Design and Fabrication of Trolley Mounted Fertilizer Spreader

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Abstract

Fertilizer is any material of natural or synthetic origin used to enhance the growth of plants. Fertilizers are commonly used for growing all crops, with application rates depending on the soil fertility, usually measured by a soil test and according to the particular crop. Fertilizer spreaders for large scale farming are tractor mounted. For small scale uses, it not possible to use costly tractor mounted spreaders. Conventional spreading of fertilizers for small scale farming are by hand. It has some problems like uneven spreading of fertilizer, more time consuming, high human effort. The farmer have to carry heavy bags throughout the spreading process. So it is necessary to develop a fertilizer spreader for small scale farming. The proposed fertilizer spreader uses a trolley type of mechanism. The main part is spreader disk, which helps for uniform spreading. The feed for the disk is from the wheels of the trolley using gear transmission. By using this spreader, a lot of time can be saved, human effort used for carrying heavy bags of fertilizer is reduced and wastage of fertilizer can also be avoided.

Keywords: Fertilizer, Vanes, Bevel Gear, Bearing, Gear Ratio

I. INTRODUCTION

Fertilizer is any material of natural or synthetic origin used to enhance the growth of plants. Fertilizers are commonly used for growing all crops, with application rates depending on the soil fertility, usually measured by a soil test and according to the particular crop. About 90% of fertilizer is applied as solids (eg: Urea, Di-Ammonium Phosphate, Super Phosphate). Fertilizer spreaders for large scale farming are tractor mounted. Conventional spreading of fertilizers for small scale farming are by hand. It has some problems like uneven spreading of fertilizer, more time consuming, high human effort. The farmer have to carry heavy bags throughout the spreading process. For small scale uses, it not possible to use costly tractor mounted spreaders. The proposed fertilizer spreader uses a trolley type of mechanism. The main part is spreader disk, which helps for uniform spreading. The feed for the disk is from the wheels of the trolley using gear transmission. By using this spreader, a lot of time can be saved, human effort used for carrying heavy bags of fertilizer is reduced and wastage of fertilizer can also be avoided.

The fertilizer spreading for small scale farming is by hand. For large scale farming tractor mounted fertilizer spreaders are used. It is not possible to buy costly tractor mounted fertilizer spreaders for small scale farming. Hand spreading has some problems like uneven spreading of fertilizer, more time consuming, high human effort. So a trolley mounted fertilizer spreader reduces these problems. The trolley mounted fertilizer is economic and can reduce the time consumption, human effort and it will provide, even spreading of fertilizer. On successful implementation, the fertilizer spreading equipment shall find its application in small scale farming.

II. PROPOSED SYSTEM

The proposed model is shown in figure 1. The project aims at developing a device for the spreading of the fertilizer in small scale farming. The fertilizer spreader uses a trolley like mechanism. A gear is coupled to the shaft of the wheels of the trolley, which is
meshed to another gear in a vertical shaft. The vertical shaft consist of a spreader disk, which spreads the fertilizer to different directions. The fertilizer is stored in a vessel at the top. The vessel has an adjustable opening at the bottom, which can control the amount of fertilizer. The trolley has handles to move it forward or backward.

The machine works as the trolley is moved forward. As the wheel rotates, through gear transmission the spreader disk rotates. The fertilizer is stored in the vessel. The amount of fertilizer to be spreaded is metered using the adjustable opening. As the opening is adjusted to required level, the granular fertilizer is poured into the spreader disk. The fins or vanes in the spreader disk direct the fertilizer to different directions. The fertilizer is spreaded to different directions evenly and in required amount.

Fig. 1: CAD Model

III. FABRICATION AND WORKING

The trolley mounted fertilizer spreader consist of L frames, which made entire structure compact. The L bars are welded each other to form a skeletal frame and the remaining components are attached to this frame. Two wheel of 10 inch diameter, which helps to move the spreader forward and back ward is attached to a horizontal shaft. The horizontal shaft contains two ISI 6204 bearings, which supports the frame, and also it transmit the loads to the frame. A bevel gear of 100 teeth is attached to the shaft, which transmit power from horizontal shaft to the vertical shaft. A pinion gear is attached to the vertical shaft, which has 20 teeth. Thus a gear ratio of 5:1 is obtained. The vertical shaft is supported by two ISI 6202 bearing to the frame. It contains the spreader disk, which has 8 vanes used to spread the fertilizer to different directions.

Fig. 2: CAD Model (Parts)
The hopper in which the fertilizer is stored is placed above the spreader in way that the fertilizer will fall right above the spreader disc. The flow of fertilizer from the hopper can be controlled manually. A handle of hollow shaft is provided to control the motion of the fertilizer spreader. GI sheet is provided at the back to avoid the spreading of fertilizer to farmer’s body.

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**IV. CONCLUSION**

A modest and reliable trolley mounted fertilizer is designed and fabricated. After using it, a uniformity in fertilizer spreading is obtained. The human effort is reduced to a great extent. The time required, which is high in conventional spreading is reduced. As we get an even fertilizer spreading, wastage of fertilizer is also reduced.

As this is compact and economic design, it is affordable for small scale farmers. The farmers can avoid carrying heavy bags. A large area of field is covered in short time. Maintenance required for this device very less. And this device does not required any external power source. So this is an economic and compact device which can be used fertilizer spreading, especially for small scale farmers.

**REFERENCES**

[1] TNAU Agritech Portal (agritech.tnau.ac.in).