Multi Operational Vehicle for Maize Plantation

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Abstract—Agriculture is demographically the broadest economic sector and plays a significant role in the overall economy of India. For the growth of Indian economy, mechanization is necessary. The main purpose of mechanization in agriculture is to improve the overall productivity and production. Planting is conventionally done manually which involves both animate (humans and draught animals), this result in higher cost of cultivation and delay in planting.

This article addresses improvement in agriculture processes like automatic planting of seeds on ploughed land by using vehicle. We have developed a vehicle having three wheels and steered by DC motors. The complete assembly can be powered by using 12V Pb-acid rechargeable battery. The battery can be charged by using solar panel which is also mounted on robot. Assembly language is used in programming the microcontrollers.

Keywords—Mechanization, Microcontroller, Indian Economy, Plantation, Vehicle

I. INTRODUCTION

Agricultural sector is changing the socio-economic environment of the population due to liberalization and globalization. About 75% people are living in the rural area and are still dependent on agriculture. About 43% of geographical area is used for agricultural activity. Agriculture has been the backbone of the Indian economy. As Indian population is growing continuously, the demand for producing crop per hectar is also increasing, this requires efficient and high-capacity machines. So mechanization in agriculture industry plays an important role in Indian economy\cite{1}.

In current generation most of the countries do not have sufficient human factor in agriculture sector and it affects the growth of developing countries. In India, there are 70% people dependent on agriculture. So we need to study the agriculture\cite{2}.

In modern globalization, many technologists are trying to update a new development based on automation which works very rigidly, high effectively and within short time period. They have developed driverless tractors but they did not have ability to embrace the complexity of real world. Now the approach of this project is to develop smart machine which do right thing in right place at right time with right amount in process of farming. The progressive invention in agriculture system is becoming an important task especially because of rising demand on quality of agriculture products and declining labour availability in rural farming areas\cite{3}.

Innovative idea of our project is to automate the process of sowing crops such as maize. The farming systems like cultivating, ploughing, watering, levelling the sand etc. is different process. All the processes are advance to modifying the mechanism in farming which works automatically without the man power requirement.

II. LITERATURE SURVEY

Regarding the mechanisation of agriculture, Billings, M.M. and A. Singh (1971) conducted a study on the impact of technological changes on human labour demand in Punjab and Maharashtra.
states representing developed and under developed regions in India based on the extent of new farm technology. The adoption of new farm technology such as area under high yielding varieties, power system of irrigation and use of power threshers, reapers and tractors, etc. was higher in Punjab.

A study conducted by Singh, H.K.M. (1979), highlights that tractor use has positive effect on employment of agricultural labour. The supply of local labour was not enough to meet the increased demand for labour in agricultural sector. Consequently, wages started rising. But because of the segmented labour market, the labour from other states, e.g., Uttar Pradesh, Bihar and Rajasthan started migrating to Punjab.

Sidhu, R.S. and S.S. Grewal (1990) analysed the demand for labour in tractor-operated farms and bullock operated farms in Punjab. They brought out that contrary to the belief that tractor displaces labour, the intensity of human labour use was found to be higher by 1144 man hours per hectare on tractor operated farms than 1099 man hours on bullock operated farms. The increase in farm size, use of weedicides and low wages were found to have negative influence on human labour demand in the state agriculture.

### III. NECESSITY FOR A MULTI-OPERATIONAL VEHICLE

Since, there are so many different processes in the farming system like ploughing, seeding, watering etc. which requires a large amount of man power. So, to reduce these problems in rural areas we have developed a multi-operational vehicle for maize plantation. The following challenges are achieved by using a multi-operational vehicle for maize plantation:

- There is a lack of mechanization in farming.
- Different processes like ploughing, seeding, watering etc. requires excess effort.
- More man power is required in agriculture field.
- More time consumption also leads to less productivity.

### IV. GENERAL REQUIREMENTS FOR MAIZE PLANTATION

The general requirements for maize plantation are as follows:

- Temperature: Between 18°C and 27°C during the day and around 14°C during the night.
- Soils: Red soils of the tropics, Black cotton soil.
- Planting Depth: 1.5 to 2 inches deep.

By considering above requirements, we have developed a multi operational vehicle for maize plantation.

### V. METHODOLOGY AND WORKING PRINCIPLE

![Figure 1. Flow Chart](chart.png)
Base frame is made for the vehicle with three wheels connected each with the dc motors. Three Wheels are welded to the chassis through bearings. Plougher is fixed at the mid-region of the vehicle and design is made to dig the soil in a ploughed land. On another end, leveller is fitted to close the seeds to the soil and water pump sprayer to spray the water. At the rear shaft, holes are made for the seeding which is connected by two funnels.

The vehicle makes use of solar panel and batteries to operate. The vehicle is controlled by the wireless Bluetooth module, which is connected to the microcontroller. Using Mobile phone, farmer can control all motion of the vehicle.

VI. PROPOSED MODEL OF A MULTI OPERATIONAL VEHICLE
### VII. MATERIAL REQUIREMENTS AND ITS SPECIFICATIONS

| **Table 1. Material Specifications** |
|-------------------------------------|
| **BATTERY**                         |
| Weight of battery: 2kg              |
| Output power: 12v 7.5 amps          |
| Operating voltage: 12v 1amp         |
| Current: 1 to 1.5 amps              |

| **DC MOTOR**                        |
| Motor speed: 80 rpm                 |
| Operating voltage: 12v              |
| Operating current: 1 amps           |

| **SOLAR PANEL**                     |
| Panel size: 316*217mm               |
| Weight of the panel: 500gms         |
| Voltage: 9V                         |
| Current: 0.335amp                   |

| **WATER-STORING JAR**               |
| Weight of the jar: 500gms           |
| Capacity: 2.5-3 Litres              |

| **WHEELS**                          |
| No. of wheels used: 3               |
| Material: Rubber                    |
VIII. FABRICATION PROCESSES REQUIRED TO DEVELOP THE VEHICLE

![WELDING PROCESS](image1.jpg) ![DRILLING OPERATION](image2.jpg)

![SHEET METAL FABRICATION](image3.jpg)

*Figure 5. Fabrication Processes*

IX. OBJECTIVES

With the help of a multi operational vehicle, the following objectives can be achieved:

- To minimize human effort in the agricultural field.
- To perform four operations (Ploughing, Sowing, Levelling and Watering of Maize seeds) at single time.

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➢ To increases production and save time of farmers.
➢ No pollution problems.
➢ Farmer can operate this vehicle remotely.

X. CONCLUSION
This project work has presented progress towards achieving a future precision autonomous farming system. This system is designed to plant the maize seeds effectively. With this compact design of vehicle, it is possible to plant the seeds in ploughed land. The system can be automated by using bluetooth technology, solar panel, dc motor, microcontroller. This system can be operated on +12V rechargeable battery. The accuracy of seed planting can be obtained. This system will reduce labour problem in future. So this system will be the best replacement for currently used systems.

| SL.NO | PARTICULARS     | MANUAL | AGRI-VEHICLE |
|-------|----------------|--------|--------------|
| 1     | Man Power      | MORE   | LESS         |
| 2     | Sowing Technique | MANUAL | AUTOMATIC   |
| 3     | Seed Wastage   | MORE   | LESS         |
| 4     | Required Energy | MORE   | LESS         |

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