Design and Development of Multipurpose Agricultural Equipment

Suyash Khurana
Department of Mechanical Engineering
Student, Reva University, Bangalore-560064, Karnataka

Abstract- *Multifunctional agricultural vehicle mainly focuses on the basic problems faced by fellow farmers. i.e. Seed Sowing, ploughing, soil levelling. In this project we will be fabricating a multipurpose agriculture equipment that will be able to dig the Earth, Sow the seeds and level the soil when harvest is completed. We have designed an agricultural machine which will be able to perform three different functions including sowing, ploughing, and levelling. This type of Equipment should be useful for the farmers as a low investment option instead of buying 2 or more machines to do this work done by a single machine of ours. We are using I C engine as a source of power to perform more than one operation, which will give enough power to perform all the operations.*

Keywords- Machine, IC Engine,3 in 1 function, Agriculture

I. INTRODUCTION

Agriculture is the backbone of India. The fields, faces some problems such as how to maximize the profit, how to increase productivity and how to reduce the cost. In India, two types of agricultural equipment are used, manual method (conventional method) and mechanized type. Mechanization involves the use of a hybrid device between the power source and the work. This hybrid device usually transfers motion, such as rotary to linear or provide sample of mechanical advantages such as increase or decrease or leverage of velocity. Agricultural machinery is machinery used in farming. Mechanized agriculture is a process of using agricultural machinery to mechanize the work of agriculture, greatly increasing farm worker productivity. In modern times, powered machinery has replaced many farm jobs formerly carried out by manual labour or by working animals such as oxen, horses, and mules. The entire history of agriculture contains many examples of the use of tools, such as the hoe and the plough. But the ongoing integration of machines since the Industrial Revolution has allowed farming to become much less labour-intensive. The biggest profit of automation is that it saves the labour. However, it also saves energy and materials and to improve the quality, accuracy, and precision. The multipurpose farming machine is doing three operations i.e. ploughing, seed sowing, and soil levelling purpose. The multipurpose farming machine is driven by 70cc I C engine. The machine is divided into two parts assembly. Part-1 assembly is the main machine. The part-1 assembly is doing three operations i.e. Ploughing (also called as loosening of soil), seed sowing and soil levelling. And the part- 1 assembly operator walks behind the machine during the working period of machine. For the loosening of soil, the iron plough tool is assembled to tool holder of machine and the gripper wheel is also attached to the tyre. The gripper is providing a proper grip into soil and will stop the tyre for skidding action into soil. At a time only two rows can plough. In seed sowing operation the seed sowing mechanism is assembled to machine and the furrows will be place back of plough tool. The seed is store in hopper of seed sowing machine after storing seed into hopper the seed is comes through the cam plates. The cam plates connected with the (different diameter of holes on cam plates for different crops) pipes which will throw the seeds into the furrows. The plough tool is hoe or plough the soil after ploughing into the soil the seed will be fall into soil and the T shape leveller covers the soil. In the seed sowing operation there are two rows to sow at a time. The seed sow mechanism constantly sows at the uniform depth and constant plant to plant distance. This reduces the wastage of seed and less time required for sowing seed.

II. OBJECTIVES OF PRESENT WORK

The objectives of the present investigation are as given below

- Design and development of hybrid ploughing, seeding and levelling machine for Indian farmers.
- To increase the productivity in farm lands.
- To reduce unwanted labour utilization.
- To reduce the time consumption.
- To decrease cost of investment on agricultural vehicles.
- Recommended for proper row spacing, seed rate and seed to seed space.

III. REQUIREMENT SPECIFICATION

HARDWARE REQUIREMENTS

- MILD STEEL TUBES FOR CHASSIS
- NUT AND BOLT

- SOWING PARTS AND MECHANISM
- CAM PLATE
- I C ENGINE
- WHEEL
- SHAFT
- BEARINGS
- BEVEL GEAR
- SPROCKET
- CHAIN DRIVE
- PLOUGH TOOL, LEVELER AND SEED BOX
- BASIC STRUCTURE OF POWER TRANSMISSION CHAIN
- ARC WELDING
- CORROSION PREVENTION

IV. SYSTEM IMPLEMENTATION

1. PLOUGH TOOL

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.

2. SOIL LEVELLER

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 levellers are with some or minimum clearance with the ground. The width of the levellers 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.

3. SEED BOX

Seed box is used to store the seeds. It is made up of mild steel sheets as the weight of the system becomes less and will have better capacity to hold the seeds in it. The number seeds that can be stored in the seed box depends upon the size and the density of the seeds. It consists of two holes at the bottom of the seed box from which the seed comes into the cam plates and to the pipes. It is kept at the height of the handle as the pressure is required to move the seeds in the cam plates. The seeds that can be stored in the seed box depends upon the diameter of the two holes in the seed box. For the seeds like groundnut, maize etc.; the diameter of the holes are different and for smaller seeds like sun flower the diameter of the holes are different.

V. RESULT AND DISCUSSION

After the assembly was finished several trial runs were undertaken and necessary changes were completed.

Completely assembled multipurpose agriculture equipment involved the following features:

Plough: This would initiate the process of converting hard soil into refined soil. It can plough the wet and moisture soil up to the depth of 2.5 inches. On an average of ½ acre can ploughed per hour. It takes more time than the wet soil to plough the dry lands. And sometimes it is not possible to plough very hard lands. It takes around 40 minutes to plough when leveller also working at same time.

Leveller: As the ploughing process was completed, the soil would be levelled to a certain medium as necessary by usage of leveller. For loose soil 25 minutes required for level the ½ acre land. But it is not possible to level the soil which is not loose. For it is not possible to level the land which is doing at first time.

Seed sowing: As cultivation is accomplished, lanes would be created with the usage of a seed guider. For the seeds like maize it takes around 21 2 kg seeds for half acre. But number of kilograms required to sow the seeds for half acre depends on the diameter of the seeds. It requires more of kgs for seeds like ragi. For the better sowing of the seeds equipment should move with low speed.

It is suitable only in small gardens, plantations and small farming. It is mostly suitable for the seeds like maize, ground nut, sun flower. It is not suitable for crops that can be grown in water like paddy. It is suitable for dry lands as the soil is very hard. The maximum speed that can be plough in wet soil is 6km/hr. But the speed decreases as ploughing and levelling done at a time.

Fig 1.4.4 Testing of the multipurpose agricultural equipment in farm field

VI. CONCLUSION

This multipurpose farming machine has considerable potential to greatly increase productivity of crops. So, designing and fabricating a multipurpose farming machine which will do multipurpose simultaneously i.e. ploughing, seeding and levelling. The machine is successfully tested into farming field and reduces time 62.5% for ploughing and 50% for sowing. 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 readily made from local components in workshops. This machine is more beneficial to small farmer who cannot afford farming equipment at higher cost. And one Person can be easily handling this machine. For more quantitative purpose this equipment can be made with more strength and the engine of more cc can used.

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