

DIRECT SEEDER/PLANTER

Direct seeders are precision planters designed to directly plant and apply fertiliser in an untilled field. These planters are able to cut and handle residue, penetrate the soil to the proper seeding depth, precisely place the seed and apply fertiliser at predetermined spacing and application rate and establish good seed-to-soil contact.

Functional performance is affected by condition of the field and residue, design of coulters and furrow openers, seed and fertiliser metering devices, harnesses, general setting that affect ergonomics such as height of handles above the ground.

There are two types of planters that can be used with the 2WT namely

- i) Single row planter
- ii) Double row planter

SINGLE ROW PLANTER

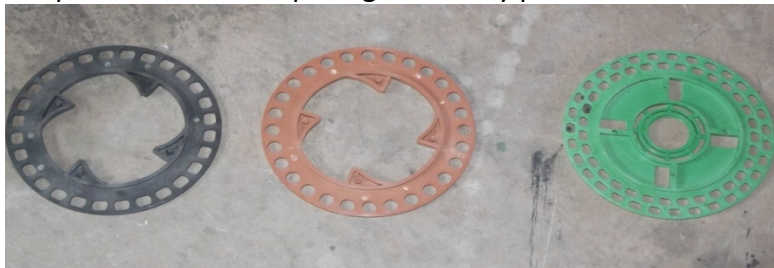
This is a planter that can hitched to a 2WT and designed to plant one row at any given time. The operator can use this type of a planter while walking or stepping on the pedals provided on the planter.

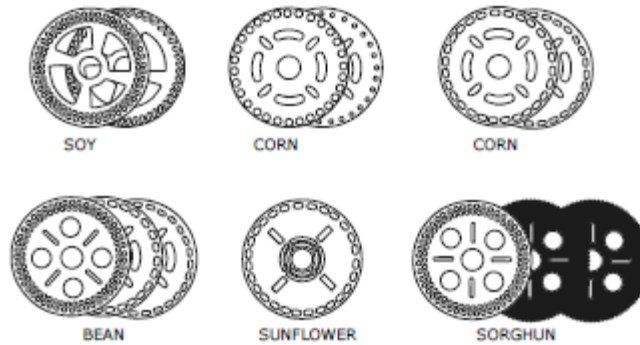
Major parts of Single row planter

1. Hoppers

Each direct seeder planter has two hoppers, one for seed and the other for fertilizer. Construction material maybe hardened plastic (PVC) or steel. At the base of each hopper is chute which delivers the seed or fertilizer into the opened furrow. The chutes are transparent hence the operator can observe whether the seed or fertilizer is being dropped.

Seed hopper – inside the seed hopper there is a horizontal seed plate with seed cells around the circumference help to reduce seed spacing variability provided the seed is graded.





A spring loaded knocker is fitted to press the seed through the seed cell into the seed delivery tube. The knocker can be single or double depending on the rows of the seed cells. Horizontal seed plates with spring loaded knocker can not handle soft seeds such as groundnut because the seed will be crushed.

Fertilizer hoppers – inside the fertilizer hopper there are gears or cogs which delivers fertilizer out of the hopper. Fertilizer metering devices include the use of different sizes of cogs, auger and hopper gates.



Fertilizer granule size affect application rates hence need to calibrate and check application rates each time the planter is used.

2. Coulters and Seed Furrow Openers

Coulter – this is a round blade/disk fitted at the front of the planter specifically to cut trash/mulch ahead of the furrow opener

Furrow opener – this in the form of a ripper tine and it is fitted behind the coulter. Its function is to open up the furrow for seed and fertilizer placement. Just behind it are delivery chutes of fertilizer and seed from the hoppers to immediately drop the fertilizer and seed respectively.

3. Drive Wheel

This is metal wheel with lugs for traction and follows behind the furrow opener. The wheel has two main functions (i) it provides drive for metering of seed and fertilizer, (i) to cover and press seed and fertilizer dropped behind the furrow opener.

Depth regulator wheel – beside the furrow opener there is a small rubber wheel which has the function to regulate the depth of seed and fertilizer placement. Adjustments is the form of changing the holes of the wheel arm by a pin.

Hitching of the Planter to the 2WT

This planter is hitched to the tractor by a single pin on the tractor hitching point. To support and stabilise the planter there are two flat bars that bolted from the planter frame to the 2WT handles to both sides

Double Row Planter

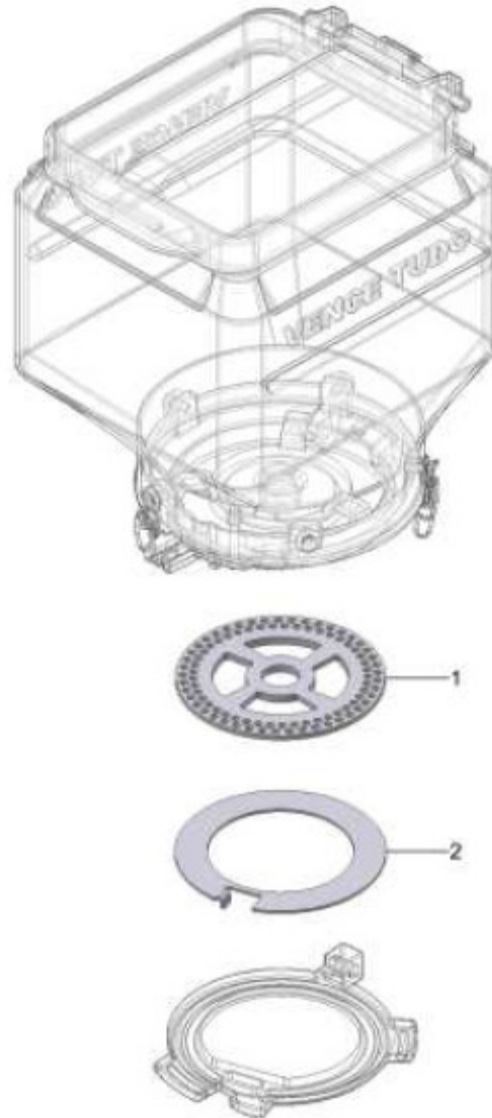
This is a two wheel trailed planter that is hitched directly to the 2WT and is capable to plant two rows at any given time. It is operated by one operator sitting on a provided seat mounted on the planter. Just like the single row planter is designed to directly plant and apply fertiliser in an untilled field making it a perfect Conservation Agriculture planter.

Parts and Function

Hoppers

Seed hoppers - The planter is equipped with two seed hoppers with a capacity of **20kg** each.

Just as in the single row planter, inside the seed hopper there is a horizontal seed plate with seed cells around the circumference help to reduce seed spacing variability provided the seed is graded.



A spring loaded knocker is fitted to press the seed through the seed cell into the seed delivery tube. The knocker can be single or double depending on the rows of the seed cells. The seed plate gets drive from one of the wheels through chain and the drive can be engaged or disengaged by two gear levers one for each hopper.

Fertilizer hopper – there two fertilizer hoppers one for each row mounted close to the seed hopper and have the capacity of **50kg** each. The hopper also are fitted with gear cogs which meters out fertilizer into the soil through a plastic tube. The drive for metering mechanism of fertilizer is also through the chain from one of the wheel.

Double Discs

Two sets of double discs are mounted below the seed and fertilizer hoppers. The fertilizer and seed tubes goes straight into the two angled discs. The discs cuts through the trash/mulch into

the soil dropping fertilizer and seed simultaneously at different levels. The discs leaves a hardly seen thin line on the ground/field where seed and fertilizer are dropped.

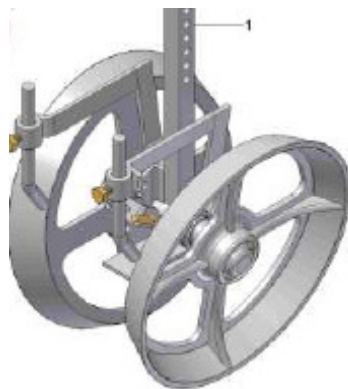


Wheels

The planter has two wheel which operate independently. Besides the main function of carrying the whole planter unit, one wheel is responsible for fertilizer metering mechanism and the other wheel is for driving the metering mechanism of seed. The planter wheels are water ballasted to increase traction during field operation

Press Wheels

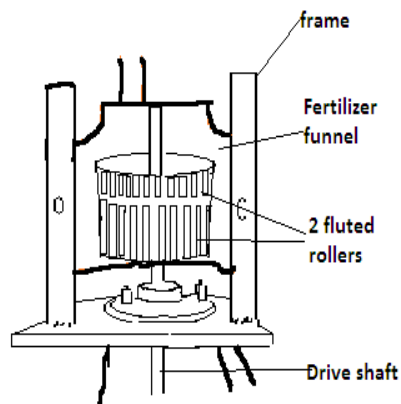
Two sets of paired metal wheels are mounted just behind the double discs to firmly press seed and fertilizer into the soil (seed and soil contact). The press wheels are used to adjust planting depth through the holes seen on the wheel holder below:



The seed unit which is composed of the fertilizer hopper, double discs and press wheels can be freely moved along the frame which makes it easy to adjust row spacing for different crop requirements.

Trouble Shooting

- **Deep or shallow planting** - adjust the height of the press wheel for two row planter and the side wheel for the single row planter.
- **Uneven seed release** - select a more suitable seed plate or grade the seed
- **Fertilizer over or under application** – check calibration and the sliding plate holding the cogs
- **No seed or fertilizer release** – check the metering mechanism



Fertilizer cogs

Fig. 6.1 Fiterelli fertiliser cogs

Drive Wheel

The drive wheel on the direct seeder planter has two functions. The drive wheel actuates the seed and fertilizer metering through different linkages such as chains or through pitman mechanical linkage. It is therefore important to ensure that the drive wheel does not slip as this will result in the direct seeder not dropping the seed and fertilizer. The design of the drive wheel therefore must ensure the wheel has enough grip to the ground to prevent wheel slip. The drive wheel is located just behind the seed and fertilizer chutes roll on the opened furrow where seed and

fertilizer would have been placed thus effectively firming the soil thereby improving seed soil contact.

6.3 Calibration

Seed Calibration

To ensure that seed is not cut, the counter sink must be facing the cut-off housing.

Table 6.1 Seed plate selection

Type of seed	No. of Holes	Size of Hole mm(diameter)	Distance in row cm
maize	6	16	22.00
maize	8	16	16.75
sorghum	12	6	11.50

- First, the planter is pulled on a flat surface and check whether all moving parts are working properly.
- The farmer selects the seed plate that gives the spacing as recommended by local extension officers.
- A few seeds are put into the hooper and the planter is pulled and seed spacing is observed if it is being spaced at the recommended spacing as per the seed plate.

Fertilizer Calibration

- Suspend the planter body on blocks of wood so that only the wheel and pitman arms move.
- Put some fertilizer in the hooper and place a container beneath it to collect the fertilizer as it comes out through the spout.
- Place the mark on the wheel, turn it and count the revolutions it takes to complete the length of a single row in the field.
- Determine how much fertilizer is collected in the container. If it is less than the recommended amount, increase the amount by opening the hopper gate.
- If its more fertilizer than recommended then reduce the amount by narrowing the opening of the hopper gate.

Fiterelli Direct Seeder

Seed Spacing

Fiterelli direct seeder comes with different seed plates for maize, Soya bean and sorghum and of a wide range of seed sizes as shown by the figure below;

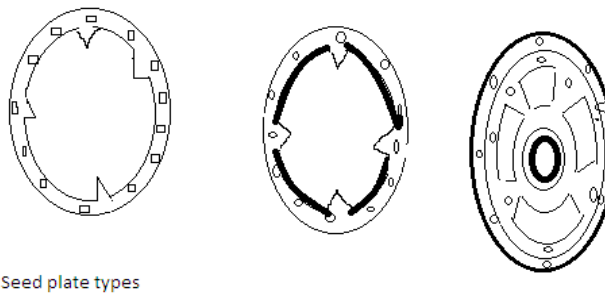


Fig 6.2 Seed plate types

- First select the seed plate for the type of seed i.e. maize (*milho*), Soya bean (*soja*) or sorghum (*soghi*).
- Select the plate which suites best the seed size and shape by placing seeds on seed cells of seed plates and then lift the seed plate. The most suitable plate will allow single seeds per cell to pass through without hanging on the cell. The selected seed plate is fitted at the base of the seed hooper. If the seed plate has a single row of cells a single knocker is used and when a seed plate with double row cells, a double knocker is fitted.
- Plant population is then determined by selecting the bevel gears below the seed hooper. There are three bevel gears which can be engaged with one bevel gear below the seed hooper which drives the seed plate. Plant population from the three gears are shown on the table below;

Table 6.2 Plant Population Calibration

Gear Size	Seed plate	Plant Population/ hectare
smallest	maize	36 000
Middle	maize	44 000
Largest	maize	55 000
smallest	Soya bean/sorghum	44 000

It is important to use graded seed in order to ensure seed spacing uniformity. Where the seed is not graded make an effort to grade it.

Fertilizer

Fertilizer is calibrated by using cogs which planter is supplied with. There are two cogs of different size which give different application rates. The application rate varies with inter row spacing for each cog as shown in the table below.

Table6.3: Fertiliser application rates

Cog size	Inter row spacing (m)	Application rate (kg/ha)
small	0.90	82.0
large	0.90	165.0
small	0.45	41.0
large	0.45	82.5
small	0.70	63.8
large	0.70	128.3

Combining two cogs of the same size will double application rates and combining two cogs of different sizes will increase the application rates relative to the cog outputs.

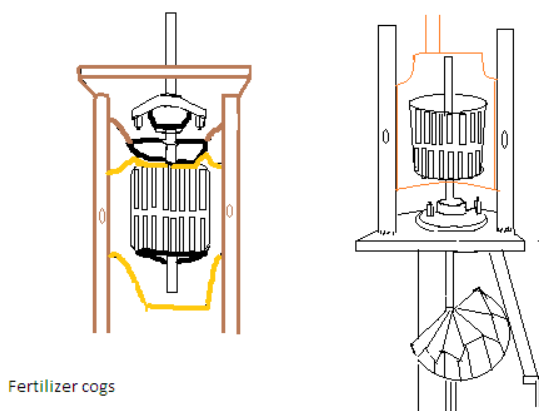


Fig 6.3 Fertiliser cogs

Verification of plant population and fertilizer output calibrated

After the planter is calibrated there is need to check if the planter is dropping the seed and fertilizer as per the calibration. The planter is pulled over a known distance say 20m while collecting fertilizer and seed from the chutes. Collected seed and fertilizer is then used to calculate if the planter is working according to the calibrations using the formulas below.

$$\frac{\text{Number of seeds collected}}{\text{Distance traveled (m) x inter row spacing (m)}} \times 10000 = \text{Plant Population/hectare}$$

$$\frac{\text{Fertilizer collected in kgs}}{\text{Distance traveled (m) x inter row spacing (m)}} \times 10000 = \text{fertilizer application rate/hectare}$$

N.B The result is compared with the calibrated plant population (seed spacing) and fertilizer application rate and if there is too much variance of more than 5 % there is need to check the planter metering mechanism or recalibrate again.

6.4 Care and Maintenance

- It has to be transported to the field but can only be drawn by animals for short distances but avoiding rocky surfaces.
- After using the planter both the seed and fertilizer hopper must be emptied and cleaned.
- Rotating parts should be lubricated when necessary.
- The knocker on the Zimplot planter must be oiled to prevent rusting.
- Scratched areas should be painted to prevent rusting.
- The planter must be stored in a shed, protected against the sun and rain.

Trouble Shooting

- **Deep or shallow planting** - adjust the height of the disc-coulter in relation to size of animals being used.
- **Uneven seed release** - select a more suitable seed plate or grade the seed
- **Fertilizer over or under application** – check calibration and the sliding plate holding the cogs
- **No seed or fertilizer release** – check the metering mechanism