Sugar Research Australia

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Booklet

# Bed formers used in the sugarcane farming system

The improved farming system is not a one-size-fits-all recipe, but rather the adoption of the concepts of controlled traffic, reduced tillage and the use of a fallow legume break crop to break disease cycles and reduce compaction. In some cases, modified equipment is needed and has been developed. However, in many cases existing farm machinery can be used to implement the concepts of the improved farming system.

This fact sheet looks at bedformers which are an important component in the improved farming system. Bed forming is seen as a way to build a protected, well-drained area in which to grow the crop. There is no fixed rule on how high the bed should be, but they must be suited to harvesting operations and must prevent machinery tracking easily over the growing area. The beds are best first laid down with GPS guidance to maximise efficiency.

The benefits gained from beds include:

- Reduced tillage - once cane is planted into preformed beds no further cultivation is need to form a hill-up suited to harvesting.
- Improved drainage for the growing of fallow legume and cane crops.
- Assisting with controlled traffic as they form a barrier to traffic movement.

There are many bed former designs, with each type being suited to a particular soil type or soil stubble trash content.

Bed formers can be placed into two broad classes - those with discs and those without discs:

- Bed formers with discs work well in all soil types and can work in soils with high trash levels. They may produce beds which are lumpy and inconsistent or excessively high.
- Beds formers without discs work well in soil that has been prepared to a fine tilth. The formed beds are of consistent height and shape and are ideal for planting and harvesting operations.

## Different types of bed formers

1. Scrapin- type
2. Plough type
3. Heavy-duty disc type
4. Disc type, light duty type
5. Rotary hoe type
6. Former type
7. Bed reformer type

**1. Scraping-type**

Scraping-type bed formers do a good job where the soil is well tilled, with plenty of loose soil depth and is almost completely free of trash and debris. They typically produce a very uniform bed when correctly adjusted, as they carry soil that fills in depressions in the field being bedded. They are only useful the first time that beds are being built from a fallow situation and are not suitable for rebuilding old beds.

**Image 1:** Ascraping-type bed former in operation. Note the rounded beds and the flat interspaces.

***Advantages***

- Simple design
- Suited to high working speeds
- Provides a smooth wheel track
- Can be designed to provide bed profiles that match base cutters
- Well suited to multi-bed design

***Disadvantages***

- Must have well-worked soil
- Will not tolerate much trash
- Soils need to be relatively dry

**2. Plough-type**

Plough-type bed formers are also best used in reasonably well-tilled soil. However, as they have digging points, they will penetrate the harder subsoil and give a consistent bed height across variable fields.

They require reasonably high horsepower to operate as a lot of soil is carried and the points must penetrate the firmer subsoil. This type of bed former typically leaves a V-shaped bottom in the area that the tractor and harvester tyres will run - a flatter bottom may be preferable.

The bed is flat on top, so does not match harvester base cutter angles very well. This bed is very suitable for growing and harvesting soybeans prior to replanting cane. The overall finish of the beds is typically very smooth.

**Image 2:** Four-row plough-type bed former.


**Image 3:** Plough foot of a plough-type bed former.

**Image 4:** Beds formed by a plough-type bed former. Note the flat tops and the V-shaped wheel tracks.

***Advantages***

- The points can penetrate the subsoil and bring up additional material if required
- Carries a lot of soil, which is useful for providing a consistent bed shape if there are hollows to be filled

***Disadvantages***

- Requires more horsepower than some other types
- Leaves a sharp V-shape for wheel tracks
- Commonly leaves a flat-topped bed
- Difficult to adjust for different width beds
- Soil must be well-tilled with little organic material

**3. Heavy-duty disc type**

Heavy-duty disc bed formers are suited to semi-prepared soils with moderate amounts of trash cover. They are very suited to a wide range of soil types and can build a bed in most conditions, although the finish of bed may be quite rough in 'gluepot' soils on the first pass. Parts from old equipment, such as trash-incorporator legs, can be used to make a 'budget' bed former.

**Image 5:** Three-row, heavy-duty disc bed former.

**Image 6:** Heavy-duty, disc bed former with a ripper to rip the beds.

**Image 7:** Bed formed with a disc bed former and a crumble roller.

***Advantages***

- Can make a bed in nearly any soil type
- Will pass through soils with lots of organic material
- High working speed/work rate
- Can be built from old cane machinery parts
- Suited to a multi-row implement

***Disadvantages***

- If not fitted with some sort of finishing device, such as a crumble roller, the bed finish will be very rough in heavy clay soils
- Bed can be inconsistent in size and shape

**4. Light-duty disc type**

Light-duty disc bed formers are typically made from second hand parts, especially from the cotton industry, and work extremely well in well-tilled soils with minimal trash. They can not pull up a huge bed in one pass but are very effective at heights up to 125 mm. They should be followed with a finishing roller to firm-up the bed.

**Image 8:** Bed former with gangs of light discs forming the beds after the furrowing sweeps.

**Image 9:** Three-row light-disc bed former producing consistent, well-worked beds.

***Advantages***

- Ideal finish
- Suited to multi-row set-ups
- Good working speed
- Very adjustable

***Disadvantages***

- May leave the bed too 'fluffy' - this may lead to excessive settling at the first rain event
- Gluepot, heavy-clay soils may be challenging for this type of implement

**5. Rotary hoe type**

Rotary hoe type bed former combinations provide a very fine tilth bed and can operate with modest amounts of trash and growing weeds.

Typically the beds are formed by placing a disc in front of the rotary hoe or by modifying the shape of the rotary hoe tail gate.

The rotary hoe can be adapted to bed renovation if all blades over the wheel tracks are removed and only the bed zone is tilled.

If rippers are mounted in front of the rotary hoe, the machine can provide a true one-pass operation. This type of bed former will tolerate most soil and trash conditions but have low operating speeds and high power requirements.

**Image 10:** Rotary hoe with a tailgate bed former and crumble roller.

**Image 11:** Hill-up disc in front of the rotary hoe.

***Advantages***

- A true one-pass bed-building operation
- Seed bed is of a very fine tilth
- Suited to bare fallows that still have some trash, weeds and stool

***Disadvantages***

- High horsepower requirement
- Slow working speed
- Can be multi-row which requires a larger tractor
- Considerable bed-settling may occur

**6. Former type**

The former type is very basic in design but will work satisfactorily only in soils that have been worked to a considerable depth. They leave a smooth, open wheel track, together with a bed profile matched to the base cutter angle, and are well suited to a multiple-bed forming implement. They are, however, rarely used.

***Advantages***

- Simple construction
- Light weight
- Smooth, flat wheeltrack
- Optimal bed shape to suit basecutter

***Disadvantages***

- Requires soil to be very well prepared
- May not be suitable in heavy clay soils

**7. Bed reformer type**

This type of implement is suitable for bed forming under almost any conditions. The machines consist of both ripper and hilling discs with a finishing crumble roller to produce the beds. These machines are used to reform beds at the end of the first crop cycle to allow the second crop cycle to be established into the existing beds.

**Image 14:** Bed reformer.

**Image 15:** One pass of a bed reformer through a trash blanket.

***Advantages***

- Bed construction can begin in a completely untilled fallow block
- Provides a bed shape compatible with harvester base cutter
- Significant savings in fuel labour and time
- One-pass operation

***Disadvantages***

- Heavy
- Not well suited to multi- row implement design

## Good advice

- Bed forming:
  - > Improves drainage for cane and legume crops.
  - > Can be a useful part of a reduced-tillage system.
  - > Assists with controlled traffic by limiting machinery movement over the beds.

Two broad classes of beds formers include those with discs and those without discs.

- Bed formers with discs work well in all soil types and can work in soils with high trash levels, but may produce beds with are lumpy and inconsistent or excessively high
- Beds formers without discs work well in soil that has been prepared to a fine tilth. The beds formed by them are of consistent height and shape and are ideal for planting and harvesting operations.