Design & Fabrication of Automatic Fertilizer Spreader

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Abstract— A method was generated to spread the fertilizer automatically over the agricultural land by dropping the fertilizer over the impeller disc. A 25cc engine is used to rotate impeller disc in which the fertilizer drains and spreads from hopper where it is introduced. In tractor mounted or manual system they carry four and three wheels respectively. But here two wheels are used in which the bigger front wheel is connected to engine through supporting wheel can be adjustable. The speed of wheel is varied by control lever connected through a cable. In this the fertilizer spreads only in front side of impeller while its back side 180 is covered. The size and width of the fertilizer is reduced to make it less weight and suitable for multi crops. From this method the cost fertilizer spreader is reduced by 50%.

Key words: Fertilizer Spreader, Impeller Disc, Butterfly Valve, Ratchet Mechanism

I. INTRODUCTION

India is our country where agriculture is our traditional work done by the farmers. Nearly about 70% people of our country are farmers. Our economy also hangs on agricultural products. At the present time incredible changes have arisen in conservative methods of agriculture like seed plantation, irrigation system, pesticides and spray castoff. For emerging our monetary condition, it is obligatory to upsurge our agricultural production and superiority also. Farming practice consist of many stages, out of which fertilization is one of the vital stages and which is not burst out up to the mark up till now. Now-a-days, we are used to do spreading of fertilizer in traditional way which is time consuming, costlier as well as not afford luxury to the manual labor. Also, some tractor activated machines for spreading of fertilizer are available. So, what we requisite is an alternative to the traditional as well as tractor operated fertilizer spreading machine which will bear out all the necessities.

So, we are working to plan an automatically operated machine for fertilizer spreading by taking into contemplation the user group and their needs which helps to them to work easy and functional.

II. RELATED WORK

In Feb 2015, Narode R.R, Sonawane A.B, Mahale R.R, Nisal S.S, Chaudhari S.S, Bhane A.B proposed "Manually Operated Fertilizer Spreader". A method was generated to spread the fertilizer uniformly over a fallow land by dropping the fertilizer over the impeller disc. The system consists of a three heels, two at the front and one at the back. These two wheels at the front are used to impel the fertilizer. The two hoppers are castoff to supply the fertilizer. These hoppers are tie up at certain height from the wheel axle so that the fertilizer drops on to the impeller. The hopper is on condition that with flow control contrivance. In fertilization, the flow maintenance is indispensable. In general every crop ought to get sufficient amount of fertilizer. This condition is gratified by Spring Mechanism. In ordinary conditions spring is not in pressure and hopper is locked. As operator apply pressure on the spring, controlling plate moves backward and hopper is open. Beneath this system there is an impeller. It is astride on output shaft. Hooper opens on Impeller bizarrely and due to centrifugal action fertilizer spreads in the farm.

In February 2016, S.Meivel, Dr.R.Maguteeswaren, N.Gandhiraj, G.Srinivasan proposed "Quadcopter UAV Based Fertilizer and Pesticide Spraying System". The quadcopter is cost in effect substitute to extraordinary cost standard rotorcrafts. UAVs are briskly forthcoming routine for cultivation, production and protection progressions. The quadcopter was elected for this project because of tall stability and further lifting power. The controller of quadcopter is laid-back than the helicopter exemplary of vehicles. Some solicitations of quadcopter are Search and Rescue, Police, Code Enforcement/Inspections, Emergency Management, Fire, Surveillance, Border Security, Defense, etc.

III. PROPOSED SYSTEM

In the Existing system, two or more wheels are used to spread the granular materials which was very difficult to the farmers to use more wheels in their agricultural land. So we proposed a single wheel drive on the land to spread the granular materials which is convenient for the farmers to spread the granular materials.

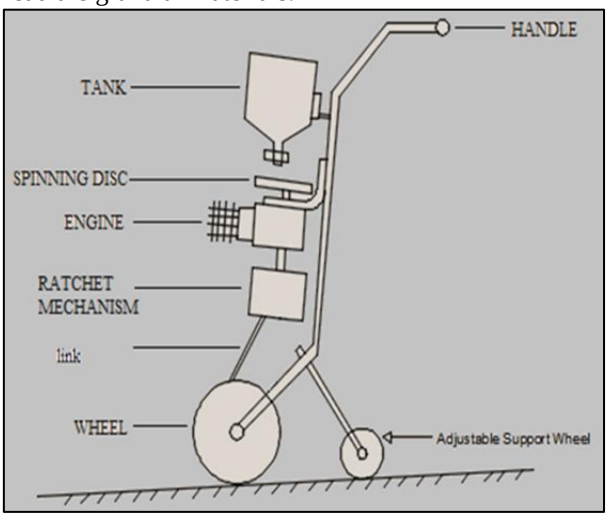

Fig. 1: Layout of Spreader

A. *Components required for construction*

1) Frame (R8 alloy steel)
2) Engine (25cc two stroke petrol engine)
3) Impeller disc
4) Ratchet mechanism
5) Supporting wheel

B. Frame

A frame is the main supporting structure for the fertilizer spreader to which all other components are attached, comparable to the skeleton of an organism.

Fig. 2: Constructed Frame

C. Engine

Two stroke petrol engines is the main component for this project .It gives power to the impeller for granular materials. It consists of two strokes

1) Suction/Comparison
2) Power/Exhauster

Fig. 3: 25cc two stroke engine

D. Impeller

Impeller is mounted below the output shaft of the engine. It is used to spread the granular material over the agricultural land.

Fig. 4: Impeller Disc

E. Ratchet Mechanism

The Ratchet Mechanism is used to connect the wheel and the engine.

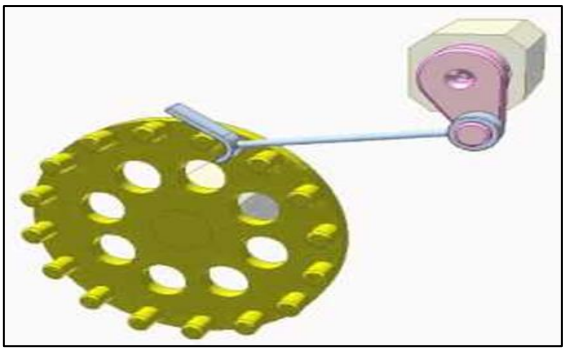

Fig. 5: Ratchet Mechanism

F. Supporting Wheel

The smaller wheel is used to support the spreader. When a single wheel is placed the center of gravity of spreader will not be stable and the balancing of spreader is become difficult. If the center of gravity is maintained between the two wheels the balancing of spreader become easier. In such it is made adjustable using the bolts and links to vary the slope of spreader.

Fig. 6: Supporting Wheel

IV. CONSTRUCTION AND WORKING

The main function of the spreader is to spread the fertilizer or granular materials along the lane in where it is travelling. The fuel for the engine is filled in its fuel tank. And then the engine is started using the starting cable, now the impeller disc rotates at maximum speed. The wheel doesn't rotate as the link is connected at the extreme end position. When the control lever is activated the wheel starts moving slowly and during the return stroke the wheel doesn't rotates. The fertilizer is introduced into the hopper at affordable level of amount. It starts spreading when control valve is opened. According the required amount the control valve is opened.

The fertilizer is filled in the fertilizer tank and the fuel in the fuel tank. The engine is started and then the control valve for fertilizer is opened slowly according to the requirements. The speed of the engine is adjusted according the spread rate required. The change of engine speed is made through the control lever connected along the accelerator cable of engine and it is placed on the right side of the frame.

The speed of the wheel is controlled through the control lever connected along the ratchet mechanism. Thus the vehicle is smoothly drived along the lane. It is more suitable for the lands with arrayed patterns of crops. The power of engine is used to run both the wheel of vehicle and the spreading impeller. The position of hopper end can be

connected varied to control the spreading adjustments. There are two levers connected to control the speed of engine and to control the speed of wheel respectively. The adjustment of the supporting wheel is made by varying the length of link connected along with it.

V. ADVANTAGES

- The weight of the spreader is reduced
- Comparatively low cost
- Rate of spreading is improved
- It is portable
- Suitable for many type of crops
- Doesn't require special lane path

VI. LIMITATION

As the volume of hopper is abridged the repeated refilling of the hopper is mandatory. Via the ratchet mechanism the stepped revolution of the wheel is attained there is no continuous rotation of wheel.

VII. CONCLUSION

Our goal was to build a system which is efficient to perform the spreading of fertilizer. It is suitable for all crops having a row pattern of cultivation. With the scope of improvement, the project is done to fulfill the demands of agricultural applications. The main objective of our project was to fulfill the need of farmers suffering from the problems of increasing labor cost for fertilizing. The draw backs in the existing spreader models are reduced in this system. Our future work is to make it in sensor based system.

REFERENCES

[1] Cunningham F M; Chao, E Y S, "Design relationships for centrifugal fertilizer distributors". Transactions of the ASAE, 10(1), 91-95. (1967).
[2] Patterson D E; Reece A R, "The theory of the centrifugal distributor. I: Motion on the disc, near-center feed". Journal of Agricultural Engineering Research, 7(3), 232-240.
[3] Vangeyte, J., Sonck, B., Van Liedekerke, P., Ramon, H.: Comparison of two methods to measure the outlet velocity of fertiliser grains from a rotary disc. In: Proceedings of AgEng 2004, Leuven, Belgium, 12–16 September 2004.
[4] Hofstee J W; Huisman W, "Handling and spreading of fertilizers. Part 1: Physical properties of fertilizer in relation to particle motion". Journal of Agricultural Engineering Research, 47, 213- 234, (1990).
[5] D. S. Sharma and Mukesh Sharma, "Farm Machinery Design Principles and problems", PP- 225-245.
[6] R.S. Khurmi , J. K. Gupta, "Machine Design", S. Chand Publications New Delhi,1st edition,2010 PP-387-390, 510-512, 766-774.
[7] PSG College of Technology, Coimbatore- 641 037, "Design Data", Kalaikathir Achchagam, Coimbatore-641 037, INDIA, PP- 1.10-1.12
[8] Amerine, J. D. and R. L. Parish. "Development of a rotaryspreader with an elliptical shroud" ASAE paper number 79-1511.

