BLUETOOTH CONTROLLED SOLAR POWERED MULTIPURPOSE AGRICULTURE MACHINE

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Abstract: Today's era is marching towards the rapid growth in all sectors including the agricultural sector. 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. This Project deals with the various operations performed in India like seed sowing, spraying of pesticides, cutting of weeds, grass, ploughing and digging. The comparison between the traditional sowing method and the new proposed machine which can perform a number of simultaneous operations and has number of advantages. As day by day the labor availability becomes the great concern for the farmers and labor cost is more, this machine reduces the efforts and total cost of sowing the seeds and fertilizer placement. This machine is controlled by Bluetooth.

Index Terms **– Digging, Seed Sowing, Pesticide Spraying, Cutter and Solar powered Bluetooth**

I. INTRODUCTION

Agriculture has been the backbone of the Indian economy and it will continue to remain so for a long time. It has to support almost 17 percent of world population from 2.3 percent of world geographical area and 4.2 percent of world's water resources. The present cropping intensity of 137 percent has registered an increase of only 26 percent since 1950- 51. The net sown area is 142 Mha. The basic objective of sowing operation is to put the seed and fertilizer in rows at desired depth and spacing, cover the seeds with soil and provide proper compaction over the seed. The recommended row to row spacing, seed rate, seed to seed spacing and depth of seed placement vary from crop to crop and for different agricultural and climatic conditions to achieve optimum yields and an efficient sowing machine should attempt to fulfill these requirements. In addition, saving in cost of operation time, labor and energy are other advantages to be derived from use of improved machinery for such operations. A traditional method of seed sowing has many disadvantages. This project is about the different types of methods of seed sowing and fertilizer placement in the soil and developing a multifunctional agriculture machine which can perform simultaneous operations.

Modern agricultural techniques and equipment are not used by small land holders because this equipment is too expensive and difficult to acquire. By adopting scientific farming methods, we can get maximum yield and good quality crops which can save a farmer from going bankrupt but majority of farmers still uses primitive method of farming techniques due to lack of knowledge or lack of investment for utilizing modern equipment. The use of hand tools for land cultivation is still predominant in India because 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. There is huge gap in technology adoption and Implement used with small and marginal farmers. Sustainable improvement in the livelihoods of poor farmers in developing countries depends largely on the adoption of improved resource conserving cropping systems. While most of the necessary components already exist, information on the availability and performance of equipment is lacking and effective communication between farmers and agricultural research and development department is unsuccessful.
In mechanized cutting methods, the operating & fuel cost of the machine exceeds the budget of a common farmer. To overcome all these drawbacks, we can use renewable, Non-conventional energy source like solar energy as it is easily available in nature. An application of non-conventional, renewable energy source is the alternate solution for current energy demand. In this project solar energy is used which is non-conventional-renewable energy source which is freely available, to reduce the overall cost of the cutting operation. The mechanisms used are also simple. The machine is light weight & Compact. Most importantly, can be easily available by the farmers.

In modern times, powered machinery has replaced many farm jobs formerly carried out by manual labor or by working animals such as oxen, horses, and mules. The entire history of agriculture contains many examples of the use of tools, such as the hoe and the plough. But the ongoing integration of machines since the Industrial Revolution has allowed farming to become much less labor intensive. The biggest profit of automation is that it saves the labor. However, it also saves energy and materials and to improve the quality, accuracy, and precision. The seed feeding, pesticides sprinkling and crop cutting are the important stages in the agriculture field. The design of multipurpose agro equipment machine will help Indian farmers in rural side and small farm. It will reduce the cost of seed feeding, pesticides sprinkling and crop cutting the field and will help to increase economic standard of an Indian farmer.

II. LITERATURE SURVEY

Mahesh R. Pundkar stated that the seed sowing machine is a key component of agriculture field. high precision pneumatic planters have been developed for many varieties of crops, for a wide range of seed sizes, resulting to uniform seeds distribution along the travel path, in seed spacing.

P.P. Shelke concludes that bullock drawn planters are becoming necessity for sowing as the skilled workers for sowing are almost diminishing. Planting distance and plant population are crucial factors in maximizing the yields of crops.

Singh (1971) revealed that by using a seed drill for wheat crop there was an increase in yield by 13.025 percent when compared with the conventional method, it also revealed that by using a seed drill for wheat crop, a saving of 69.96 per cent in man-hours and 55.17 percent in hillock hours was achieved when compared, with the conventional method.

Umed Ali . in Pakistan has evaluated three sowing methods and seed rate in a four replicated RCBD method and concluded that drilling method of sowing at seed rate 125 kg/ha is optimal for yield and quality of wheat grains, because the said sowing method and seed rate distribute seed uniformly and desired depth which provide appropriate depth for seed germination and crop establishment.

III. OBJECTIVES

The objective of this project is to present the machine which easily performs agriculture operations.
1)To reduce the efforts of a farmer and labor cost by introducing automation in agriculture field.
2)To perform operations like cutting, digging, seed sowing & pesticide spraying using a single machine, hence increase in production & saves time.
3)Easy operation of machine.
4) Maximum work done in less time.
5) Effective usage of solar energy to drive the machine.

IV. METHODOLOGY

The aim of our project is to design and develop a multipurpose machine, which is used to reduce time and human effort. The operations are carried by a machine are harvesting, digging, seed sowing and leveling to close the soil and also sprayer to spray pesticide. These all operations are performed by using the battery and solar power.

- The frame of machine is made of Mild Steel (MS). The four wheels are connected to the frame, which are driven by using a DC motor.
- The front of frame harvester rotor is connected and this rotor is rotated by using DC motor.
- On the middle of frame three diggers are connected to dig the soil.
- Funnel is used to store the seeds. Three hoses are used to connect the funnel, seeds are flown down with the help of low speed motor
- At the end of frame, the leveller is connected by using leveller the seeds are close in the soil.
- Sprayer is used to spray the pesticides on the crops. Pump is used to spray the fertilizer and the pump is operated on the DC motor.
- Top of the frame solar panel is mounted. Solar panel is connected to the battery. To operate all system, it requires 12V battery.

V. CALCULATIONS

DC MOTOR
Volt = 12v
Current = 1amps
Speed = 60rpm

Specifications
No of Teeth in Pinion =24
No of teeth in Gear = 60
Gear ratio = 2.5
Diameter of Gear = 10.5

EQUATIONS
Force required by cutting blade to shear the grass is given by;
$F = T/R \ldots$ (1)
Where, T = Shaft torque
R = Radius of cutting blade But shaft torque is given by;
$T = P/2\pi N \ldots$ (2)
Electrical Power is given by;
$P = I * V \ldots$ (3)
Torque of motor is given by;
$P = 2\Pi NT / 60 \ldots$ (4)
$T = (P*60) / (2\Pi N)$

Design Parameter
Selection of electric motor
A) DC motor SPEED (N) = 1250
B) RPM VOLTAGE (V) = 12 VOLT
C) POWER = 18 WATT

Torque of the motor

A) Torque (T) = (P X 60) / (2 X 3.14 X N)
= (18X 60) / (2 X 3.14 X 1250)
= 0.1375Nm i.e.
Torque = 137.5 N-mm

B) The shaft is made of MS and its allowable shear stress = 42 MPa

Electrical (electric) power equation

A) Power (P) = I × V
Where,
V = 12 V
P = 18 W
Then,
I=18/12=1.5 A

B) In hp = 0.02414hp

Plastic wheel

Size = 6 inch

1) Design of Frame

Frame design for safety for 25*25*3 square angle mild steel channel
b = 25 mm, d= 25 mm, t = 3 mm.
Consider the maximum load on the frame to be 20 kg.
Max. Bending moment = force*perpendicular distance = 20*9.81*400
M = 78480 Nmm
We know, M / I = σb / y
M = Bending moment
I = Moment of Inertia about axis of bending that is; Ixx
y = Distance of the layer at which the bending stress is consider (We take always the maximum value of y, that is, distance of extreme fiber from N.A.)
E= Modulus of elasticity of beam material
$I = BD^3/12-bd^3/12$
$= 25*25^3 / 12 -19*19^3/12$
I = 21692 mm4 σ_b = My /
I = 78480*12.5 / 21692
σ_b = 45.22 N /mm²
The allowable shear stress for material is σ_{all} = Syt / fos.
Where Syt = yield stress = 210 MPa = 210 N/mm²
And fos is factor of safety = 2
So σ_{all}= 210/2 = 105 MPa = 105 N/mm²
Comparing above we get, $\sigma_b < \sigma_{all}$ i.e. 45.22 < 105 N/mm²
So, design is safe.

2) Design of Shaft

$M/I = \sigma_b/Y$ (1)
Bending moment=force*perpendicular distance =5*9.81*450
Bending moment =22072.5Nmm for diameter 15mm,
I=π/64*d4
=π/64*154
I=2483.78 mm4
Therefore, using equation no. (1)
22072.5/5483.78=σ_b/7.5
σ_b = 8.86*7.5
σ_b =66.64 N/mm²

Solar panel calculation

A) VOLT = 18 V
B) POWER=10W
C) W = V X I
10 = 12 X I
I = 10/18
=0.566 A
i.e. I =566 Ma

Selection of Battery

From battery available range in market we assume battery capacity 12V, 7.2 Ah
Required battery capacity = V × I
= 12 × 7.2
= 84.4 Watt

But Consider deep cycle of battery is 80% of total capacity of battery
Running capacity of battery = 0.80 × required battery capacity
= 70 Watt
We consider following working time –
Load raise time = 5 min
Load lower time = 5 min Travel time = 15 min
Total time of one operation cycle = 25 min
So, total time of 25 min battery requires 10 min and in 1 hour we use 3 times battery when fully charged

VI. RESULTS AND DISCUSSIONS

The concept of group project was included in our engineering syllabus with the view to inculcate within us the application ability of the theoretical concept of design and production engineering to practical problems. So also, to help us to learn to work more as a team rather than an individual. This project is mainly based on minimizing man power as well as cost of the equipment. Automation is needed such as industry, bio-medical, survey line etc. Especially in agriculture field for increasing yield of crops. Flexibility of automation system is high than traditional system. The advantage of this system reduces the labor cost, and time. In this work a machine is built and established to carry out operations like seeding, digging, cutting, harvesting, Fertilization in an agriculture field. The functioning of the machine is performed by renewable energy like solar energy. It is expected that the machine will support the farmers in improving the efficiency of operations in their farms. It can help the farmers in the initial stage of agriculture

Table 1- COMPARISON BETWEEN TRADITIONAL AND MODERN METHOD

Sl. No.	Parameter	Traditional	Tractor	Agriculture machine
I	Speed	Slow	High	Comparatively high
II	Man power	More	Moderate	Less
III	Time required	More	Less	Less
IV	Sowing technique	Manually	Manually	Automatically
V	Required energy	High	Very high	Less
VI	Yield of crop	Low	Moderate	High

VII. REFERENCES

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