"HOLE DIGGER MECHANISM FOR FERTILIZER FEEDING"

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ABSTRACT

When properly used fertilizers cover crop is important assets in productive agricultural systems. However, the heavy use of commercial fertilizers and overabundance of it are responsible for plant nutrients nitrogen, phosphorus and potassium being carried beyond the agro ecosystem and into environments where they become serious pollutants. Now a day the conventional method is that by digging hole manually near to roots of crop and pours the fertilizer in each hole simultaneously. This increases the requirement of manpower, money, time. For that we are going to design a manually operated digger mechanism. This paper aims to design such mechanism which will dig the hole automatically at equal distance with the help of Disc and follower arrangement in accurate manner. This will provide the easy way to feed the fertilizer by avoiding the wastage of fertilizer and also the money, time and labor cost.

Keywords: *Disc, Follower, Frame, Hopper.*

1. INTRODUCTION

In 21st century human being requires convenient and suitable work in less time. As in our country 75% of population is doing agriculture. Day by day numbers of inventions have done for easy farming and to produce mass production. As we are the engineers have to think about the development in the technology of farming that will be beneficial for farmers and indirectly to all of us. This mechanism is about minimizing the efforts and the time require to feed the fertilizer to the crops. The method use to feed the fertilizer will increase the fertility of the soil causes good quality production. The technique used in this project having simple design which will minimize the cost. Conventional methods requires more manpower, money as well as it requires more time for the operation of the producing bores and pouring the fertilizer into the bore. To overcome the drawbacks of the above older methods, the automation is required in the digging process and fertilizer pouring process. As the farmers have to do lot of work for producing the crops. After the plantation again they have to feed the fertilizer to that crop for better and mass production. Now the method used for the fertilizer feeding is not efficient. As farmers are feeding the fertilizer by three methods they are – 1 Top dressing method 2 Side dressing method 3. Bore bed method.

In Top Dressing Method the fertilizer is spread on the surface of the land. This method may cause the wastage of the fertilizer. Now, in the Bore bed method the fertilizer is feed by using one hollow pipe in which fertilizer is provided. This is operated manually. The hollow pipe is pressed vertically downward. The opening mechanism is provided for opening the nozzle to draw the fertilizer to the hole. But this method takes lot of time for feeding fertilizer. As for each crop there is individual hole. This is the drawback of this method. But the method is efficient. This Mechanism has the same function as that of the Bore Bed method. Only difference is that this takes less time than that one. As this works on the principle of digging and fertilizer feed by manual operation. This also

causes the reduction in the hard work , cost of fertilizer feeding, labor cost and lot of things. Due to manual operation, there is reduction in efforts taken for the fertilizer feeding. So this paper may be beneficial for the farmers to feed fertilizer.

1.1 PROBLEM DEFINATIONS:

The effective method is that to dig the hole near to the root of crops and feed the fertilizer which will reduce wastage of fertilizer and enhance the quality of crops. Now a days farmers are using this effective method by manually digging the holes near to roots of crops which requires more manpower and also the time.

1.2 OBJECTIVE:

To design of mechanically operated mechanism with higher accuracy and efficiency which would perform the work in less time and less effort is to be achieve by hole digger mechanism for the fertilizer feeding which will help to increase fertility.

2. COMPONENT

A. Frame:

Function: It supports the whole assembly of model.

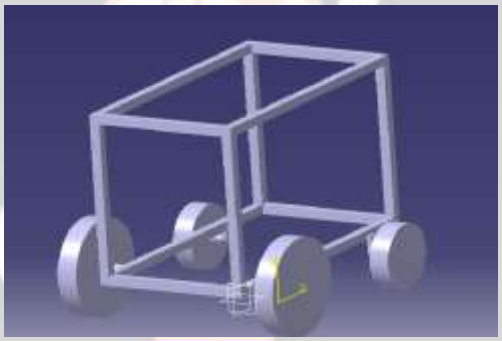

Fig-1: Frame

B. Chain and Sprocket:

It consists of 18-teeth small sprocket and 54-teeth big sprocket.
Function: It is used to obtain different gear ratios for follower timing.

Fig-2: Chain and Sprocket

C. Bearing:

The 6304-2RS and 6304-ZZ is a 20mm ball bearing use to support radial load.

Fig-3: Bearing

D. **Hopper:**

It is used to store and feed the fertilizer as per the timing of follower.

Fig-4: Hopper

E. **Disc and Follower:**

Function: The rotational motion of disc is converted into reciprocating motion of follower

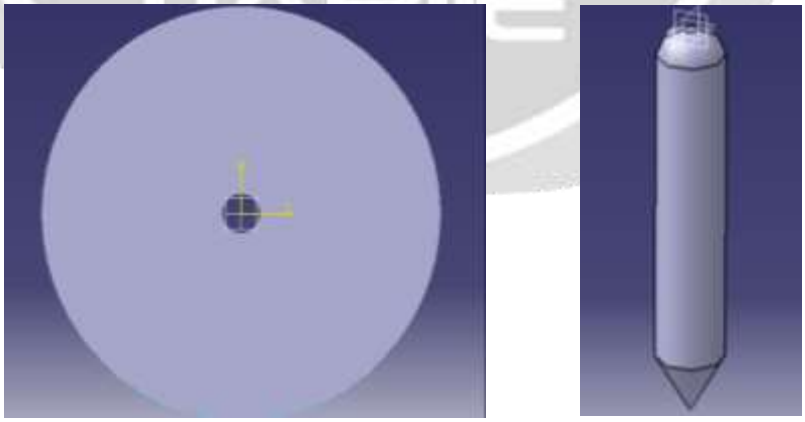

Fig-5: Disc and Follower

3. CONSTRUCTION

The Whole operation depends upon the rotations of the wheels .This consists of number of sprockets, bearings, shafts, disc, follower, hopper, wheels. Small sprocket is mounted on the rear wheel shaft. This sprocket is having 18 teeth. On the next shaft there are two sprockets, one is of 18 teeth and other is of 54 teeth. The rotation is transmitted by chain drive. To the next stage, which consist of one shaft having two small sprockets and a circular disc attached with follower. The next stage consists of hopper and one small sprocket on the shaft. This is whole construction of hole Digger Mechanism. The frame is made up of mild steel. The length of the frame is about 870mm, height is about 560mm, width is about 460 mm. The distance of the bottom frame to the land is about 200mm.The disc provided with the follower is mounted at the center of the frame.

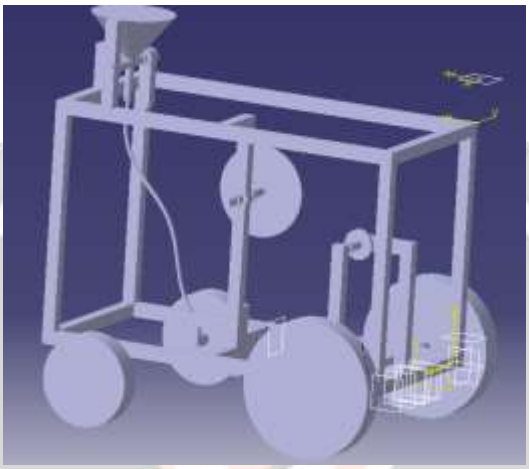

Fig-6: Construction of mechanism

4. WORKING

As this project works on the rotation of wheels and sprockets, so rotation is main point for accurate working of mechanisms. For rotation of shaft, sprocket chain arrangement is used. The rear wheel is having 330mm diameter and it's circumference is about 3 feet. Rear wheel is having small sprocket about 18 teeth. The one of sprocket causes single rotation of sprockets provided on next step. The next step consists of two sprocket, one is small and other is big (50teeth) Teeth rotation for first stage is 1:1.

The motion is transmitted through chain drive from bigger sprocket of 54 teeth to the next stage having small sprocket (18 teeth) .Having ratio of 3:1. This means single rotation of bigger sprocket causes the three rotation of smaller sprocket and meanwhile of disc and follower. This causes the digging the hole for each 33cm for 1 feet. This rotation is given to the next step having hopper and small sprocket. Hopper having small wheel on which three holes are drilled at 120º. For each rotation of small sprocket there is opening in hopper via hopper wheel. So after one stroke of follower causes dig in the land and after digging the hole there will be supply of the fertilizer in the hole. This will repeat until the rotation of rare wheel takes place.

For each hole there is provision of fertilizer at that hole. The main function of the follower is to dig the hole required according to applications. The follower is having vertically up and down motion which depends upon the motion and type of the cam. The cam required or cam used in this project is the circular cam. The rotational motion of the cam is converted to the reciprocating motion of the follower.

This all depends on the rotation of the wheel provided at rear side. The digging operation does not depend on the how much force is required to dig the hole .It depends on the rotation of sprocket and wheel. As discussed above the circumference of the wheel at the rear side is about the 990mm. That means for the single rotation of the wheel ,it travels about 990mm distance linearly.

The Sprocket selected is on standard basis. In market there are number of sprockets available such as 18 teeth,48 teeth, 54 teeth and so on. For this project we require the hole in the land at about 300 mm. So we have

selected the sprocket of 18 teeth and 54 teeth. For each rotation of the sprocket having 54 teeth, there will be three rotation of sprocket having 18 teeth. This causes the three rotation of the disc consists of the follower. So that there will three hole in between 990mm distance, means it digs hole for each feet distance.

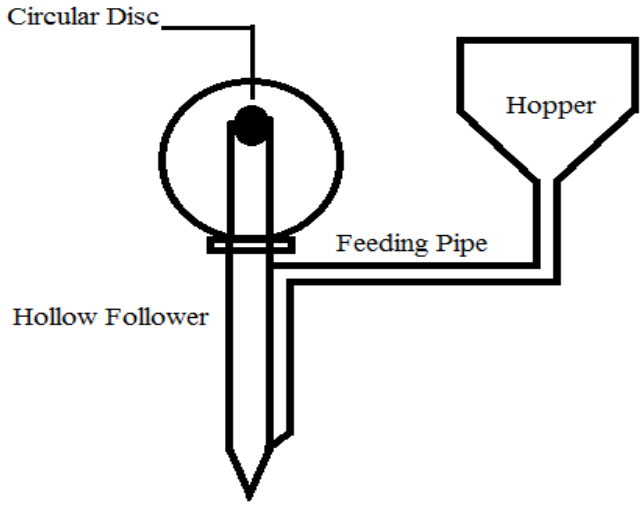

Fig-7: Proposed Drawing for Principle of Operation.

5. CONCLUSION

Digging and feeding machine are an efficient tool for farmers to pour fertilizer into the soil. It is a simple and mechanically operated machine which can pour fertilizer at equal distance at a faster rate and with good accuracy.

With the help of automated bore dressing machine amount of fertilizer is reduced by 30% as well as time required for fertilization is reduced by 30%. The most important factor, cost of fertilization is reduced by 37%.

The traditional method of spreading fertilizers with hands has much disadvantages and less efficiency which can be overcome using this machine. This machine will increase working capacity of farmers and saves time and helps to increase of farmer and save time and helps increase yield.

The traditional method of fertilization by hand has uneven distribution of fertilizer which increase wastage. This drawback can be overcome using this machine as it pour evenly fertilizer. The reduction in efforts for feeding the fertilizers. Simple design and easy handling. It can enhance the fertility of soil. So that indirectly increase the productivity.

6. FUTURE SCOPE

In future, this mechanism can also be used as seeder and/or planter mechanism.

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