

A Review Paper on Bull Drawn Multipurpose Fertilizer Drill Device

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Abstract— A Bull Drawn Multipurpose Fertilizer Drill Device will be design and developed by selecting the best parameters from previous model studies. This device is related to agricultural domain. The purpose of this device is to apply the fertilizer effectively, uniformly and cheaply in the growth stages of crop. The equipment will consist of a main rectangular frame, three sets of tines of different depths, and two hoppers for carrying seed in one and fertilizer in another, supporting wheels with depth control provision, fertilizer metering device and a lugged (drive) wheel with chain and sprockets for transmitting power to the metering mechanism. The equipment has the provision to place the fertilizer up to a depth of 320mm, 280mm and 210mm using the three sets of tines, thereby helping to place the fertilizer at different depths in vertical soil profile in a single pass.

Key words: Fertilizer Drill, Manual Seed, Rotary Dibbler

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. 70% population earns it's livelihood by agriculture. The annual food grain requirement is 255 million tonnes. 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.

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 any tool or implement at desired depth to supply plant nutrients to crop before sowing or in the standing crop is called placement.

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.

II. LITERATURE REVIEW

Arun Kumar has studied and implemented the concept of sub soil placement of fertilizer. The maize crop was taken into consideration to conduct the experiment. The response shown by the maize crop was enlisted in detail. The practice of sub soil placement of fertilizer was undertaken by specially designed winged type leading tines that penetrate deep into the soil. The design and the experimental calculations are made are systematically represented for future reference.

Godwin, R.J has given a detailed investigation report on tine characteristics of tines. The investigation report was prepared by conducting experiment on a hard soil that offers maximum possible friction. The report presented the mechanics of working of tines.

Walker, H.B has studied deep for the entire upcoming and ongoing problems faced by the agriculture professionals at times of fertilizer placement in engineering problems in fertilizer placement. The problems faced are studied in detail and are causes are investigated. The corresponding solution for the respective problems are proposed that include change in agriculture, fertilization methods, sowing and nutrient placement timings to tackle with the problems and obtain higher production rate with minimum input by systematic and well defined method.

III. PROBLEM IDENTIFICATION

Aspects that require consideration while fertilizer application:

- (1) Availability of nutrients in manures and fertilizers
- (2) Nutrient requirements of crops at different stages of crop growth
- (3) Time of application
- (4) Methods of application, placement of fertilizers
- (5) Residual effect of manures and fertilizers
- (6) Unit cost of nutrients and economics of manuring

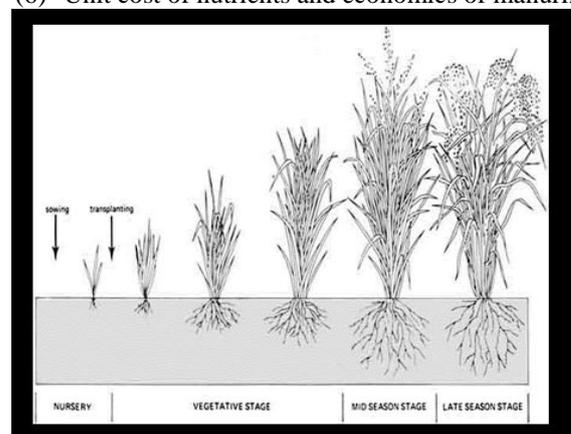


Fig. 1: Vegetative Stages

The following drawbacks were observed in existing models:

- (1) In all the above mention 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.
- (2) The main source for driving the unit is tractor which the poor farmers cannot afford.
- (3) Uneven distribution of fertilizers.
- (4) Most of nutrients of the fertilizer not utilized.

IV. EXISTING METHODS AND MODELS AVAILABLE:

Existing methods of fertilizers application in India:

- (1) Manual spraying.
- (2) Tractor drawn fertilizer drill.

The fertilizer drill is a device that permits farmers to have a precise control over the depth at which fertilizers are applied. It employs a series of runners (tynes) spaced at the same distance as the ploughed furrows.

These runners open the furrows to a uniform depth before the fertilizers are applied. Device can also be used for planting seeds.



Fig. 2: Fertilizer Device

A. Existing Models Available:

- Rotary Dibbler
- Manual Seed and Fertilizer Drill
- Manual Garlic Planter Multicrop Planter
- Low cost seed drill
- Three row fertilizer cum seed drill
- Animal drawn tool frame for seeding
- Animal drawn three row seed drill
- Manual Rice Transplanter
- Power Tiller Drawn Seed Cum Fertilizer Drill

V. METHODOLOGY

A. Aim:

The aim of this project will be to apply the fertilizers effectively, uniformly and cheaply in all three growth stages of crop and this can be done by modifying the existing device in its construction and methodology.

B. Objectives of Project:

Keeping the above points in view, the present investigation will be based on the following objective:

- To study the existing model and find out area of modification on which it is to be done.
- To design the bull drawn multipurpose fertilizer drill device by using Pro-E software.
- To select the materials and manufacturing process in order to fabricate the modified model as per design.
- To analyze the drill (tyne) by using ANSYS or HYPERMESH software.

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 seed. 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. Although many manual, tractor and animal driven seed-cum-fertilizer drill devices are available in market, the aim of this project is to economize the process of fertilizing so that proper penetration of fertilizers take place and maximum absorption of nutrient at each stage is available.

For this main components of the devices need to be studied. Following are the main components of the existed seed-cum-fertilizer drill devices:

- Frame
- Seed hopper and fertilizer hopper
- Seed and metering device
- Power transmission unit
- Depth control side wheel
- Tynes
- Plastic tubes with aluminum cups
- Flow control tongue

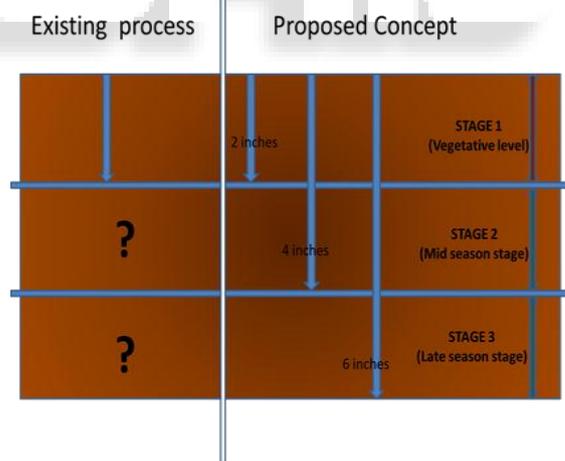


Fig. 3: Analysis of Concept

VI. ADVANTAGES

- It will allow sufficient penetration of fertilizers without wastage.
- Ensuring proper growth and comparatively good quality of crops.
- It will make the entire process economically sound.

VII. FUTURE SCOPE

- The devise can be used for different crops.
- The device will be portable.

- The use of the device will be cheap as bull instead of tractor will be used so that poor farmers can afford it.

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