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A PATH FOR HORIZING YOUR INNOVATIVE WORK

A REVIEW PAPER ON VARIOUS SEED SOWING METERING DEVICES

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Abstract: Seed metering devices are those devices that meter the seed from the seed box and deposit it into the delivery system that conveys the seed for placement on or in the seedbed. The major functional requirements of seed metering systems are to meter the seed at a predetermined rate/output (e.g. kg/ha or seeds/meter of row length) meter the seed with the required accuracy (spacing) to meet the planting pattern requirements (i.e. drill seeding, precision drilling, etc); and cause minimal damage to the seed during the metering process. The present review provides brief information about the various types of innovations done in seed sowing machine available for plantation. The seed sowing machine is a key component of agriculture field. The performance of seed sowing device has a remarkable influence on the cost and yield of agriculture products. seed metering device is a heart of seed sowing machine which is evaluated for seed distance, seed size between seed varieties.

Keywords: Seed sowing machine ,seed metering device, Performance detection, Seed spacing.

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INTRODUCTION

Seed sowing machine is a device which helps in the sowing of seeds in a desired position hence assisting the farmers in saving time and money. 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 paper discusses different aspects of seed sowing machine which will be helpful for the agriculture industry to move towards mechanization. The agricultural industry has always been the backbone of India's sustained growth. As the population of India continues to grow, the demand for produce grows as well. Hence, there is a greater need for multiple cropping on the farms and this in turnequires efficient and high-capacity machines. Mechanization of the Agricultural industry in India is still in a stage of infancy due to the lack of knowledge and the unavailability of advanced tools and machinery. In traditional methods seed sowing is done by broadcasting manually, opening furrows by a plough and dropping Seed by hand.

TYPES OF SEED METERING DEVICES:-

A large range of seed metering devices exist, but most can be classified as either 'precision' or 'mass flow' depending primarily on their principle of operation and the resulting planting pattern. Precision type seed meters attempt to select single seeds from the seed lot and deliver them from the meter at a preset time interval. If this time interval is maintained as the seed is being delivered to, and placed in, the seedbed, the seeding pattern will be one where the seeds are equidistant along the furrow, i.e. a precision drilling pattern. A precision meter plus an accumulation device enables a hill drop pattern while a precision meter plus an accumulation and an indexing device will enable a check row planting pattern. In general, precision type seed meters are used for crops that:

• are usually planted at relatively low seeding densities (typical range 10–150 seeds/m2);

• are planted in relatively wide rows (typical range 250–900 mm);

• have a relatively narrow range of plant populations from which optimum yields can be expected for a given environment; and

1. MASS FLOW SEED METERING DEVICES:-

Common mass flow seed metering systems can be broadly classified as either stationary opening', external force feed' (fluted and peg/studded rollers) and 'internal force feed' (double run) types.

1.1 STATIONARY OPENING TYPE SEED METERING:-

Stationary opening type seed meters are simple devices, essentially consisting of a seed box, an agitator and a variable sized outlet orifice. The orifice size is usually adjusted by sliding a plate that increases or decreases the size of an opening or by rotating a plate to expose a different orifice size. The seeding rate is controlled by changing the size of the outlet orifice in the base of the seed box by rotating a plate with various hole sizes around its periphery until the appropriate hole size is positioned over the box outlet. While most stationary opening types of seed meter utilise a shaft-driven agitator, some rely on small diameter flexible spring wire that is attached to the top of the seed box then passes through the outlet orifice far enough to make contact with the ground. As the machine moves forward the spring wire jiggles' (vibrates) and so provides a degree of agitation to the seed in the box. For uniformity in seeding rate, the outlet orifice has to be above some minimum size (in relation to seed size) and the seed lot must exhibit a high degree of 'flowability'. If the seeds have a tendency to pack or otherwise cling together in the seed box, flow through the orifice may be irregular ,intermittent or cease completely. While stationary opening type seed meters are still extensively used on many broadcast type planters, they have largely been replaced in drill type planters. Nevertheless, because of their simplicity and low cost they are still used for specific applications. For example, they are still commonly used in vegetable and grain crop production in many small-scale, low-resource agricultural systems.

1.2 EXTERNAL FORCE FEED SEED METERING :-

External force feed seed metering systems employ a rotating member in the form of a fluted or a peg/studded roller to regulate seed flow from the seed box to the seed delivery system. In both cases, as the roller rotates the seed is moved and metered by the external surface of the roller.

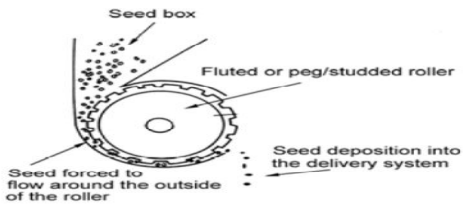

Figure1: General principle of operation of 'external force feed' seed meter types

While the principle of operation and the application is similar for both fluted and peg/studded roller types, the method of adjusting the seeding rate differs significantly as discussed below

Fluted roller type

Figure 2 shows the general form of the fluted roller type of external force feed seed meter. This type of meter essentially consists of a fluted roller, a sliding cut-off and an adjustable flap. The rotating fluted roller and the stationary cut-off are moved axially as a unit to change the exposure of the fluted roller to the seed. The adjustable flap can moved closer to, or further away from, the roller to change both the cross-section area through which seed can move and the extent the seed has to be moved by the roller before it can exit the meter. The seeding rate on the fluted roller type meter can be adjusted by one or more of the following:

• adjusting the speed of rotation of the fluted roller relative to ground speed (i.e. adjust the velocity ratio);

• sliding the shaft axially to change the length of the flutes exposed to the seed; and/or

In general: the speed of the shaft is adjusted by a gear box located in the drive train from a ground wheel to the shaft; to expose more or fewer of the fluted rollers to the seed.

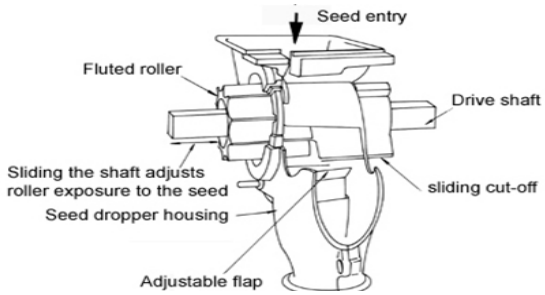

Figure 2. The general form of the fluted roller type of external force feed seed meters

1.2 PRECISION SEED METERING DEVICES:-

Unlike mass flow seed meters, precision meters attempt to meter single seeds. While there is a large range of precision metering devices, most can be broadly classified as ‘plate’, ‘belt’, ‘disc’, ‘drum’ or ‘finger’ types. Classification largely depends on the design and/or shape of the principle moving element that enables seed singulation (i.e. the selection of single seeds from the seed lot) Nevertheless, considerable variation exists within each type and these are discussed further.

1.2.1 PLATE TYPE PRECISION METERS

Plate planters are taken here to be those that principally use a moving plate with indents, i.e. holes, cells or cups, around its periphery and metering performance is generally highly dependent on matching the size (length, breadth and thickness) of the indents to the size of the seed. Plate meters can be sub classified as 'horizontal plate', 'inclined plate' or 'vertical plate' types.

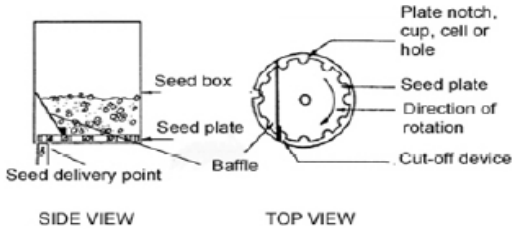

Fig 3. Horizontal plate type mete

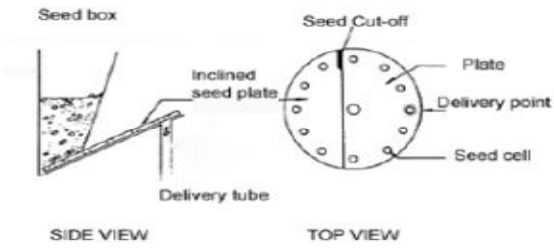

Fig:-inclined type seed meter

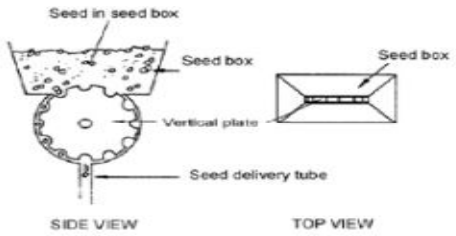

Fig:-vertical plate type seed meter

VACUUM DISC TYPE PRECISION SEED METERS :-

The vacuum disc precision meter is now the industry standard, even though pressurised disc metering systems have been developed. Essentially, this system consists of a seed box, a split housing, a vertical rotating disc that has a row of holes around its circumference, and a fan or blower. The disc differs from the plate used in plate type precision meters in that the seeds do not fall into, nor pass through, the hole and disc thickness plays no part in the singulation process. Further there is no need to correctly match the seed size to the hole size, other than

ensuring the hole diameter is smaller than the smallest cross sectional dimension of the seed in the seed lot, i.e. small enough to ensure that seeds cannot pass through the hole. As Figure shows, the disc rotates between the two halves of the housing and is exposed to a negative pressure (vacuum) on one side and to the seed on the other. As the disc rotates, each hole passes through the seed lot and picks up one or a number of seeds as a result of the pressure difference across the disc, i.e. seeds are held by suction to the hole. As the disc continues to rotate, the seeds attached to a hole are subjected to the effects of a wiper that can be adjusted to cover more or less of the hole diameter. If the wiper is correctly adjusted all seeds except one will be wiped from each hole and fall back under gravity to the seed lot. The single seeds are then carried by the disc towards the base of the meter where the pressure difference is removed and the seed falls into the seed delivery system. The metering performance therefore depends mainly on a combination of the following:

• ensuring the disc hole size is the minimum required to prevent the smallest seed in the seed lot passing through, or being lodged in, the holes in the disc;

selecting the correct pressure differential across the hole;

• setting the wiper/cutoff in the correct position to achieve singulation; and• • ensuring the disc speed does not exceed that required for seed pick-up/adhesion to the hole.

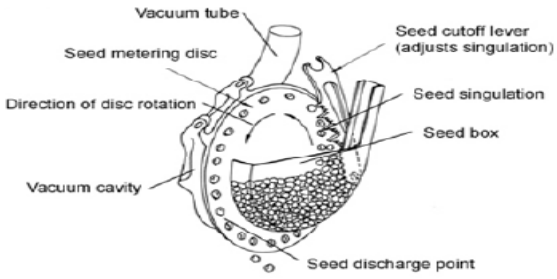

Fig:- vacuum type seed meter

RESULT AND DISCUSSION:-

No one seed metering system can meet the requirements of all crop types. Compromises have to be made and, in many cases, at least two planting machines will be required – one for drill planting and one for precision planting, particularly where both summer and winter cropping is undertaken. Irrespective of the cropping program, an informed decision can only be made if the following information is known for each of the crops to be planted:

• the established population required and the expected levels of both germination and field emergence;

• the range of agronomically acceptable row spacings;

• the sensitivity of crop yield to the evenness of plant spacing along the row; and

• the physical properties of the seed: seed size and variation in seed size, seed shape and seed fragility in particular. While all seed meter types will find a role because of simplicity, cost, flexibility in drive mechanism, ease of adjustment or cleaning, etc, it is anticipated that in the longer term 'peg or studded roller' types and 'vacuum disc' types will predominate for use in drill and precision planting systems, respectively

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