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A Review Paper on Solar Powered Soil Digging Machine

Dr.S.M.Mowade 1, Nikhil Pillare2, Mukesh Mankar3, Kishan Sarwa4, Satish Naktode5

1.Professor&Head of Department of Mechanical Engineering.
2.Student of Department of Mechanical Engineering.
3.Student of Department of Mechanical Engineering.
4.Student of Department of Mechanical Engineering.
5.Student of Department of Mechanical Engineering.
[1,2,3,4,5]Smt.Radhikatai Pandav College Of Engineering, Umred road,Nagpur-441203
Corresponding Author; Dr.S.M.Mowade

Abstract:-*The interest of people towards plantation of sapling is increasing due to global warming, rise in global temperature and many such factors, so plantation is being done at a faster rate through many of the government organisation,N.G.O'S as well as people.The Solar Powered Soil Digging Machine which shows capability of drilling in soil and to improve sapling plantation techniques. Solar photovoltaic system use silicon cell get connected in series and parallel combination known as solar panel it convert sun-light into electricity. This machine uses the principle of auger drilling machine which is used in pile foundation during construction. The machine is made automatic by employing a D.C motor which serves as a power source for digging the soil.This machine is designed for a preliminary aim of avoiding the use of shovels & levers in plantation of saplings thereby enhancing the plantation process by making it facile. Engine is running on fossil fuel which emits carbon dioxide and other pollutants every second.In order to make the developmentof our farmeras well as nation in automation in there working field sustainable and cause less harm to our environment this system find vital place in present era.*

Keyword*:-Plantation, Solar Powered, Solar Panel, Motor, Auger bit*

I. Introduction

The need for plantation of trees has become even greaterthese days and going increasing day by day because of the increasing emission of CO_2,SO_2 and other pollutant substances to cause pollution in the environment. Tree plantation involves transplanting tree seedlings or sapling transplanting to grow forests and spread greenery around. There are a various number of reasons why the process of tree plantation is important for the environment on presents days as well as future days.

Today, we are losing environment at a fast race due to urbanization and related factors. The rate of damage to the environment is way too high than its repair, thereby, making tree plantation a much needed method to control environmental damage. Though, it isdifficult to totally reverse the damage, we can at least minimize its effects by planting trees, so plantation is being done at a faster rate through many of the government organization, N.G.O'S as well as people. In case of planting trees in huge number it is difficult to use shovels & levers for the same it makes the process tiresome and takes very long time. There are various technique used in India for making dig in the soil are manual, ox and tractor operated or engine operated soil digging machine.The manual and ox operated technique are time consuming and low in productivity. A D.C motor can be fitted to the end of the auger shaft and which can be used both in clockwise and anti-clockwise direction thus enabling the shaft to go deep inside the soil as well as come back after the required size is being achieved. The auger drill is made of required size by scaling up and down its original size as per the requirement.There are water container provided for loosening hardness of soil as well as watering the plants after plantation .The machine can be transported easily since there are wheels which are provided at the bottom of the frame. The machine is made of stainless steel material since it should withstand a higher impact loading. The motor power is brought down to the shaft using spur gear arrangement. The greater advantage in this machine is that it digs only the required area and also does the same in very minimum time.

Fig. Shovel operated dig

Fig. Tree plantation

Solar Energy

Our home planet Earth intercepted power from the sun is approximately 1.740×10^{17} MW, which is more than thousands times larger than the total consumption rate on the earth including all commercial sources of energy on the present days. Thus converting this energy to other forms of energy, it will one of the most promising resources of non- conventional energy.śThe use of solar power in India is a fast developing industry. In India capacity of solar installed reached 31.696 GW as of 31 October 2019.On other hand globally India has lowest capital cost per MWs to install the solar power plant.

II. Objectives

The objectives of fabrication a system for Solar Powered Soil Digging Machine is:

- To make a portable machine with the use of battery as a power source
- Low cost as compare to existing engine operated machine.
- A Machine with more efficient and less noise.
- To Improvement and optimizing the present procedure to improve simplicity and availability.
- Minimize the time and effort required by arranging simple mechanical and electrical mechanisms.
- To Develope machine which will require less labour and which can be operate with unskilled operator.
- It will completely operate on green energy

In short objectives are:

- Efficient
- User-friendly
- Transportable
- Cost-effective
- Reduce repetitive task
- Functional requirement of proposed system

III. Methodology

- Considering various problem identification and study of current system find alternative method of making dig in soil.
- Study of the Literature for the soil digging machine.
- Considering the ergonomics and aesthetics factor in mind, Select the shape and size of project.
- Our focus on to make this machine portable, we are trying to eliminate excess parts of machine and make it less bulky and light in weight.
- We are trying to keep its operation as simple as possible.
- Selection of material and components utilized in fabrication such as solar plate, battery, motor, auger bit, frame etc.
- Selection of size of equipment as the requirement.
- Finding the different components for experimental set up according to design.

- Performance on the experiment set up.

IV. Equipments

1. SOLAR PANEL :-Solar energy is the renewable energy resources. Solar energy can be directly converted to electrical energy by means of photovoltaic effect which is defined as the generation of the electro motive force as a result of the absorption of ionization radiation. Solar energy is the conversion of the light energy into the electricity. Here we are using photovoltaic cells, energy from the sun can be converted into electricity that we can use everyday. Silicon is one of main materials that can be used in a photovoltaic cell to convert the sun's energy into electricity. As sunlight strikes onsolar cell of silicon the electricity generated can be used to power source to a motor.

2. BATTERY:-A battery is an electronic device which is used for storing of electrical energy. Batteries is the only technically and economically available storage of energy means. Since the photo-voltaic system and battery are high in capital costs. The overall system be optimized with respect to available energy .To be economically the storage of solar electricity requires a battery with following properties.

(1) Low cost
(2) Long life
(3)High reliability

3. DC MOTOR :- The power source for the soil digging machine is obtained from DC power supply. Hence DC motor is used to operate the auger drill the motor power is about 0.33 HP and it has an torque about 4.2 Nm sufficiently enough to turn the auger and lift the mud from the ground.Selection of this motor done on the basis of Torque Constant – 8 N.m (80 kg-cm), high torque motor beneficial for the drilling into the soil.

4.AUGER BIT:-The auger drill is usually made out of shaft which has shovel blades surrounding it. The normal auger drill is usually made for a size of 6" diameter and 8m depth since it is being employed for pile making purpose. In our case the purpose is to make a hole of 5 to 9" diameter so the auger is scaled up to a smaller size having the diameter suited for the above purpose and a depth of 16". The shaft is first made and then the blades are fixed on to it. As per requirement of various size of dig the dimensions of auger bit can be scaled up and down.

V. Block Diagram

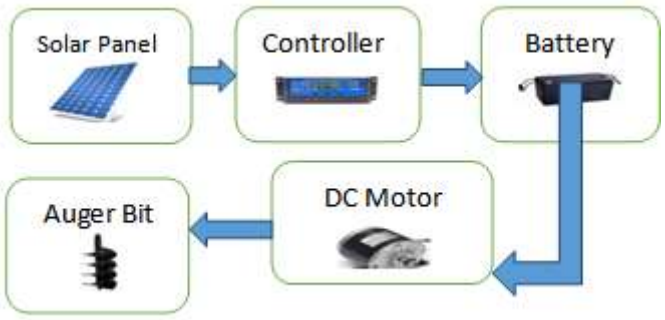

Fig. Block Diagram

VI. Literature Survey

Several studies were reported and held successfully recently due to the awareness created by Government and Non-Governmental organizations on the importance of green resources and tree plantation and automation in agriculture field.

Limo Kipkoech Eliudet al (2011) proposed machine is driven by the tractor power take-off (PTO). The PTO shaft will be connected to the vertical shaft by a set of straight mitre bevel gears at 90 degree. The design of auger type drilling units with the auger being replaced by the vertical shaft carrying a cutter pate.

Ersson B. T. et al (2013) Based on their assumptions and simulations revealed that in-creasing the number of planting heads per crane arm rather than number of crane arms per base machine offers the greatest potential to raise the productivity of intermittently advancing planting machines.ssss

Joshi S.G et al (2014) presents a high speed solar powered system in cultivation based on robotic platform and artificial agent which is steered by DC motor remote control. The IR sensor is used and the seed block can be detected and solved using water pressure.

Kyada. A. R et al (2014) proposing for seed to seed spacing and depth of seed placement, using mechanisms such as seed meter mechanism, plunger mechanism, lever fulcrum mechanism, cam shaft and power transmission, pulling mechanism.

Swetha S. et al (2015) developed a machine to minimize the working cost and time for digging and seed sowing operation by using solar energy to run the wheels. IR sensors are used to maneuver robot in the field.

International Conference on Systems, Science, Control, Communication, Engineering and Technology 2016 [ICSSCCET 2016] Semi-Automated Soil Digging Machine for Sapling Plantation SaiKrishnan D1, Sakthivignesh K2, Balaji P3, Brailson Mansingh B4 International Journal Of Research In Advent Technology, Vol.5, No.5, May 2017 E-Issn: 2321-9637.

VII. Conclusion

Innovative soil digging equipment's has exceptional influence in agriculture and sapling plantation. By using this innovative project of soil digging machine we can save more time required for digging process and additionally it reduces lot of labour cost. It is very helpful for large tree plantation program and making portable wall compound around the farm. After comparing the distinctive method soil digging and restrictions of the existing machine and from the experimental validation and theoretical analyses it is found that the above project is feasible and can be extensively used in Plantation of Sapling. We have identified the best auger drill design and material such that it operates effectively under different types of soils. During the design process we have intuitively guessed the value of torque required to dig a hole and found the guessed the value to be satisfactory and hence its saves work requirement so as labour cost, labour time and also save parts of energy. Hence it is easily affordable by farmers. So we feel that this project serves something good to this world and we would like to present it before this prosperous world.

After comparing the different method of soil digging and limitations of the existing machine, it is concluded that this solar powered soil digging machine is

- Environment friendly as no fuel is required
- Economically affordable

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