Solar Operated Seed Sowing and Agricultural Spray

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Abstract—A pre fertilizer cum seed drill was designed and developed by selecting the best parameters from previous model studies. The equipment consisted of a main rectangular frame, one tines which is expand according to need of different depths, and one hoppers for carrying seed in one, supporting wheels with depth control provision, one solar panel is mounted on the main frame which can be manually adjustable according to the sunlight, a 12 volt battery is attached with solar panel for use this equipment in rainy season, one tank of PVC is fitted on the frame to store the pesticide, four nozzles provided for spraying purpose. The basic objective of sowing operation is to put the seed and fertilizer in rows at desired depth and seed to seed spacing, cover the seeds with soil and provide proper compaction over the seeds. The recommended row to row spacing, seed rate, seed to seed spacing and depth of seed placement vary from crop to crop and for different agro-climatic conditions to achieve optimum yields.

Key words: PVC, Traditional Sowing Methods, Solar Panel

I. INTRODUCTION

India is currently the second most populated country in the world with a population of 1.21 billion (2011 census). Indian population continues to increase and the provision of adequate supply of food remains a challenge. Agriculture in India has a significant history, today it ranks second worldwide in farm output. Agriculture accounted for 13.7% of the GDP in 2012-13 according to the estimates by CSO (Central Statistics Office), and about 51% of the total workforce. Despite the steady decline of its share in GDP, it is the largest economic sector and plays a significant role in the overall socio-economic fabric of India.

The annual food grain requirement is 255 chemical fertilizers required is approximately 45 million tones. India is the third largest producer and second largest consumer of chemical fertilizer in the world.

Fertilizers are substances containing chemical elements such as manure or mixture of nitrates that improves the growth of plants. They give nutrition to the crops. When added to soil or water, plants can develop tolerance against pests like weeds, insects and diseases. This means that the need for herbicides and insecticides are reduced producing healthier crops. Diseases can also be eliminated which gives aesthetic value to the harvest.

II. TRADITIONAL SOWING METHODS

Traditional method include broadcasting manually, opening furrows by a country plough and dropping seeds by hand, known as 'Kera', and dropping seeds in the furrow through a bamboo/meta funnel attached to a country plough (Pora). For sowing in small areas dibbling, making holes or slits by a stick or tool and dropping seeds by hand, is practiced. Multi row traditional seeding devices with manual metering of seeds are quite popular with experienced farmers. Traditional sowing methods have following limitations.

1) In manual seeding, it is not possible to achieve uniformity in distribution of seeds. A farmer may sow at desired seed rate but inter-row and intra-row distribution of seeds is likely to be uneven resulting in bunching and gaps in field.

2) Poor control over depth of seed placement.

3) It is necessary to sow at high seed rates and bring the plant population to desired level by thinning.

4) Labour requirement is high because two persons are required for dropping seed and fertilizer.

5) The effect of inaccuracies in seed placement on plant stand is greater in case of crops sown under dry farming conditions.

6) During kharif sowing, placement of seeds at uneven depth may result in poor emergence.

In current scenario the output of farm depends a lot on the proper use and application of fertilizers. Fertilizers may be applied on or into the soil or directly to the plants. The techniques of application of fertilizer, which will be elaborated later, are:-

A. Placement:

Inserting or drilling or placing the fertilizer below the soil surface by means of tin tool or implement at desired depth to supply plant nutrients to crop before sowing or in the standing crop is called placement. The following methods are most common in this category.

- Plough - Sole Placement
- Deep Placement
- Sub - soil Placement
- Localized Placement

1) Plough-Sole Placement:

In this method, the fertilizer is placed in a continuous band on the bottom of the furrow during the process of ploughing.

2) Deep Placement:

In this method, ammonical nitrogenous fertilizer like ammonium sulphate or ammonium forming nitrogenous fertilizer like urea is placed in the reduction zone, where it remains in ammonia form and is available to the crop during the active vegetative period.

3) Sub – soil placement:

This refers to the placement of fertilizers in the sub-soil with the help of heavy power machinery.

4) Localized Placement:

This method refers to the application of fertilizers into the soil close to the seed or plant. Localized placement is usually employed when relatively small quantities of fertilizers are to be applied.

B. Broadcast:

It refers to the uniform application of fertilizers across the entire soil surface. This may be done before the land is ploughed, immediately before planting, or while the crop is standing. Fertilizers may be broadcast on the surface then tilled or watered into soil, or banded on or beneath the soil surface.
In all the above mentioned methods the fertilizer application is limited to one stage only, the vegetative stage, which is ineffective because the fertilizers again need to be applied in mid-season and late season stages. The aim of this project is to apply the fertilizers effectively, uniformly and cheaply in all three stages. Keeping the above points in view, the present investigation was carried out with the following objective:

1) To design and develop pre fertilizer cum seed drill for placing the seed.
2) Economizing the process of fertilizing.
3) Efficient use of available resources.
4) Proper penetration of fertilizers.
5) Maximum absorption of nutrient at each stage.
6) To increase the agricultural revenue of Indian agriculture.
7) Meter seeds of different sizes and shapes.
8) Place the seed in the acceptable pattern of distribution in the field.
9) Place the seed accurately and uniformly at the desired depth in the soil.
10) Cover the seed and compact the soil around it to enhance germination and emergence.

III. PROPOSED MODEL

Fig. 1: Proposed model

A. Working:

1) Solar Panel – 12 volt:
Mounted with ms structure as shown in the figure. It is connected to 12 volt dry cell battery which is fitted in the bottom of the liquid tank in between solar panel and the battery the electronic device fitted known as charge controller the function of charge controller is to regulate the output of the battery volt regularly as well as which cut off the charging system when battery is full charge another function of charge controller it is not allowed to discharge the battery up to nil point to avoid total discharge this function is used with the help of charge controller from the solar panel up to battery we use pvc coated wire along with the pvc pipe the socket fitted to the end of wire.

2) Charge Controller:
The Charge Controller specification is follows. The entire circuit is based on PCB that is known as Printed Circuit Board with different type of electronic gadgets like transistor, resistance.

With combination of Integrated Circuit Supply of the Charge Controller systemic 12 volt DC.
In this system we used 16 liter Capacity PVC mounted on the frame with the help of nut bolt. One whole is provided in the tank with strainer and tank to pour the chemical inside at the bottom of the tank in the tank we provided a drain outlet to wash the tank as well as removing the chemical which is excess in the tank In the bottom of the pump we installed electrical circuit

3) 12 volt Dry Cell Battery:
One Dry cell battery is provided to run the entire system in between battery and device we used different color of PVC wire to identify the polarity as we known the entire system is DC that’s why color code is important role for every joining of wire we use PVC detachable male female socket because any one component can easily remove for the maintenance.

4) DC Motor:
One DC motor of 12 volt of 1500 rpm fitted with centrifugal force like pump along with the diaphragm system for the regulation of the pressure control system is provided for the use of discharging the water wall which automatically the often system.

As we design the device it should be user friendly and user of entire system is layman or a farmer so we design such type of system which are very useful or easy operating system .The function of system are as follows we provided the solenoid switch like system which operate with the help of diaphragm .Once motor get Started diaphragm get filled which contact to run the motor as soon as we stop the discharge the diaphragm get expanded and cut off the electrical system as the motor stop.

In one operating System Simultaneously two control are operated which is water and electric this is the unique design for the farmer this way they have to operate twin functioning

The function of the motor is top spray the liquid with the help of accessories mounted on the unit this motor generate 2.5kg/cm2 pressure which convert flow in mist formation 8mm (PVC hores is provided) to transfer liquid from motor to nozzle fitted with clamp to avoid the leakage In this unit we provided two spraying boom. The end of spraying boom is adjustable according to crop head even we can adjust the spraying nozzle as per the distance of crop.

Four nozzle provided in the unit to cover the maximum area of Spraying as a result we increased the working efficiency of unit and manpower.

Entire system is mounted on a pair of wheel.

5) Comparison Between This New System And Traditional System:
In traditional System the chemical tank has to be mounted on the back and the working has to operate the lever to generate the pressure for spraying. In this unit the pump is mounted on the frame the advantage of the unit is to avoid man work load to carry about nearly 23 kg of pump on back with operated handle or walk in uneven field its quite TDS job as a resultant output is 1 to 1.5 acres a day as per result the spraying work is around 4 to 5 acres per day .The advantage is around 4times per day.

6) Nozzle:
For the mist spraying nozzle are Provided of PVC and brass bodies having thread size ¼ BSW(British Width Standard).
End of nozzle a single whole led is their with the provision of .01mm on the upper side of the lead spindle is provided which we twist the water intake from the pump further discharge from the single whole lead which form mist.

7) Seed Drill System:
In previous system mostly farmer are using the seed drill which is manually work have to take seed grain in hand and discharging in hopper as per requirement but discharging of seed through land is not so accurate so we find sometime more seed or less seed insert in the soil which is directly proportional to yield of farmer .As this is the new concept with the help of this we can easily insert the seed in the soil and in extension we are also providing the pesticide spray if need it is useful for farmer.

8) Hopper System:
One hopper of the M/S sheet is mounted on the frame one 12 volt motor of 30rpm with provided with control system which can we reduce as per our requirement at the shaft of the motor and we provide PVC disc around 4 inch diameter of various thickness with the different number of cups design in the disc Which pick a number of seed at a time and not allowed in small hopper for the discharge. It is depend which type of crop you are using that type of PVC disc fitted in the motor according to the size of seed grain from the small hopper and we are using transparent pipe end of the pipe is provide with tine is such as vertical boom which is adjustable as per the depth of the seed we provide a triangle of MS sheet with 65 degree parallel to ground level the 65 degree is such as a degree universal provided in seed drill which required less effort to penetrate in the soil and less resistance to travel so we required less force to pull the system of the end of triangle plate a capes provide to form a way mostly known as rige is easily insert the seed inside it. Behind the tine we provided a 25/160 mm MS pipe clamp to it flexible joint which recover the soil fig by the tines which cover the soil.

As we also providing the electrical charging system for the charging the battery in rainy or cloudy weather because in rainy season solar system may not work Indicator of different colors are provided to know exact position of battery charged or not.

9) Switches:
1) One electrical toggle switch to off-on the seed drill.
2) One no of wall to operate the spraying system.
3) One no of electrical button system to off-on whole system.
4) One button for pressure regulate for spraying.

IV. CONCLUSION

The solar operated seed sowing and agricultural spray has been fabricated. The overall cost of the project is approximately Rs. 17,000/- only. It has been made keeping in mind the poor farmers who cannot afford tractors so that they can use this machine easily. It save time and reduces human fatigue. We have successfully overcome the problems which are there in some of the existing models in the market.

REFERENCE