5-In-1 Agro Machine

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Abstract- *Since agriculture is a backbone of Indian economy and above 70% of Indian people depending on agriculture, development of agricultural equipment plays a vital role. From few decades even though improved agricultural machineries have been invented they have not been reached to farmers in economical way. Objective of this project is to reduce human effort in agricultural field and also reduce cost of equipment's. 5-in-1 Agro machine can perform five different operations such as ploughing, grass carving, water spraying and seed sowing. The motors used in this equipment are powered by solar panel which makes the concept economical and will satisfy the partial thrust of Indian agriculture. Practically the developed machine will satisfy the consumer need in most economical way.*

Keywords- Grass carving, cultivation, seed sowing, flowing process, crop dusting operation

I. INTRODUCTION

Agriculture is a process of cultivating the land or raising stock, it is an historic sector and back bone of Indian economy. Agricultural equipment are the most important endeavor in the world, as it imparts about 8.4% to the total Gross Domestic Product andjprovidesjemployment to over060% of the universe.

Fig-1: Early age plough tool

Agriculture is composed of five specialized branches. They are

- **Agronomy** deals with the soil management and growing of crops.
- **Horticulture** deals with the cultivation of fruits, vegetables and ornamental crops.
- **Agricultural engineering** which deals with farming machines and equipment's. Also involve developing of new systems and practices to address agricultural problems.
- **Agricultural economics** which deals with the business end of farming.
- **Animal science** which basically involves the breeding and caring of animals for particular purpose.

Improved agricultural methods increase the economic status of Indian domain. Agro machineries are devices used in farming process. The mechanized agriculture is a process of using mechanical devices in various agricultural methods to greatly increase the productivity of farming [1]. Over the years, agricultural practices have been carried out by small-holders cultivating between 2 to 3 hectare, using human labor and traditional tool such as wooden plough, yoke, leveler, harrow, spade, big sikle etc. These tools are used in land preparation, sowing of seeds, weeding and harvesting. Multipurpose agriculture equipment is basic and major equipment involved in agriculture for maximum yielding.

In India, farmers are facing many problems in developing of agricultural methods because of unavailability of laborers, traditional approaches of farming using non efficient farming equipment's which requires more time and also increases labor cost. It causes farmers to suffer more, for example in traditional method the seed sowing process is carried out based on some assumptions of seed spacing and depth of placement which is not at all streamlined and alongside it needs lot of time and efforts too.

II. MATERIAL SELECTION & DESIGN OF FABRICATION

2.1 Ball bearings

Ball bearings have extended advantage than other hence with widely used to maintain the distance between moving parts of bearing. The 5-in-1 agro machine is developed by using ball bearings which will reduce rotational friction and power loss. It consists of a number of rolling balls made of hard steel, the balls are fitted between a metal sleeves over a rotating shaft and the outer sleeve mounted in the bearing housing.

Fig -2: Advanced Ball Bearing

Outer diameter D_1 is =35 mm , inner diameter D_2 is = 15mm, thickness T is = 12mm, r_1- corner radii of the shaft and housing

Therefore mean diameter of the bearing:

$D_m = (D_1+D2)/2 = (35+15)/2$
$D_m = 25$ mm

WAHL STRESS FACTOR:

$$Ks = \frac{4C-1}{4C-4} + \frac{0.65}{C}$$
$$= \frac{(4 \times 2.3) - 1}{(4 \times 2.3) - 4} + \frac{0.65}{2.3}$$

K=1.85 hence ball bearings found most suitable for the model.

2.2 Mild steel and low carbon steel

It plays an indispensible character in the fabrication of agro model .the percentage of carbon dispersed in steel ascertains the diverse categories of steel, this is on account of the 0.05-0.12% and 0.1-0.3% of carbon which enhances the ductile and malleable attributes besides ameliorates surface hardness with 7.85g/cm^3 denseness and 210x10^3 N/mm^2 of young's modulus.

2.3 Solar panel

Solar panel will be the power recharger for agro model. Solar PV array in which the electrical energy is directly harnessed from sun by PV effect. The table shows the specifications of solar panel used for model. The 9X8 cells format panel has been used as power source.

Table-1: Solar panel parameters

PARAMETERS	SPECIFICATIONS
Maximum power	10WP
Open circuit voltage	22.32 V
Short circuit current	0.6 Amps
Maximum voltage	18.1 volts
Maximum current	0.56Amps
Permissible system volt	600 V

2.4 Toggle switches

Toggle switches are used to control individual agro machine operations. Toggle switches operated by both manual and by lever to ease the operation.

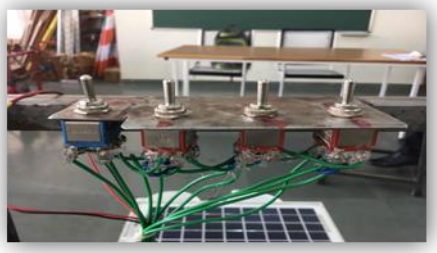


Fig- 3: Dedicated Toggle switch

In the model, manually operated electromechanical toggle switches are used with one or more electrical contact sets that are connected to electrical circuits. The toggle switches are of two way and three way control which enables the operation easier and flexible.

III. METHODOLOGY OF WORKING

Fig -4: Fabricated design.

The five in one machine principally works on the battery and gets charged by solar panel. Ahead starting the machine, the wirings are affiliated to the battery accordant to their terminals (+ve, -ve) then the battery is charged by solar plane. The machine is controlled by the toggle switch [2]. First the cutter blades are ON by using toggle switch which rotates at 20 rpm and the mechanism is used to cut the crops and

unwanted weeds, continuing with the cultivation tool connected to lead screw through the bearing and operated by dc gear motor through the toggle switch.

Fig-5: Cultivating fabrication

The forward motion of the toggle switch results the lifting up the tool from the ground level. The back word motion of toggle switch leads to down word movement of tool which touches the ground level or depth is increase for cultivation.

Table-2: Specification of model

COMPONENT	SPECIFICATIONS
Length	2.28 inch
Width	1.2 inch
Tank	0.96x0.35 inch
Machine weight	15kg
Operation speed	8km/hr
battery	12 V, 7.2AH
Tank capacity	5 lit
Power source	Solar panel
Field capacity	1000 sq ft

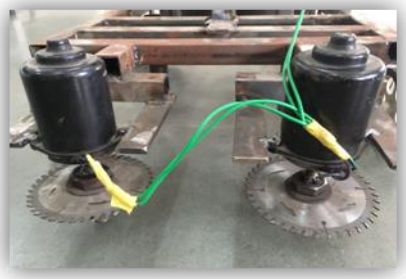


Fig-6: Cutters

The DC gear motors are ON to move the machine in forward motion and backward motion. Each motor is connected to two toggle switches when these switches are in same direction (forward direction) the wheels are rotated at forward motion [3] same as the vise-versa when the both switch are in same direction (backward) the wheels are rotate at backward direction. In this gear motor we can incur angular motion also, when the two toggle switch of drive motor are in opposite direction (1in forward and s2in backward direction) the wheel are rotated in angular motion.

Fig-7: Hoppers

The next operation is hoppers and the water sprayer, these both operations are controlled by single switch as the both switch is ON the two operations are done at same time. The hoppers , it is operated by cam mechanism by dc motor which is controlled by switch by the cam mechanism the hoppers reciprocate in a linear motion .this is used feeding the seeds to the cultivating land, as the hoppers reciprocate the seed will fall on cultivating land[4]. Water sprayer it is operated when submersible motor is ON in the water tank, the water sprayer is connected to the submersible pump.

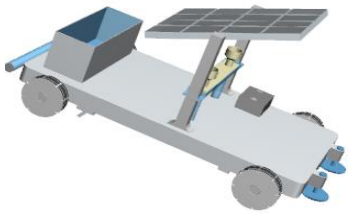
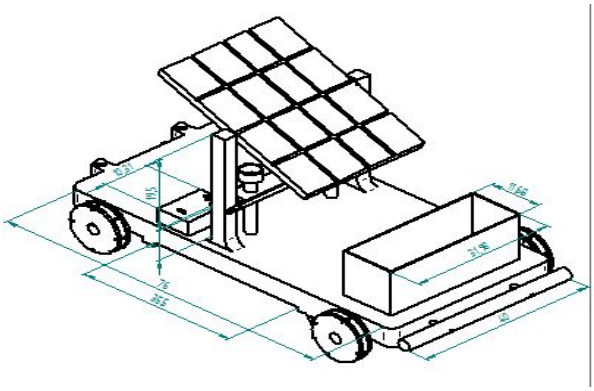


Fig- 8: 2D and 3D isometric view of design



IV. CONCLUSION & FUTURE SCOPE

The 5-in-1 agro machine requires less human power and less time compared to other traditional methods so if we manufacture it on a large scale its cost gets significantly reduce and we hope this will satisfy the partial thrust of Indian agriculture. So in this way we can overcome the labor problem that is the need of today's forming in India. It performs more than one operation, so processing time can be saved. By using agro machine maximum farmers can overcome with labor wages difficulties by reducing the dependency of labors for farming process and also can make the process very ease and fast. It can be further used for the following purposes:

- To provide the agro machine with reduced cost and less weight.
- To reduce human exertion in the agricultural domain.
- To adapt proper depth in variable soil in any atmospheric conditions.
- To increase power output using solar energy this also increases the efficiency of machine.
- To solve the labor crises problems.
- To improve output by minimising processing time.

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