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## Multifunctional agricultural machine

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### ABSTRACT

*In our day-to-day life lot of traditional process have become automated because of automation of process activities are becoming more economic less labor intensive and most of all less time-consuming so, is the process in agriculture. Automation has been well integrated in various industries. In recent times agriculture an essential and traditional process has been automate which resulted in greater quality as well as quantity of crops and as quality of the product risen in a great amount so is the demand for them in modern consumers. The modern consumers demand organic products which are only possible by the use of organic crops created at farms. This demand will be ever-lasting and grow day by day as the number of consumers keep steadily increasing because of rapidly increasing population also due to application of automation in agriculture it has brought great comfort to the farmers working on field whom have picked it up and successfully keep up it however automation of agriculture has only been picked up by big companies' reason being they have the capital ensure the installation and smooth running of automation equipment in agriculture a normal farmer is not able to achieve such a great quality of product and compete against these big companies. If the automation process becomes at a reasonable price where a normal farmer can afford it and have a great product with consistent quality and even greater consumer demand. We are in this project using simple mechanics in order to make the cost of components cheap, affordable and easily replaceable for assembling prototype of a simple semi-automatic device at a reasonable price device for the average farmer. Using technologies such as advance technologies to do the same amount of work quicker and better.*

**Keywords**— Agriculture, Farmer, Automation, Prototype, Plough, Harvest, Seed drilling, Cart, Tool,

### 1. LITERATURE REVIEW

In this section, literature review is based on the area of research done by various authors has been executed and took help from researches for this paper. The literature review is performed on research paper as follows:

**D.A. Mada, Sunday Mahai, [2013]:** In this research paper author has mentioned needs of mechanization in agricultural industry by the conclusion from the paper was need of multifunctional single axel vehicle for pre and post harvesting. We have made this our fundamental objective to fulfil the needs of automation of agricultural industry presented in this paper

**Darshan M , Dastgir Ganagapur [2020]:** As due to urbanization labour has been shifting towards the metropolitan cities due there has been a significant amount of worker deficient can be seen as a result there may occur the incident of more supply and less demand in order cope up and to feed the demand the deficient must be covered. In order to do that the author has Fabricated agricultural Robot for Ploughing, Seeding and Grass Cutting where it employs robots instead of people to bring out more efficiency and cover the deficit.

**Siddaling S PDM B.S.Ravaikiran:** The paper is based on Design and Fabrication of Small Scale Sugarcane Harvesting Machine. The paper has described the relation between the tools and quality of crops.

**Hanumesha Pujar<sup>1</sup>, Prashant D Banakar and S C Sajjan Design:** The topic of the paper was Fabrication of Multipurpose Agricultural Mini Farm Vehicle Using Scooter Engine. Here a mini farm vehicle was created which had benefits over conventional methods.

## 2. INTRODUCTION

Agriculture is the specific study of theory and practice of cultivation of plants and livestock. Agriculture came to rise as the early man became gather from hunter i.e., stopped hunting of animals and began growing and gather crops and seeds. The word agriculture is made up of two Latin words agricultūra, from ager, "field", and cultūra, "cultivation" or "growing". Agriculture is a process to produce commodities which helps in maintaining life by cultivating food, horticultural crops, and their related services.” An agriculture produced product needs to go through various different process starting with selection of land following selection of crops and then continued by farming of the selected crops which are suitable on selected land the crops cultivated are later transported to a processing center where it is processed according to consumers demand then transported to distributors then they supply it to retailers and in final process product is consumed by consumers. In this the core process which gives birth to the chains of other process farming is the core. In this project we focus on the agriculture process.

Multi-functional Agriculture machine is a device which increases the efficiency of the process of cultivating crops. There are 3 main processes in the agriculture after selection of land and cultivating crops

1. Ploughing
2. Sowing
3. Harvesting.

There is various process in agriculture but all types of process come under these 3 core banners.

1.Ploughing: In this process a hoe or plough is used to loosen the soil of the land where cultivation would take place and make space for seeds to be sown. Here the land is divided in sections of row or columns

2.Sowing: This is just after the above process of ploughing where places have been made to sow the seeds if this done correctly whole field can be used evenly and all the areas can be utilized which would increase the quantity of crops

3.Harvesting: This process is not immediate after the other two but after months later when crops are fully grown after and ready to be transported to a processing factory

A modern farmer in order to do these processes either employ labor, buy machinery or do it by themselves. In first two option a lot of money is require while the third is quite labor intensive so, normally person with a handful amount of capital will opt for machinery or employee labor but if opts for machinery the person will need more money for its maintenance a sound knowledge of the machinery its using while if he employees labor he will have to deal with management of employees which will be cheaper but will be time consuming whereas this time can be utilized in a much more productive activity. While a person with no capital will opt for third option it will be too much time consuming and crops will have incontinent quality and quantity will be minimum. We create an adaptive design and assemble a device which will be an ensemble of parts and mechanism which are of low cost, more replaceable, easily transportable, very user-friendly interface, more efficient and give more consistent products which increase the demand of product.

The major companies in the agriculture industry and food industry which are as follows E.I. DuPont India Private Ltd which produce insecticide., Rallis India Ltd which is a tata enterprise., Nuziveedu Seeds Ltd which have various seeds in their product catalogue, Godrej Agrovet Ltd which provide mainly dairy products, Nestle India Ltd. with product such as maggi, nescafe and kitkat; Advanta India Limited, Monsanto Company, Parle Products Private Limited with variety of biscuits, Britannia Industries with products such as breads biscuits and cakes: Ltd., REI Agro Limited., and Indian Farmers Fertilizer Cooperative Limited (IFFCO) with products such IFFCO nano nitrogen.

## 3. DESIGNING

### Design of Cart

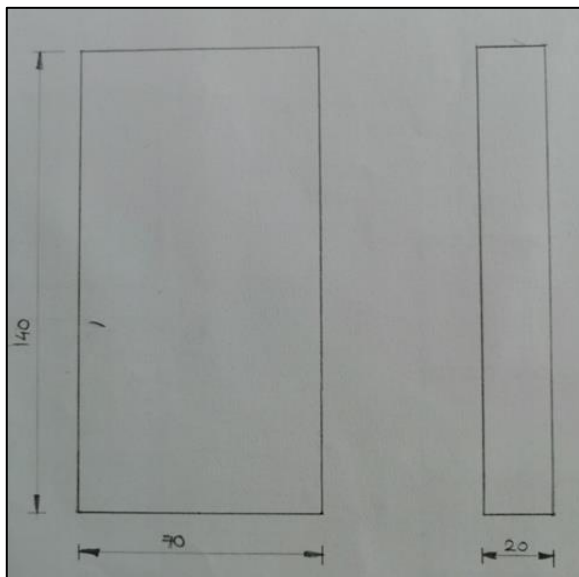


Figure No. 1: Wooden Plank for cart

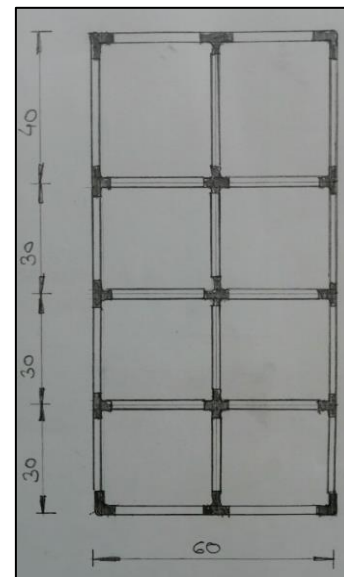
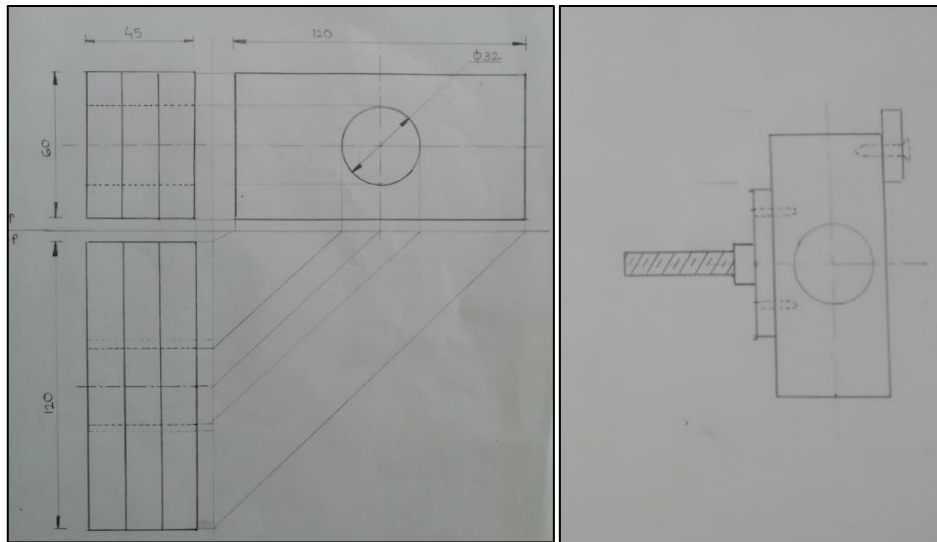


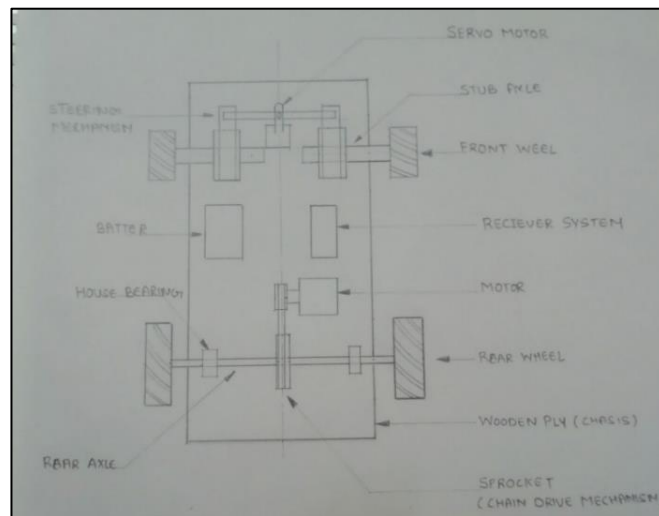
Figure No. 2: PVC Chassis of Cart

This chassis is under the wooden plank to give extra support and is made of PVC so it can be lightweight durable and cheap layout here is done in such a way where the weight will be distributed evenly at all sections



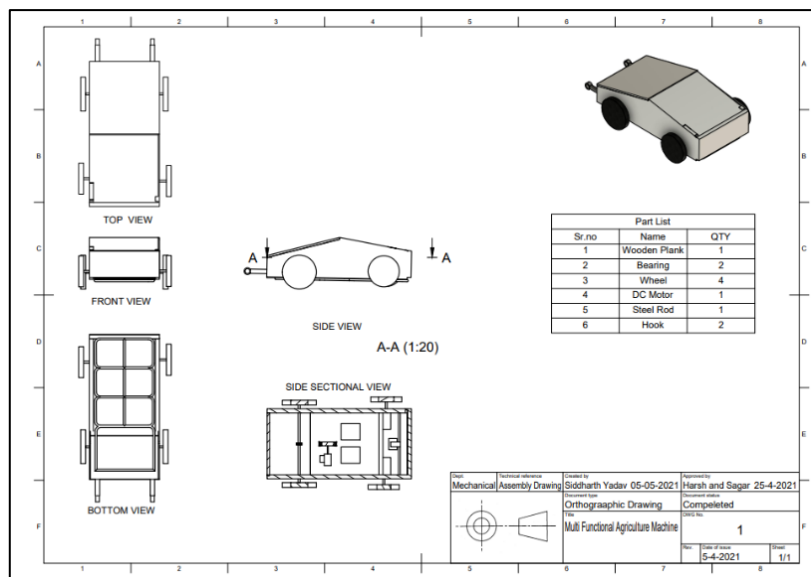
**Figure No. 3: Wooden Block Designs for Steering**

There steering block is an important party of the steering mechanism. It is made up of three layers for smooth rotation shaft passed through it



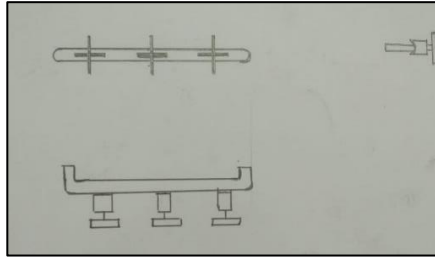
**Figure No. 4: Overall Cart Design**

This is a labeled design of the cart which will carry the tools where the components are mounted on the wooden plank in a systematic manner with proper weight distribution in mind



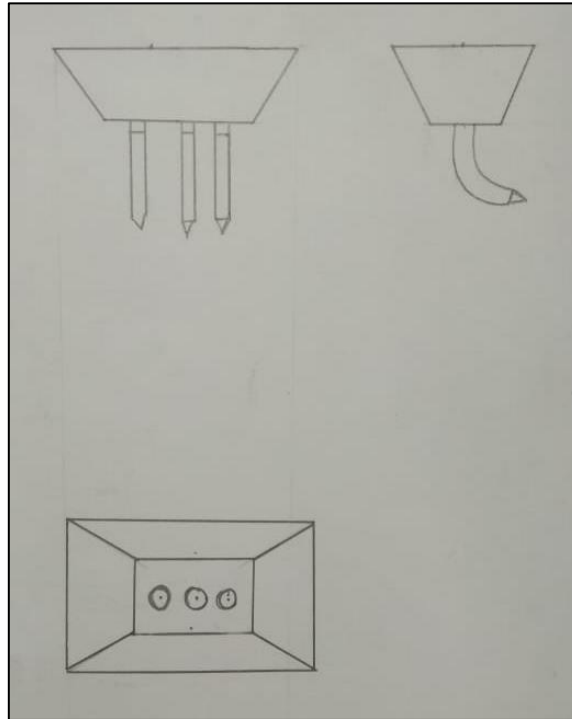
**Figure No. 5: Orthographic drawing of Cart**

**Tool Designs**



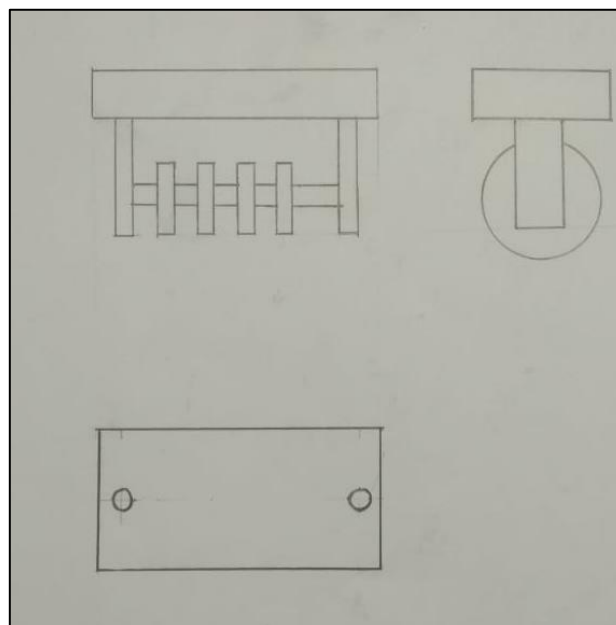
**Figure No. 6: Orthographic drawing of Harvester**

Harvester is used to harvest crops. It has three morors attached to a pvc pipe evenly attached for better asthetic and weight distribution .



**Figure No. 7: Seed driller orthogonal drawing**

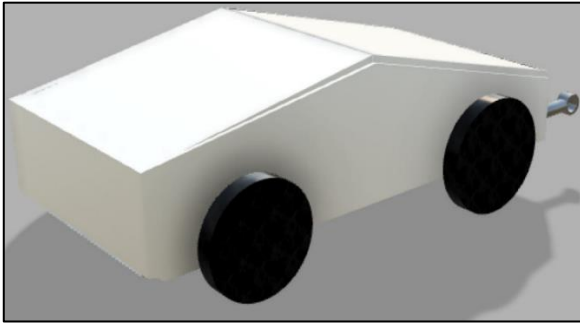
This tool is used to make drills on the land where seed will be putted. A hopper is used as storage tank for the seeds and it has three holes in it which are connected to three pipes and the pipes have a hoe a the end with vibrations of moving on land it will spread seeds on land



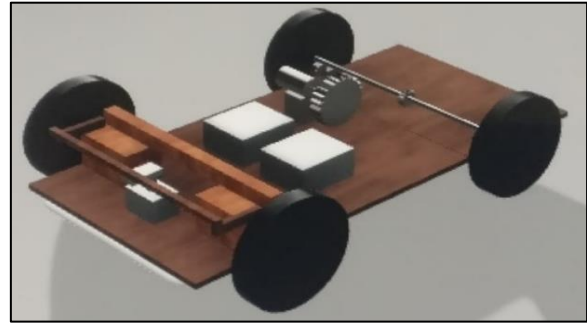
**Figure No. 8: Plough orthogonal drawing**

It has 4 circular plates connected to each other on a shaft which is connected to a flat plate which is connected to the cart

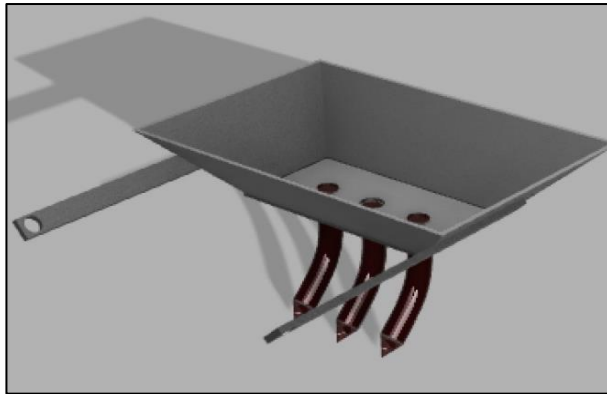
**3D Models**



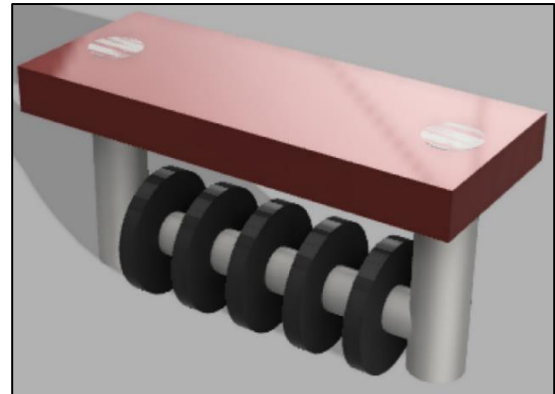
**Figure No. 9: 3D Model of cart with body**



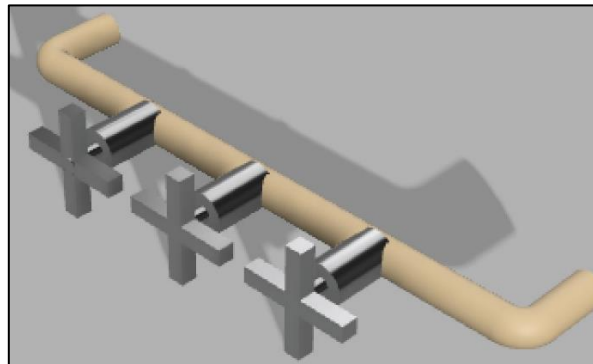
**Figure No. 10: 3D Model of cart without body**



**Figure No. 11: 3D Model of Seed driller**



**Figure No. 12: 3D Model of Plough**



**Figure No. 13: 3D Model of Harvester**

**4. METHODOLOGY**

**Cart**

The cart will be putting the tools on work by attaching it to the them and moving them along the field as its moving. In order to that will be using high torque motor of 300RPM planetary gear mechanism and a 35kg capacity servo motor for steering mechanism of the cart which all will be controlled using RC technology

**Tool**

The Tools or equipment is attached to the cart or carrier with the help of forked pin. Both the cart or carrier and tools are provided with single or double eye pin by which the forked pin will inserted to hold both. The Tools use in farming are for ploughing, seed drilling, sowing and harvesting. Here there are s3 tools are made to do the above-mentioned processes. Plough: The plough is made by using a semi rectangle frame. Shaft is providing just above the end section of rectangular frame and the elliptical plates are mounted on the shaft. the plougher is used before land drilling and sowing and to mix the soil properly for better fertilization. The tool for land drilling and sowing is combine to increase productivity and decrease time. Seed driller: In a seed driller a hopper or container is provided with three holes at bottom for the passage of grain towards land. Further the hole is connected with a hoe which having a grain size hole just below the pointed hoe end. As the tool move forward the grain automatically gets deposited in soil. In this the process of drilling of soil and sowing of seed are done simultaneously saving time and maximizing efficiency of the process.

**Harvester**

For the process of harvesting, we make a harvester by taking a PVC pipe frame which is made. At front of the frame, holes are provided so can we can accommodate high speed DC Motor. Cutting blade so mounted on the motor shaft so that we can do the harvesting easily and fast. Here crops are cutter automatically instead of manual labor by using cheaper alternative

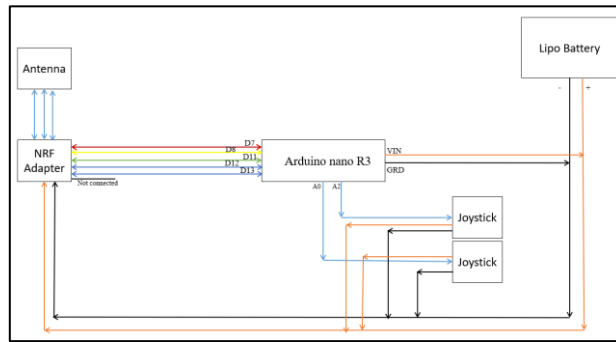
**Radio control of cart or carrier**

In this radio control circuit, there are 5 crucial parts which are transmitter, receiver, esc, motor, servo motor, and batteries. In order

to keep the cost of our project minimum will be building the two-channel transmitter and receiver of the circuit as follows:

**Transmitter**

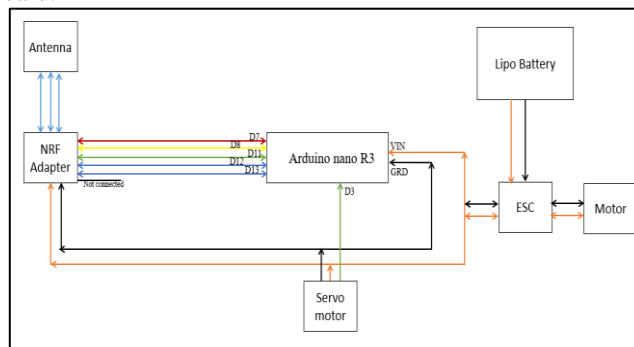
For making a transmitter we are going to use soldered Arduino nano, NEF24L01 module, NRF Adapter, Joystick module and antenna.



**Figure No. 14: Transmitter Circuit Chart**

**Receiver**

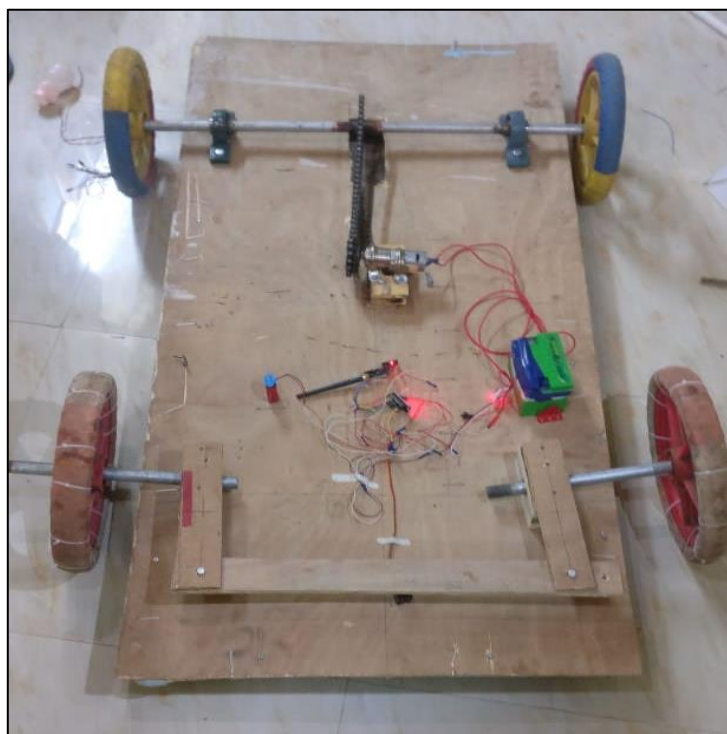
For making a receiver we will be using same components as transmitter without joysticks and addition of components such as steering servo, esc and motor. The connections between the antenna, adapter and Arduino nano will be the same but the battery will now be connected to the nano board via an ESC which is connected to the motor with positive and negative terminals. The ESC will be connected to the nano board at its positive and negative ports through its own positive and negative ports. Its negative port will also be connected to the receiver's negative whereas receiver's positive will be connected to the steering servo which will also be connected to the positive of nano board.



**Figure No. 15: Receiver's circuit diagram**

**5. CONCLUSION**

We have thus developed a prototype of a machine which will reduce labor effort increase efficiency quality and quantity of crops cultivated using this machine



**Figure No. 16: Cart**



**Figure No. 17: Seed driller**



**Figure No. 18: Plough**



**Figure No. 19: Harvester**






## **6. ACKNOWLEDGEMENT**

We would like present our sincere gratitude towards our guide and mechanical department of our college Pravin Patil Polytechnic for their encouragement and guidance towards making of this project.

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