Design and Fabrication of Multi-Purpose Agricultural Vehicle

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Abstract- *The paper aims on the design, development and the fabrication of the vehicle which can dig the soil, sow the seeds, leveler to close the soil and pump to spray water, these whole systems of the vehicle works with the IC engine and solar power, the vehicle is controlled by accelerator. In recent years the development of the autonomous vehicles in the agriculture has experienced increased interest. The advantages of these vehicles are hands-free and fast input operations. In the field of agricultural autonomous vehicle, a concept is been developed to investigate if multiple small autonomous machine could be more efficient than traditional large tractors and human forces. Keeping the above ideology in mind, a unit with the following feature is designed, Ploughing is one of the first steps in farming. During this process we till the land and make it ready for the seed sowing. By tilling we mean that a plough will be used which will have teeth's like structure at the end and will be able to turn the top layer of soil down and vice-versa. Seed sowing comes next where the seeds need to be put in ground at regular intervals and these needs to be controlled automatically. Limiting the flow of seeds from the seeds chamber is typically doing this. soil leveler is fitted to close the seeds to the soil and to level the ground. Water pump is used to spray the water.*

I. INTRODUCTION

Agriculture is the backbone of India. The history of Agriculture in India dates back to Indus Valley Civilization Era and even before that in some parts of Southern India. Today, India ranks second worldwide in farm output. The special vehicles plays a major role in various fields such as industrial, medical, military applications etc., The special vehicle field are gradually increasing its productivity in agriculture field. Some of the major problems in the Indian agricultural are rising of input costs, availability of skilled labors, lack of water resources and crop monitoring. To overcome these problems, the automation technologies were used in agriculture. The automation in the agriculture could help farmers to reduce their

Efforts. The vehicles are being developed for the processes for ploughing, seed sowing, leveling, and water spraying. All of these functions have not yet performed using a single vehicle. In this the robots are developed to concentrate in an efficient manner and also it is expected to perform the operations autonomously. The proposed idea implements the vehicle to perform the functions such as ploughing, seed sowing, mud leveling, and water spraying. These functions can be integrated into a single vehicle and then performed.

II. REASON FOR SELECTING THE PROBLEM

- Lack of mechanization in farming
- Required excess efforts for different process.
- Required more man power.
- Excess time consumption for performing individual process.

III. SCOPE OF PRESENT PAPER

The Present project aims at designing an intelligent robotic vehicle which can be controlled by accelerator, the main aim of our project has been to develop an IC engine operated digging machine. In this machine we used a 2 stroke operated IC engine, which uses petrol as source to operate. IC engine output is connected to the wheel by chain and sprocket mechanism and same power is used to move bevel gear which intern operates the seed sowing mechanism. In this project an attempt is made to make the electric and mechanical systems share their powers in an efficient way.

IV. OBJECTIVES

The objective of this paper is to present the status of the current trends and implementation of Agricultural and autonomous systems and outline the potential for future applications. Different applications of autonomous vehicles in agriculture have been examined and compared with

Conventional systems and are proved as efficient and effective.

- To reduce human effort in the agricultural field with the use of small robot.

- To perform all 4 operations at single time, hence increases production and saves time.
- To complete large amount of work in less time.
- The usage of solar can be utilized for Battery charging. As the Robot works in the field, the rays of the sun can be used for solar power generation.
- To increase the efficiency, the solar power is used and the Power output can be increased.

Moreover we will give examples of the economic potential of applying autonomous robotic vehicles compared to conventional systems. Focus will be put on potential labor cost savings, farm structure implications and sizes for operation, daily working hours, potential environmental impact, energy costs and safety issues

V. METHODOLOGY

The basic aim of this project is to develop a multipurpose machine, which is used for digging the soil, seed sowing, and leveler to close the mud and water sprayer to spray water with least changes in accessories with minimum cost. This whole system of the robot works with the battery and the solar power.

- The base frame is made for the machine with 2 wheels connected to the drive.
- One end of the frame, cultivator is fitted which is also driven by IC engine and design is made to dig the soil.
- Funnel is made by the sheet metal, to store the seeds and the seeds flow through the funnel through the drilled hole on the shaft to the dogged soil.
- On the end leveler is fitted to close the seeds to the soil, and water pump sprayer to spray the water.
- Solar panel is placed on top of the machine and is connected to the battery for charging the battery.
- Thus the max efficiency is utilized from the sun by the solar panel and to the battery
- The whole robot requires the 12v battery to operate the system
- Toggle switches are used to control the operation of the vehicle.

Fig. 1 Fabricated model

VI. OPERATIONS

This is equipment used for ploughing the land by using the bike engine that is 2stroke ic engine and as well as it can remove the weeds which grow in different crops so that the machine can be used for multipurpose and reliable this device has a bike engine which will work on petrol and serve the farmers in better way. As the engine operates it drives the wheel by using sprocket & chain mechanism, as this device moves in forward direction the wheels rotates and move in forward direction the engine is mounted on the frame and back side of the equipment is flexible to adopt different tools for different agriculture operations.

6.1.Ploughing

Fig. 2 ploughing operation

A plough is a tool or farm implement used in farming for initial cultivation of soil in preparation for sowing seed or planting to loosen or turn the soil. Plough were traditionally drawn by working animals such as horses or cattle, but in modern times are drawn by tractors. A plough may be made of wood, iron or stick used to cut the soil and loosen it. It has been a basic instrument for most of recorded history, although written references to the plough do not appear in English until c.1100 at which point it is referenced one of the major agricultural inventions in human history. The primary purpose of ploughing is to turn over the upper layer of the soil,

bringing fresh nutrients to the surface, while burying weeds and the remains of the previous crops and allowing them to break down. As the plough is drawn through the soil it creates long trenches of fertile soil called furrows. In modern use, a plough field is typically left to dry out, and is then harrowed before planting. Ploughing and cultivating a soil homogenizes and modifies the upper 12 to 25cm of the soil to form a plough layer. In many soils, the majority of fine plant feeder roots can be found in the top soil or plough layer. Plough were initially human powered, but the process became considered ably more efficient once animals powered ploughs were undoubtedly pulled by oxen , and later in many areas by horses and mules, although various other animals have been used for this purpose. In industrialized countries , the first mechanical means of pulling a plough were steam powered , but these were gradually superseded by internal combustion powered tractors and tiller.

6.2. Seed sowing

Fig. 3 seed sowing operation

Mainly it consists of tray with two holes, pipes and cam plates attached to the bevel gears. When seeds are filled in the tray, the seeds come out from the tray only when there is movement of the vehicle. When the vehicle moves power is transmitted to bevel gears through chain and sprocket .The bevel gear rotates from which the cam plates with holes rotates. When the holes of the cam plates and the holes of the seed tray comes to proper alignment, the seed comes out and

Reaches the ground .For every 360 degree rotation of the cam plates 4 seeds comes out. The distances between the seed to seed can be adjusted by hole distances in the cam plate and the rate of seeds can adjusted by number of holes in the cam plates. The main advantage of using this mechanism is to reduce the wastage of seeds. And for adjusting the proper and correct distances between the seeds.

6.3. Leveling

Fig. 4 leveling operation

A Sheet metal Plate is used as mud closer and leveler, the long bolt and nut is used for leveler up & down movement. The Leveler is not powered, instead it is fixed to required level initially, and the leveler closes the soil in the sowed soil & levels the land. It is the instrument used to level the soil. The soil comes upon up while ploughing forms the furrows in which the seeds are been put. In order to close the soil the levelers are with some or minimum clearance with the ground. The width of the levelers should be greater than the furrows formed while ploughing in ordered to close the soil properly over the seeds in the soil. But care should be taken over the level of depth of the soil in the field to avoid the damage of the seeds.

VII. CONCLUSION

After the manufacturing and trail on the "Multipurpose Agricultural Automobile (Farm Machine)" conclusion made are as follows:

This multipurpose farming machine has considerable potential to greatly increase productivity of crops. So, designing and fabricating a multipurpose farming machine which will do multiple operation simultaneously i.e. ploughing, seeding and leveling. The machine is successfully tested into farming field and reduces time 60% for ploughing and 50% for seed sowing compare to the traditional method. Less man power needed to operate this machine i.e. 1 person to operate. Therefore, the cost of production crops is less. Design and fabricate machine at affordable price. The multipurpose farming machine can be made from local components in workshops. This machine is more beneficial to small farmers who cannot afford farming equipment at higher cost. And one person can be easily handle this machine

- Based on the overall performance of the machine we can definitely say that the project will satisfy the need

of small scale farmer, because they are not able to purchase costly agricultural equipment.

- The machine required less man power and less time compared to 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 farming

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