

SOWING & ITS EQUIPMENT

Seeding or sowing is an art of placing seeds in the soil to have good germination in the field. A perfect seeding gives

- a. Correct amount of seed per unit area.
- b. Correct depth at which seed is placed in the soil.
- c. Correct spacing between row-to-row and plant-to-plant.

Sowing methods

(i) Broadcasting

Broadcasting is the process of random scattering of seed on the surface of seedbeds. It can be done manually or mechanically both. When broadcasting is done manually, uniformity of seed depends upon skill of the man. Soon after broadcasting the seeds are covered by planking or some other devices. Usually higher seed rate is obtained in this system. Mechanical broadcasters are used for large-scale work. This machine scatters the seeds on the surface of the seedbed at controlled rates.

(ii) Dibbling

Dibbling is the process of placing seeds in holes made in seedbed and covering them. In this method, seeds are placed in holes made at definite depth at fixed spacing. The equipment used for dibbling is called dibbler. It is a conical instrument used to make proper holes in the field. Small hand dibblers are made with several conical projections made in a frame. This is very time consuming process, so it is not suitable for small seeds. Mostly vegetables are sown in this way.

(iii) Drilling

Drilling consists of dropping the seeds in furrow lines in a continuous flow and covering them with soil. Seed metering may be done either manually or mechanically. The number of rows planted may be one or more. This method is very helpful in achieving proper depth, proper spacing and proper amount of seed to be sown in the field. Drilling can be done by (1) Sowing behind the plough (2) Bullock drawn seed drills (3) Tractor drawn seed drills.

(iv) Seed dropping behind the plough

It is very common method used in villages. It is used for seed like maize, gram, peas, wheat and barley. A man drops seeds in the furrow behind the plough. Sowing behind the plough can be done by a device known as malobansa. It consists of a bamboo tube provided with a funnel shaped mouth. One man drops the seeds through the funnel and other man handles the plough and the bullocks. This is a slow and laborious method.

(v) Transplanting

Transplanting consists of preparing seedlings in nursery and then planting these seedlings in the prepared field. It is commonly done for paddy, vegetable and flowers. It is very time consuming operation. Equipment for placing plants in the soil is called transplanter.

(vi) Hill dropping

In this method, seeds are dropped at fixed spacing and not in a continuous stream. Thus the spacing between plant to plant in a row is constant. In case of drills, the seeds are dropped in continuous stream and the spacing between plant to plant in a row is not constant.

(vii) Check row planting

It is a method of planting, in which row-to-row and plant-to-plant distance is uniform. In this method, seeds are planted precisely along straight parallel furrows. The rows are always in two perpendicular directions. A machine used for check row planting is called check row planter.

SEED DRILL

Seed drill is a machine for placing the seeds in a continuous flow in furrows at uniform rate and at controlled depth with or without the arrangement of covering them with soil.

Function of seed drill: Seed drill performs the following functions

- i) To carry the seeds.
- ii) To open furrow to an uniform depth
- iii) To meter the seeds
- iv) To place the seed in furrows in an acceptable pattern
- v) To cover the seeds and compact the soil around the seed.

Seed cum fertilizer drill

Seed drills, fitted with fertilizer dropping attachment, distribute the fertilizer uniformly on the ground. It is called seed cum fertilizer drill. Such a drill has a large seed box which is divided lengthwise into two compartments, one for seed and another for fertilizers. Seed drill may be classified as (i) Bullock drawn (ii) Tractor drawn.

COMPONENTS OF SEED DRILL

A seed drill with mechanical seed metering device mainly consists of : (i) Frame (ii) Seed box (iii) Seed metering mechanism (iv) Furrow openers (iv) Covering device (vi) Transport wheels.

Frame: The frame is usually made of angle iron with suitable braces and brackets. The frame is strong enough to withstand all types of loads in working condition.

Seed box :It may be made of mild steel sheet or galvanized iron with a suitable cover. A small agitator is sometimes provided to prevent clogging of seeds.

Covering device: It is a device to refill a furrow after the seed has been placed in it. Covering the seeds are usually done by patta, chains, drags, packers, rollers or press wheels, designed in various sizes and shapes.

Transport wheel: There are two wheels fitted on the main axle. Some seed drills have got pneumatic wheels also. The wheels have suitable attachments to transmit power to operate seed dropping mechanism.

SEED METERING MECHANISM

The mechanism of a seed drill or fertilizer distributor which delivers seeds or fertilizers from the hopper at selected rates is called *seed metering mechanism*. Seed metering mechanism may be of several types: (a) Fluted feed type (b) Internal double run type (c) Cup feed type (d) Cell feed mechanism (e) Brush feed mechanism (f) Auger feed mechanism (g) Picker wheel mechanism (h) Star wheel mechanism.

(a) Fluted feed type- It is a seed metering device with adjustable fluted roller to collect and deliver the seeds into the seed tube. Fluted feed type mechanism consists of a fluted wheel, feed roller, feed cut-off and adjustable gate for different sizes of grains. (Fig.1). The feed roller and the feed cut-off device are mounted a shaft, running through the feed cups. The roller carries grooves throughout its periphery. It rotates with the axle over which it is mounted throws the grains out on the adjustable gate from where it falls into the seed tube. The fluted rollers which are mounted at the bottom of the seed box, receive seeds into longitudinal grooves and pass on to the seed tube through the holes provided for this purpose. By shifting the fluted wheel side ways, the length of the grooves exposed to the seed can be increased or decreased and hence the amount of seed is controlled.

(b) Internal double run type- It is a seed metering device in which the feed wheel is provided with fine and coarse ribbed flanges. It consists of discs, mounted on a spindle and housed in a casing fitted below the seed box (Fig. 2). It has double faced wheel. Internal double-run type roller one face has a larger opening for larger seeds and the other face has smaller opening for smaller seeds. A gate is provided in the bottom-of the box to cover the opening not in use. The rate of seeding is varied by adjusting the speed of the spindle which carries the discs.

(c) Cup feed mechanism- It is a mechanism consisting of cups or spoons on the periphery of a vertical rotating disc which picks up the seeds from the hopper and delivers them into the seed tubes. It consists of a seed hopper which has two parts. The upper one is called grain box and the lower one is called feed box. The seed delivery mechanism consists of a spindle, carrying a number of discs with a ring of cups attached to the periphery of each disc (Fig. 3). The spindle with its frame and attachment is called seed barrel. When the spindle rotates, one disc with its set of cups rotates and picks up few seeds and drops them into small hoppers. The cups have two faces, one for larger seeds and the rate at which the seed barrel revolves. This type of mechanism is common on British seed drills.

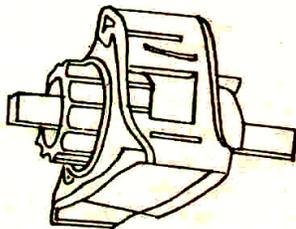


Fig.1. Fluted roller type

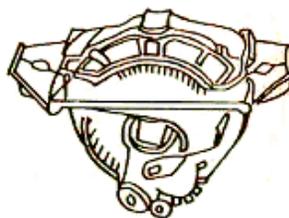


Fig.2. Internal double run

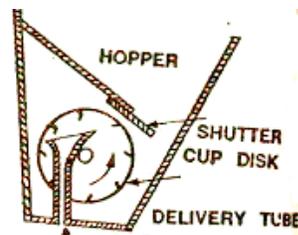


Fig.3. Cup feed mechanism

(d) Cell feed mechanism - It is a mechanism in which seeds are collected and delivered by a series of equally spaced cells on the periphery of a circular plate or wheel.

(e) Brush feed mechanism - It is a mechanism in which a rotating brush regulates the flow of seed from the hopper. A number of bullock drawn planters in the country have Brush feed mechanism.

(f) Auger feed mechanism - It is a distributing mechanism, consisting of an auger which causes a substance to flow evenly in the field, through an aperture at the base or on the side of the hopper. Many of the fertilizer drills on the country have got Auger feed mechanism.

(g) Picker wheel mechanism - It is a mechanism in which a vertical plate is provided with radially projected arms, which drop the large seeds like potato in furrows with the help of suitable jaws.

(h) Star wheel mechanism - It is a feed mechanism which consists of a toothed wheel, rotating in a horizontal plane and conveying the fertilizer through a feed gate below the Star wheel.

FURROW OPENERS

The furrow openers are provided in a seed drill for opening a furrow. The seed tube conducts the seed from the feed mechanism into the boot from where they fall into the furrows.

TYPE OF FURROW OPENERS

Different type of furrow openers are: (1) Shovel type (2) Shoe type (3) Disc Type (single disc, double disc).

(1) Shovel Type- Shovel type furrow opener are widely used in seed drills. There are three of shovels in use. They are: (a) reversible shovel (b) single point shovel and (c) spear point shovel.

Shovel type openers are best suited for stony or root infested fields. These shovels are bolted to the flat iron shanks at the point where boots are fitted which carry the end of the seed tubes. In order to prevent shock loads due to obstructions, springs are provided. It is easy in construction, cheaper and easily repairable. It is very common with usual seed drill.

(2) Shoe Type- It works well in trashy soils where the seed beds are not smoothly prepared. They are made from two flat pieces of steel welded together to form a cutting edge. It is specially suited for black cotton soil. Shoe is made of carbon steel having minimum carbon content of 0.5 per cent with a minimum thickness of 4 mm.

(3) Disc Type- They are two types: (a) Single disc type and (b) Double disc type.

Single disc type- It is furrow opener consisting of one concave disc. Disc type furrow openers are found suitable where plant debris or trash mulches are used. **Double disc type-** In double disc type furrow opener there are two flat discs, set at an angle to each other. It is suitable for trashy lands. Seed drills attached with tractors having high speeds, usually use this type of furrow opener.

The furrow opener consists of: (1) tine (2) shovel (3) seed tube (4) boot for seed and fertilizer.

Shovel - It is made of carbon steel having carbon content of 0.5 per cent and a minimum thickness of 4.0 mm.

Seed tube - It is a tube which carries the seeds from the metering device to the boot. Seed tubes are provided at the lowest lines through suitable boots and furrow openers. The minimum diameter of seed tube is 25 mm.

Boot - It is a part of the sowing machine which conveys the seeds or fertilizers from the delivery tube to the furrow. It is bolted or welded to the tine.

PLANTER

Planter is normally used for those seeds which are larger in size and can not be used by usual seed drills. A planter consists of: (i) hopper (ii) feed metering device (iii) knock out arrangement (iv) cut-off mechanism (v) furrow opener and (vi) other accessories. A planter has seed hopper for each row.

Seed metering device in a planter: There are a number of seed metering devices in a planter but the most common device consist of a rotating plate at the bottom of seed hoppers. In some planters, vertical rotors as well as inclined rotors are also used. The most common is the horizontal seed plate used in planters. The horizontal seed plates have got suitable notches or holes called cell. Depending upon the type of notches on the plates, it is of three types. (i) Edge drop (ii) Flat drop (iii) Hill drop. The edge drop carries the seed on edge in the cell of the plate. The flat drop carries the seed on a flat in the cell of the plate. In hill drop, the cells round the edge of the plate are large enough to admit several seeds at a time. Planter is usually used for those seeds which are required to be sown at equal intervals between plant to plant.

Manual Rice Planter

It is used for transplanting of paddy seedlings. The unit consists of skid frame, movable tray and seed picking fingers. Mat type seedlings are placed on the inclined trays. When the fingers are pushed downward they pick

up the seedlings and place them in the ground. Seedlings are left on the ground during return stroke. The plant to plant spacing can be controlled by the opener. It may be 5-6 rows with comb type finger. Its working capacity may be 0.2 – 0.25 ha/8 hrs.

Rice Transplanter

The rice transplanter consists of (i) Air cooled gasoline engine (ii) Main clutch (iii) Running clutch (iv) Planting clutch (v) Seeding table (vi) Float (vii) Starwheel (viii) Accelerator lever (ix) Ground wheel (x) Handle (xi) Four bar linkage mechanism

Seedlings: Growing of seedlings for this transplanter is most technical and difficult work. Seedlings are grown in special seedling trays. It is called mat seedling. Mat seedlings are grown by some standard procedure in controlled environment in a nursery.

Operation: The seedlings are raised in special trays as mat seedlings. The mat seedlings are placed on the seeding table of the transplanter in slanting position. When the engine is started, the running clutch and planting clutch are operated. Four bar linkage mechanism is there to catch 3 or 4 seedlings at a time and to separate them from the mat and fix in the puddled soil. A float is there to support the machine on the water while working in the field. There are two ground wheels made of iron for facilitating the movement of the transplanter. There is a marker also which demarcates the transplanting width while in operation.

Power from the engine goes to the main clutch from where it is divided into two routes, one goes to planting clutch and the other goes to running clutch. Unless planting clutch is operated, the four bar linkage mechanism does not work. The engine is of about 1.2 to 1.8 HP only. The machine maintains row to row spacing of 28 cm to 30 cm and plant spacing of 14 cm to 16 cm only. The planting capacity of the machine is about 0.05 to 0.1 hectare per hour.

Calibration of seed drill:

The procedure of testing the seed drill for correct seed rate is called calibration of seed drill. It is necessary to calibrate the seed drill before putting it in actual use to find the desired seed rate. It is done to get the pre determined seed rate of the machine. The following steps are followed for calibration of seed drill.

Procedure:

- i. Determine the nominal width (W) of seed drill

$$W = M \times S,$$

Where,

$$M = \text{Number of furrow openers, and}$$

$$S = \text{Spacing between the openers, m}$$

- ii. Find the length of the strip (L) having nominal width (W) necessary to cover 1/25 ha (1/25 x 10000 m²)

$$L = 400/W, \text{ meter}$$

- iii. Determine the number of revolutions (N) of the ground wheel of the seed drill required to cover the length of the strip (L)

$$L = \pi \times D \times N = 400/W$$

$$N = 400/\pi \times D \times W \text{ revolutions per minute}$$

- iv. Jack the seed drill so that the ground wheels turn freely. Make a mark on the drive wheel and a corresponding mark at a convenient place on the body of the drill to help in counting the revolutions of the ground wheel

- v. Fill the selected seed in the seed hopper. Place a container under each boot for collecting the seeds dropped from the hopper

- vi. Set the seed rate control adjustment for maximum position and mark this position on the control for reference

- vii. Engage the clutch and rotate the ground wheel for $N = 400/\pi \times D \times W$, revolutions per minute

- viii. Weigh the quantity of seed collected in the container and record the observation.

- ix. Calculate the seed rate in kg/ha

- x. If the calculated seed rate is higher or lower than the desired rate of selected crop, repeat the process by adjusting the seed rate control adjustment till the desired seed rate is obtained.