UREA FERTIIZER SPREADER MACHINE

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ABSTRACT
India is agriculture based country,almost 70% people of our country are Farmers. Most probably our economy is depends on based agricultural products. Nowadays tremendous changes have occurred in conventional methods of agriculture works like seed plantation, harvesting, irrigation system, pesticides and spray used number of machines for developing our Economic condition, it is necessary to increase our agricultural productivity and quality also. Farming process includes many stages, out of which fertilization is one of the important and which is stages not exploded up. Farmers are used to do spreading of fertilizer in traditional way which is time consuming, costlier as well as not provide comfort to the labour. Also, some tractor operated machines for spreading of fertilizer are available. So, we need a alternative to the methods for fertilizer spreading machine which will fulfill all the requirements. So, we are going to design a manually operated machine for fertilizer spreading by taking into consideration the user group and their needs which helps to them to work easy and functional.
KEY WORDS: Bevel gears, Hopper, Rotating disc, fertilizers.

1.INTRODUCTION :
From years ago the majority of Indian population depends on agriculture. Even today around 61.5% of rural Indian population depends on agriculture for their bread and butter. Agriculture always play an important contribution in the GDP of India (currently17.9% of GDP). Tropical region shared about 45% and 55% of the total area and production in the country, respectively along with the average productivity of 77 t/ha (2011-12). Sub-tropical region accounted for about 55% and 45% of total area and production of an average productivity about 63 t/ha (2011-12). The tropical sugarcane region consists of agro climatic zone 4 (Peninsular zone) and 5(Coastal zone) which includes the states of Maharashtra, Andhra Pradesh, Tamil Nadu, Karnataka, Gujarat, Madhya Pradesh, Goa, Pondicherry and Kerala.
The most common method for distributing dry mineral fertilizer is with a fertilizer spreader. In a sustainable framework, economic and political aspects also have to be considered in order to achieve the best possible maintenance of environmental and natural resources .A sustainable economy requires the conservation and maintenance of the natural soil environment , in which the leading objective must be improvement of soil sorption properties and the maximum possible increase in humus content, which is influenced among other things by the soil cultivation method Many aspects of this issue depend on the plant cultivation technology, the subsequent processing phase and how biomass used for energy production is store. In each of these areas, occupational safety is also important and requires farmers to specialize.

2.LITERATURE SURVEY :
Chaudhari et. al [1] studied the sugarcane plantation in India and need of an alternative to the traditional as well as tractor operated fertilizer spreading machine. In India near about 70% people of our country are farmers. Due to these reasons the author developed the machine which has minimal capital cost compared to traditional fertilizing equipment.
Laghari et. al. [2] focuses on beneficial uses of fertilizer in agriculture. Soil contains various micro and macro elements which are essential for plant growth and yield. It is necessary to save important nutrient elements like nitrogen, phosphorus and potassium by application of chemical fertilizers. For certain situations broadcast applications can be an inefficient method of application because there is much greater soil to fertilizer contact in more fixation or tie-up of nutrient.

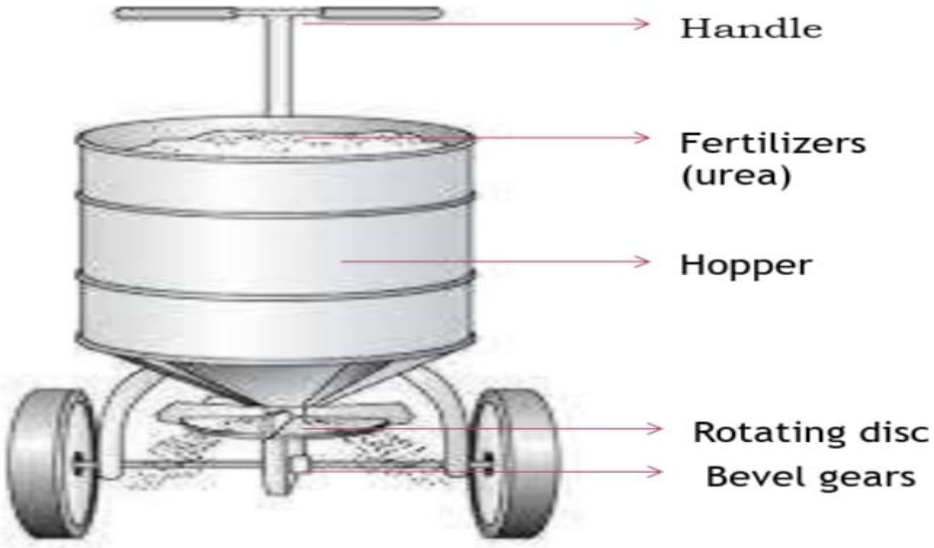
Narode R. R et al. [3] have generated a method to spread the fertilizer uniformly over a fallow land by dropping the fertilizer over the impeller disc. The system consists of a three wheels, two at the front and one at the back. These two wheels at the front are used to impel the fertilizer. The two hoppers are used to store the fertilizer; these hoppers are placed at some height from the wheel axle so that the fertilizer falls on to the impeller.

Kweon & Grift [4] have proposed a method which employs control of the drop location of fertilizer particles on a spinner disc to optimize the spread pattern uniformity. The system contained an optical sensor as a feedback mechanism, which measured discharge velocity and location, as well as particle diameters to predict a spread pattern of a single disc. The hopper is provided with flow control mechanism. In fertilization, the flow maintenance is necessary. Generally, every crop should get sufficient amount of fertilizer. This condition is satisfied by Spring Mechanism.

3.METHODOLOGY

Urea fertilizer spreader consists of a single rotating disc having two straight vanes mounted on it. A hopper having a dosing outlet and a stirrer feeds the disc with the fertilizer. Usually, the fertilizer is thrown away from the disc-vanes device with a speed ve that ranges between 15–50 m·s −1 with a maximum value that, in some case, can reach 70 m·s −1 with higher speeds related to wider working widths The fertilizer particle eject speed is directly related to the angular speed of the disc wd and to specific design factors of the spreader itself such Hopper has capacity to store 10kg of fertilizer. Urea or any other solid fertilizer is stored in hopper. When vehicle is pushed. fertilizer will flow through pipes from three holes provided in hopper under gravity. This fertilizer then passes through two discharge pipes provided. These two pipes can be adjusted so that fertilizer falls at the roots of crops. Each rotor is made up of a central shaft on which there are 3 spirals at the end of which there are provided cutting and grinding blades of the material, and at the bottom there are provided centrifugal blades

3.1 CONSTRUCTION OF UREA FERTILIZER SPREADER MACHINE:



Construction of urea fertilizer spreader machine: 1.It is based on motion of ground wheel using gear arrangement. The flow of fertilizer is maintained by using spring mechanism. It is a machine for spreading the fertilizer in continuous and controlled flow at uniform rate. It can cover an acre of farm within half an hour. Three wheels are used in this machine. In front axle two wheels are located to carry the load of the machine in proper way and last wheel is used to balance overall load of the machine. First two ground wheels transmit the input power by the operator to the rotor by gearing arrangement on rotor, Hooper is located to reservoir of fertilizer, of which flow is controlled by spring mechanism. The control of spring mechanism is under control of operator. This machine is

operated is operated using a motion of ground wheel through gear transmission arrangement. The flow of fertilizer is controlled by flow control mechanism.

4.EXPERIMENTAL WORK:

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4.1.Experimental work:

4.1.1 Hopper:

Hopper is used to keep fertilizer. Hoper is used for convey the fertilizer to the rotating disc. In this machine material used for hopper is PVC. Flow control mechanism is provided in hopper.

4.1.2 Rotating disc:

Rotating disc is look like impeller. It is mounted on motor shaft. Hopper opens on rotating disc eccentrically and due to centrifugal force fertilizer spread in farm.

4.1.3 Bevel Gears :

Bevel gears are gears where the axes of the two shafts intersect and the tooth-bearing faces of the gears themselves are conically shaped. Bevel gears are most often mounted on shafts that are 90 degrees apart, but can be designed to work at other angles as well. The pitch surface of bevel gears is a cone. The pitch surfaces of meshed external bevel gears are coaxial with the gear shafts; the apexes of the two surfaces are at the point of intersection of the shaft axes. Bevel gears that have pitch angles of greater than ninety degrees have teeth that point inward and are called internal bevel gears

4.1.4 Wheels :

It is used as supporting wheel. It helps to operator size. Four wheels are attached to the frame in order to move the machine in specific direction. The movement of these wheels are controlled by handle manually.

4.1.5 Bearings :

A bearing is a device to allow constrained relative motion between two or more parts, typically rotating or linear movement bearings according to their principle of operation as well as by the direction of applied load they can handle.

A ball bearing is a type of rolling-element bearing that uses balls to maintain the separation between the bearing races. The purpose of a ball bearing is to reduce rotational friction and support radial and axial loads. It achieves this by using at least two races to contain the balls and transmit the loads through the balls.

4.2.WORKING OF UREA FERTILIZER SPREADER MACHINE:

1. The system consists of a three wheels, two at the front and one at the back. These two wheels at the front are used to impel the fertilizer
2. Hopper is placed at some height from the wheel axle so that the fertilizer falls on to the impeller.
3. The hopper is provided with flow control mechanism. In fertilization, the flow maintenance is necessary. Generally every crop should get sufficient amount of fertilizer. This condition is satisfied by Spring Mechanism. In normal conditions spring is not in tension and hopper is closed. As operator apply tension on the spring, controlling plate moves backward and hopper is open.
4. Below this system there is an impeller. It is mounted on output shaft. Hooper opens on Impeller eccentrically and due to centrifugal action fertilizer spreads in the farm.
5. This high value of centrifugal force is generated by the help of proper gear reduction ratio. The gears are coupled to the shaft of wheel with this machine.
6. Percentage reduction in time required for Fertilization was observed to be 50% and reduction in labor cost as compared to conventional method was 80%. It has solved the problem of traditional way of Fertilization

5. RESULTS & DISCUSSION:

5.1 Calculation of weight of hopper:-

In this project hopper is made galvanaized iron sheet of Cross section of hopper is circular, at the bottom end of hopper there is one short cylindrical pipe is attached In this calculation bottom end of hopper is neglect.

W= total weight of hopper .
r = radius of hopper at upper end.
h = height of hopper.
d = diameter of hopper.
g = 9.81 m/s^2.
Input parameters
r = 15cm
h = 20.32cm
d = 2.5cm

After putting all the input parameters in above equation total weight of hopper is obtained and its value

w= 61.30N.

5.2. calculation of weight of rotating disc:-

Rotating disc is circular in shape. In this project for calculating weight of rotating disc the following formula is used

Where,
d = diameter of rotating disc.
t = thickness of rotating disc:
ρ = density of disc.
g = 9.81 m/s^2
Input parameters
d = 20.32cm
t = 1.5cm
ρ = 0.43 g/cm^3

After putting all input parameters in above equation weight of rotating disc is obtained and its value is w= 2.052 N.

DISCUSSION :

is important when spreading fertilizer that a spreader can achieve a consistent level of performance at various application rates whilst driving at a specific about width. It is shown from this study that for different capacity we can achieve various discharge rates. With variation in plantation methods, we collected various data. The tested spreader has 50 cm rear width and 82.5 cm length. It can be used for 3 different plantation method. The result obtained from multiple testing varied significantly from above results. Result shows that for different plantation, discharge of fertilizer required is not the same. There is no consistency between plantation methods, so the product can be used for all methods.

By taking of our machine and gathering information it have shown result better than other possible traditional methods of spreading fertilizers in the field.

C0NCLUSION:-

The main objective of our project was to fulfil the need of farmers suffering from the problems of increasing cost of Fertilization, labor cost and availability as it is operated by single person. The draw backs in the existing spreader models are reduced in this system. It has solved the problem of traditional way of fertilization by saving almost 50 % time Also this machine is eco-friendly, easy to operate with low capital cost and less troubleshoots.

It provides a uniform distribution of fertilizer, i.e. avoiding excessive fertilizer granules in specific areas, which can cause damage to crops. The main goal of our project is to meet the needs of

farmers, are subject to single-person operations that increase the cost of fertilization, labor costs and availability.

Using this machine, the percentage reduction in time required for fertilization was observed to be 1/3, and the labor cost reduction was 2/3 compared to the conventional method. It solves the problem of traditional fertilization methods.

Capital costs are a key factor in choosing the type of agricultural equipment. Compared to other types of machines, this machine has a very low capital cost and is environmentally friendly and has the main advantage of being easy to troubleshoot. Through all these discussions and experiencing all the factors related to fertilization.

REFERENCES:

1. Sobczak, P.; Mazur, J.; Zawi´slak, K.; Panasiewicz, M.; Zukiewicz-Sobczak, W.; Kr´ólczyk, J.; Lechowski, J. Evaluation of dust concentration during grinding grain in sustainable agriculture. Sustainability 2019, 11, 4572. [CrossRef]
2. Zukiewicz-Sobczak, W.; Sobczak, P.; Rog´ ó´z, A.; Wojtyła-Buciora, P.; Kozak, M.; Zagórski, J. Evaluation of the content of selected elements in herbs cultivated in organic farms in the Lublin region. In Proceedings of the Farm Machinery and Processes Management in Sustainable Agriculture, Lublin, Poland, 22–24 November 2017; pp. 461–464. [CrossRef]
3. Kachel-Jakubowska, M.; Matwijczuk, A.; Gago´s, M. Analysis of the physicochemical properties of post-manufacturing waste derived from production of methyl esters from rapeseed oil. Int. Agrophys. 2017, 31, 175–182. [CrossRef]
4. Kachel, M.; Matwijczuk, A.; Sujak, A.; Czernel, G.; Niemczynowicz, A.; Nowicka, A. The influence of copper and silver nanocolloids on the quality of pressed spring rapeseed oil. Agronomy 2019, 9, 643. [CrossRef]
5. Blicharz-Kania, A.; Pecyna, A.; Krajewska, M.; Andrejko, D.; Szmigielski, M.; Zawi´slak, K.; Sobczak, P.; Berbec, A. Chemical properties of tobacco seed oil. Przem. Chem. 2018, 97, 1906–1909. [CrossRef]
6. Kozak-Kalita, M.; Sobczak, P.; Zawi´slak, K.; Mazur, J.; Panasiewicz, M.; Zukiewicz-Sobczak, W. Influence of UV-C radiation on the microbiological purity in selected species of herbs. Health Probl. Civiliz. 2018, 12, 285–290. [CrossRef]
7. Przywara, A.; Kachel, M.; Koszel, M.; Leszczy´nski, N.; Kraszkiewicz, A.; Anifantis, A.S. The influence ofdigestate on the static strength of spring rapeseeds (Brassica napus var. arvensis). Sustainability 2019, 11, 2133. [CrossRef]
8. Guerrieri, A.S.; Anifantis, A.S.; Santoro, F.; Pascuzzi, S. Study of a large square baler with innovativetechnological systems that optimize the baling effectiveness. Agriculture 2019, 9, 86. [CrossRef]
9. Kraszkiewicz, A.; Kachel, M.; Parafiniuk, S.; Zajac, G.; Niedziółka, I.;Sprawka, M. Assessment of the possibility of using hemp biomass (Cannabis sativa L.) for energy purposes: A case study. Appl. Sci. Basel 2019, 9, 4437. [CrossRef]Agriculture 2020, 10, 467 10 of 10
10. RajabiHamedani, S.; Villarini, M.; Colantoni, A.; Carlini, M.; Cecchini, M.; Santoro, F.; Pantaleo, A.Environmental and economic analysis of an anaerobic co-digestion power plant integrated with a compostplant. Energies 2020, 13, 2724. [CrossRef]
11. Pantaleo, A.; Villarini, M.; Colantoni, A.; Carlini, M.; Santoro, F.; RajabiHamedani, S. Techno-economic modeling of biomass pellet routes: Feasibility in Italy. Energies 2020, 13, 1636. [CrossRef]
12. Bulgakov, V.; Pascuzzi, S.; Anifantis, A.S.; Santoro, F. Oscillations analysis of front-mounted beet toppermachine for biomass harvesting. Energies 2019, 12, 2774. [CrossRef]

