrees, the force remains relatively stable, fluctuating around 49 N. The shear stress shows a notable decrease from 21161.8 Pa at 30 degrees to 10588.3 Pa at 45 degrees, then slightly rises to 12325.6 Pa at 60 degrees. The coefficient of drag remains consistently high, with minor variations, reaching its peak at 60 degrees with a value of 4.51765. From the above simulation results force is similar from a 30-degree to 50-degree blade angle but shear stress applied for the blade is less at 45-degree. Also, the coefficient of drag is less at 45 degrees. So, we have chosen a 45-degree blade angle.

Selection of Bend Angle for Blade (Using SolidWorks Flow Simulation)

TABLE 4

BEND ANGLE

Bend Angle (degree)	Force (N)	Shear Stress (Pa)	Coefficient of Drag
60	48.7576	10588.3	4.37312
50	48.3364	15416.8	4.14609
45	**55.8839**	**10022.2**	**4.08674**
40	45.6837	11008.4	4.36865
35	46.4162	17834.1	4.28732

As in Table 4, From the given results, it is found that maximum force is applied at a bend angle of 45- degrees and the shear stress of the blade is low at 45 degrees. Also, the coefficient of drag is lower at 45-degree. So, we have chosen a 45-degree bend angle.

Selection of Inclined angle for Blade (Using SolidWorks Flow Simulation)

TABLE 5

INCLINED ANGLE

Inclined Angle (degree)	Force (N)	Shear Stress (Pa)
160	55.8839	10022.2
150	**53.9884**	**9378.8**
140	44.0627	12080.5

As in Table 5, The table shows the relationship between inclined angles, force, and shear stress. As the inclined angle decreases from 160 degrees to 140 degrees, the corresponding force values range from 55.8839 N to 44.0627

N. Additionally, the shear stress values vary, starting at 10022.2 Pa for 160 degrees, decreasing to 9378.8 Pa at 150 degrees, and then increasing to 12080.5 Pa at 140 degrees.

From the above simulation results, we have found that the force at 160 degrees and 150 degrees is almost similar, and we have chosen 150 degrees because the deformation of the blade is low at 150 degree.

Size of the cutting blade

Push (KGF) = Width * depth of cut * unit draft (3)

25 = W * 7* 0.37

W = 10.6~10 cm

The unit draft of the light to medium soil ranges can be taken as 0.37 kg /cm^2 [4]

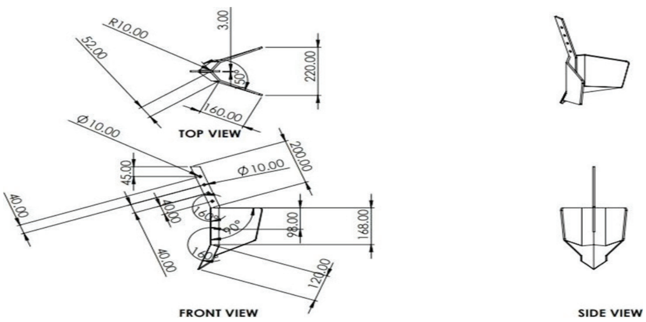

Figure 2: SYSTEMIC DIAGRAM OF BLADE

Thickness of Blade (Using SolidWorks Static Simulation)

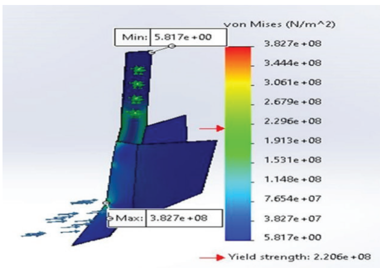

Figure 3: Failure of blade of 1mm thickness

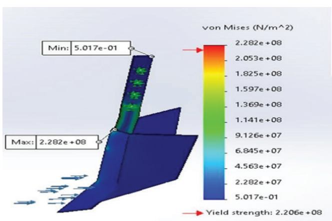

Figure 4: Failure of the blade of 2 mm thickness when 200 N force is applied when 200N is applied

As in Figure 3, In SolidWorks Static Simulation, the blade with a minimum thickness of 5.817 N/m^2 to 3.827 N/m^2 experienced failure when subjected to a load of 200 N. The failure was observed in a blade with a thickness of 1 mm under the same load.

As in Figure 4, In SolidWorks static simulation, the blade with a minimum thickness of 5.017*10^ (-1) N/m^2 to 2.282*10^8 N/m^2 experienced failure when subjected to a load of 200N. the failure was observed in a blade with a thickness of 2mm under the same load.

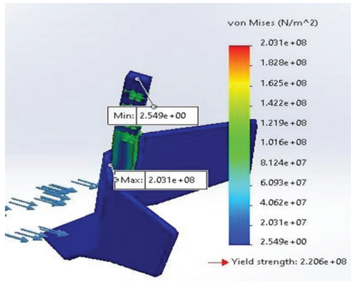

Figure 5: Blade is safe at 3mm thickness

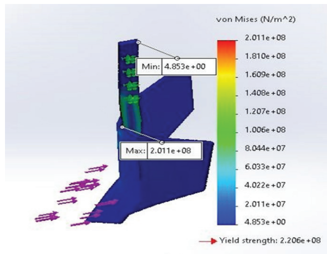

Figure 6: Blade is over-defined at 4mm when 200 N force is when 200N force is applied

As in Figure 5, In Solid Works static simulation, the blade with a minimum thickness of 4.853 N/m^2 to 2.011*10^8 N/m^2 experienced safety when subjected to a load of 200N. the success was observed in a blade with a thickness of 3mm under the same load.

As in Figure 6, In SolidWorks static simulation, the blade with a minimum thickness of 2.549 N/m^2 to 2.031*10^8 N/m^2 experienced over-defined when subjected to a load of 200N. It was observed that the blade is excessively defined at 4mm under the same load.

For Wings

The distance between the two wings is 22 cm because the most commonly practiced distance between the two rows in inter-row cultivation of maize farms is found to be 30 cm. [5]

Figure 7: Blade after fabrication

Frame

The frame helps with the attachment of the handle, wheel, and blade.

Main frame:

Length of the bar = 310 mm

Thickness = 6 mm

The outer diameter of the bar = 30 mm

The gap between two successive holes on individual supporting bars = 5.3cm

Diameter of hole = 10 mm

310 mm long supporting bars are taken because all parts of the weeders are attached to these bars. The thickness of the supporting bar is 6mm, which gives it rigidity.
Base frame:
Length of the frame = 554 mm
Width of the frame = 42 mm
The thickness of the frame = 5 mm
Length of the center supporting bar = 280 mm
The dimensions of the frame, 554 mm × 42 mm, have been carefully chosen to align with the row spacing of crops and the power developed by man. This thoughtful consideration ensures optimal performance and ease of use.

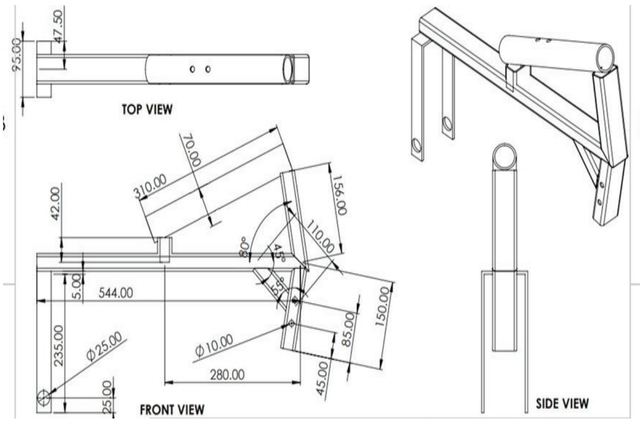

Figure 8: Design of frame

Design of handle

A standard lightweight mild steel of outside diameter conduit pipe is used for the handle.

The length of the handle is calculated based on the average standing elbow height of the operator.

Handle pipe:

Total length of pipe = 660 mm

Outer diameter of pipe = 26 mm

Inner diameter of pipe = 23 mm

Thickness of pipe = 3 mm

The 26 mm diameter of the inner pipes is taken because it is easily inserted into the 30 mm outer diameter of pipes. The 10 mm holes are given at the bottom side of the inner pipe for adjusting the inclination of the handle. Similarly, 10 mm holes are given by the upper side of the inner pipe for different height adjustments. The holes given for outer pipe holes are in contact with the inner pipe upper side holes.

Shaft:

Diameter = 25 mm (Using SolidWorks Design)

The diameter of the shaft is chosen according to the inner diameter of the hole of the wheel.

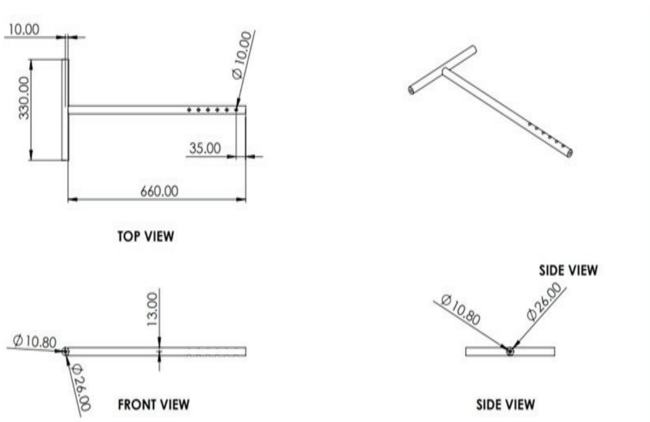

Figure 9: Design of handle

Deformation of frame and handle test using SolidWorks static simulation:

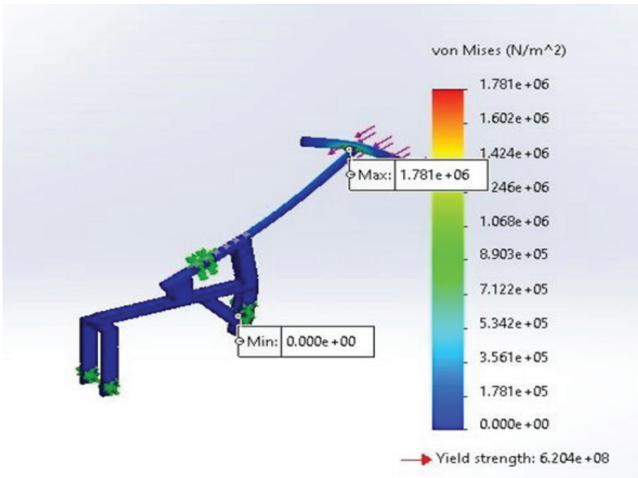

Figure 10: Analysis of handle

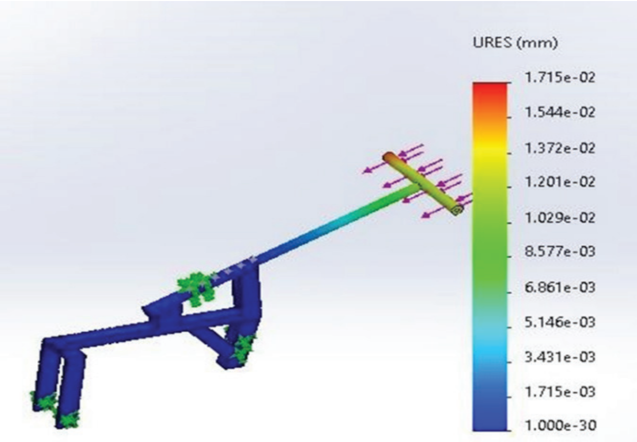

Figure 11: Deformation at 100 N force

As in Figure 10, the Yield strength of the handle is 6.204*10^8 N/m^2.

Similarly, in figure 11, from the SolidWorks simulation, the handle is safe at 100 N Force.

2) *Calculation of Wheel*

Force (F) =250 N

Speed (V) =0.33 m/s

Power (P) = F*V (4)

=250*0.35 =88 watt

Revolution per minute (N) =18 rpm

Torque (T) =60*P/ (2*pi * N) [6]

Or, 60*88 / (2*pi *14) = 61 Nm

From Torsional equation: T/J =σ /R (5)

T= Torque

J=Polar moment of inertia=π d^4 / 32

σ = Shear stress =3*10 ^4 N/m^2(for soil)

R=Radius of the wheel = d/2

Now, d ^3 = T*16 / (σ * pi) d =61*16 / (3*10 ^4 * pi) = 0.218 ~218 mm

Let us assume that the external diameter of the wheel is D= 1.07 d

=1.07 *218

= 233 mm

We found a wheel of similar dimension in the market as we have got data from solid work design.

External Diameter of ground wheel = 300 mm

External Radius of ground wheel = 150 mm

Internal Diameter of wheel = 280 mm

Internal Radius of wheel = 140 mm

Circumference of ground wheel = 2πr = 2×3.14×150 = 942 mm

The thickness of ground wheel spokes = 20 mm

Distance between two spokes = 157.07 mm

Thickness ground wheel = 10 mm

Width of ground wheel = 50 mm

The diameter of the 300 mm ground wheel used due to the height of the Tyne is 18 cm, then the power transmits from the wheel to the tyres perpendicularly then it moves freely in field conditions. The width and thickness of the ground wheel are 50 mm & 10 mm respectively because it gives rigidity. A 20 mm spokes gives efficient support to the ground wheel. (Using SolidWorks Design)

A ploughing tool with tyres that have a radius of 0.15 meters and operate on loamy soil with a moisture content of 20%. Let's calculate the slippage of the tyres.

Firstly, calculate the circumference of the tyre using the formula:

C = 2 x π x R (6)

C = 2 x 3.14 x 0.15

C = 0.942 meters

Next, to measure the distance travelled by the tyre in one revolution. We measure it to be 0.89 meters.

Using the formula for slippage in loamy soil:

Slippage = ((C - T) / C) x 100 [7]

Slippage = ((0.942 – 0.89) / 0.942) x 100

Slippage = 5.5%

Therefore, the slippage of the ploughing tool tyre on loamy soil would be approximately 5.5%.

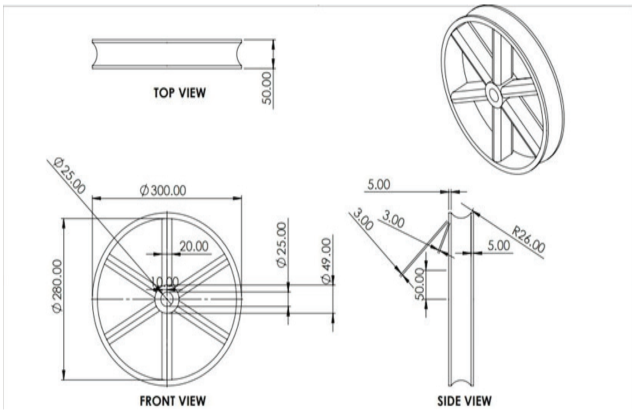

Figure 12: Design of wheel

Result and Discussion:

Type of implement: Hand Driven Ploughing Tool for Maize Farm

Manufacturer name and address: Fabricated by an undergraduate research student with Bachelor's in Mechanical Engineering, IOE, Thapathali campus.

"Plough with required dimensions, shape and parameters have been fabricated in the workshop of IOE, Thapathali campus:

Width of cut: 10 cm

Depth of cut: 7cm

Material: Mild steel

Thickness of material: 3mm

Using the SOLIDWORKS simulation, the thickness of mild steel was found to be 3mm which will be suitable for cutting blades.

Weight of blade: 2.7kg

Blade angle: 45 degrees

Rack angle: 45 degrees

Handle:

Length: 660mm

Diameter: 26 inner and 30outer

Working height: 3ft-4ft

Weight: 1.6kg

Support wheel Material:

Rubber and C.I

Diameter: 300mm (external) and 280mm (internal)

Weight: 2.63kg

For blade:

Depth of cut = 7 cm

Width of cut= 10 cm

Distance between the two wings = 22 cm

Blade angle = 45 degrees

Rake angle = 45 degrees

Soil analysis:

Measurement method

Soil water content, % (dry weight basis)

= (w2-w3)/ (w3-w1)*100 [8]

Where,

W1 = weight of container

W2 = weight of the container and wet soil

W3 = weight of the container and dry soil.

W1 =5 g, W2 = 105 g and W3 = 85 g after drying, then Soil water content, % (dry weight basis)

= (105-85)/ (85-5) *100%

=25%

FORCE developed by machine:

K=d^4*G/8D^3*Na [9]

Where,

k=spring constant

D=mean coil diameter

d=wire diameter

G=Shear modulus

Number of active coils

For the spring we used,

d=2mm

G=81 Gpa

D=23mm

Na=7

S0, K = [(2*10^-3) ^4*81*10^9]/ [8*(23*10^-3) ^3*7] =1902.1N/m

And the deflection of the spring=4.3cm

Force on wheel F= UR = 0.25*2.6*9.81= 6.37 N

Now, F= k*x = 1902.1*4.3*10^-2=81.79N

Hence, the total force applied on our machine is 81.79N.

Power (P) = F * V= 81.79 *0.331=27.07 watt

Power developed by the machine

The operating speed of the machine is 0.3 m/s (because the power-operated machine has an operating speed of 1.2 km.

We know that,

Power (in hp) = Push (kg)* speed (m/s) /75 (7)

Push (KGF) = 0.1*75/0.3=25 kg [10]

Hence the force developed by the operator is 25 kgf.

WEAR ANALYSIS:

Many models have been proposed for wear processes. The most general relationship expresses wear by the volume of wear debris created,

V= k FS/H [11]

Where V is the wear volume, mm^3

K is a dimensionless proportionality constant, called the wear coefficient

F is the compressive normal force, N

S is the sliding distance, mm

H is the hardness of the softer member in contact, kg/mm 2 105

Area of cutting Tip (A) = 11595.53 mm^2

Thickness of tip (t) = 3mm

Wear Volume (V) = A*t (8)

= 11595.53*3

= 34786.59 mm^3

= 3.47*10^-5 m^3

We have

V= k FS/H V

= Kf (v*T)/H

Where

S= velocity* time (9)

T= (V*H)/kfv

T= (3.47*10^-5 *415*10^6)/ (4*10^-5*56.49*0.3)

= 21243435.42 sec

H= hardness of mild steel

= 415*10^6 N/m^2 v

= 0.3 m/s

k=3*10^-5

When the tool is used for 8 hrs. Per day, then 8 hrs. =28800-sec T= 737.619 days~738 days =2.02 years

Tool life will be 2.02year when it is used for 8 hrs. per day

But actually, the tool is used a maximum up to 180 days i.e., 6 months throughout the year in the farm we have, T= 738/180 = 4.1 yrs. ~ 4 years

Hence the Tool life of our hand-driven ploughing machine will be 4 Years. So, every Four years, the front cutting tip of the blade can be replaced within a few amounts of money which can be easily affordable by normal farmers.

Testing results:

TABLE 6

VELOCITY OF SPADE

No of trial	Weight (kg)	Height (ft.)	Distance (m)	Time taken (min)	Plough velocity (m/s)	Gender
1st person	57	5.7	270	47.5	0.09	Male
2nd person	68	5.6	270	51.5	0.08	Male
3rd person	64	5.9	270	58.5	0.07	Male
4th person	54	5.6	270	50	0.09	Male
5th person	72	5.7	270	44	0.1	Male
6th person	70	5.5	270	46	0.09	Female
7th person	59	5.3.	270	52	0.08	Female
Average					0.085	

As in Table 6, The testing results show data for seven individuals, with an average plough velocity of 0.085 m/s. All participants completed a distance of 270 meters. Males had weights ranging from 54 to 72 kg and heights from 5.6 to 5.9 feet, while females had weights of 59 and 70 kg and heights of 5.3 and 5.5 feet, respectively. The time taken to cover the distance varied from 44 to 58.5 minutes.

I. Ploughing Tool

TABLE 7

VELOCITY OF PLOUGHING TOOL

No of trial	Weight (kg)	Height (ft.)	Distance (m)	Time taken (min)	Plough velocity (m/s)	Gender
1st person	57	5.7	270	11	0.409	Male
2nd person	68	5.6	270	14	0.321	Male
3rd person	64	5.9	270	12.5	0.36	Male
4th person	54	5.6	270	15	0.3	Male
5th person	72	5.7	270	14.5	0.31	Male
6th person	70	5.5	270	13	0.34	Female
7th person	59	5.3	270	16	0.28	Female
Average					0.331	

As in Table 7, Here's a concise summarizing the table, "Seven individuals, consisting of five males and two females, were tested for plough velocity, with average measurements resulting in 0.331 m/s."

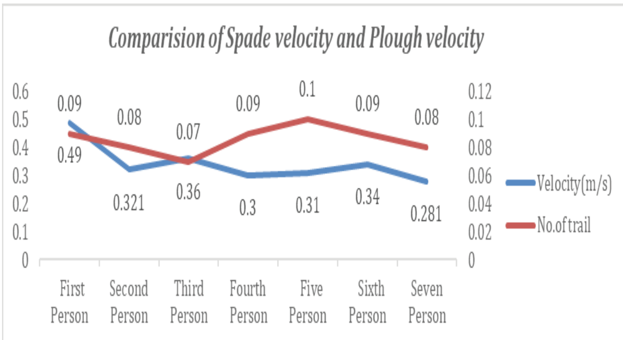

Figure 13: Comparison between spade velocity and plough velocity.

Comparison of Speeds: Ploughing Tool vs. Traditional Tool

The speed ratio = Average speed of Ploughing Tool / Average speed of Traditional Tool = 0.331/0.085 ≈ 3.89, or about 4 times. Therefore, the working speed of the Ploughing Tool is approximately four times greater than that of the Traditional Tool.

Weeding efficiency

The weeding efficiency test was performed on a selected plot. The respective readings were noted and reported in the table below. The average value of the wedding efficiency was found to be 80.50 per cent. It can be concluded that the machine is efficient because its efficiency is more than 80 per cent and also easy to operate. The wedding efficiency was calculated by the following mentioned expressions and parameters;

e = (w1- w 2) /w1 [12]

Where, e = Weeding efficiency (%)

W1 = number of weeds before the wedding

W2 = number of weeds after weeding

The table below confers the results of four weeding trials conducted on a 0.9 m² area. The initial and final weed counts, along with the calculated weeding efficiency percentages for each trial, are provided. The average weeding efficiency across all trials is 80.50.

TABLE 8
WEEDING EFFICIENCY

No of Trial	**Area (m^2)**	**No. of weeder before the wedding (W1)**	**No of weeder after weeding (W2)**	**Weeding Efficiency (%)**	**Average**
1	0.9	60	12	80	
2	0.9	93	17	81.75	80.50
3	0.9	75	13	82.6	
4	0.9	90	20	77.7	

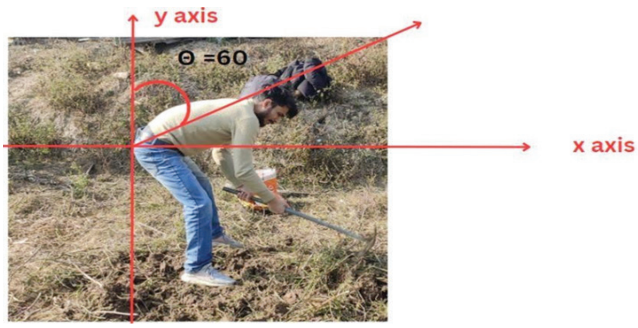

Fig14: The bending angle using a traditional plough

Fig 15: The bending angle using a modern ploughis 24 degrees is 60 degrees

As in figure 14, the bending angle is 60 degree which is more in comparison of bending angle 24 degree in case of hand driven plough machine as shown in figure 15.

Conclusion

The hand-driven ploughing tool, designed specifically for maize farms, offers a simple structure, easy operation, lightweight design, and time-saving capabilities. It is four times more efficient than traditional ploughing methods. Test results demonstrate that it can achieve a 7cm depth of cut at a velocity of 0.331m/s, compared to the conventional plough's velocity of 0.085m/s. With a cost of NPR 4000 per tool, it is a cost-effective solution for farmers and can significantly improve ploughing operations in the industry.

Limitations

This hand-driven ploughing machine does not function in bare land. The blade profile of the ploughing tool is designed to plough in arable land containing loamy soil, especially for maize farm cultivation.

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