# Information Sheet

## 4. HUSBANDRY

## 4.3 Subsoiling/ripping in ratoons

The effect of ripping (subsoiling) on ratoon crop yields has been tested on the following 11 soil forms under rainfed conditions in the South African sugar industry: Glenrosa, Longlands, Westleigh, Arcadia, Cartref, Hutton, Milkwood, Wasbank, Shortlands, Inanda and Kroonstad. The effect of ripping on ratoon cane yields has also been tested on the following five soils under irrigated conditions in Swaziland and the Eastern parts of Mpumalanga: Shortlands, Arcadia, Estcourt, Sterkspruit and Tambankulu.

### Implements used

A straight tip subsoiler tine (in some cases with wings) was used in rainfed field trials. Various spring tine rippers (in some cases with wings) and a paraplough, were used in irrigated areas (see Figure 1). The tine of the paraplough was pulled through the middle of the interrow in all trials to depths of 150 to 550 mm (Swaziland) and 300 to 600 mm (South Africa).

### Soil water content

For maximum effect most soils should be dry at the time the fields are ripped. In moist soils the lateral disturbance is absent and the ripped slot is smeared (sides are sealed) which reduces the rate of water movement into the bulk soil. In general, the best time to rip rainfed fields is during winter when conditions are normally dry. Summer should however be selected for irrigated areas as pre-harvest dry-off will normally yield drier soils. Certain grey soils and soils with a high clay content might yield huge clods when ripped too dry which is also not desirable.

### Timing

In exceptional circumstances where compaction is evident, ripping should be practiced within two weeks after harvesting in order to minimise damage to the new roots of the germinating crop. To maximise the ripping effect, soil water content discussed above should be kept in mind when planning the operation.

### Trash

Trash or any other organic residue on the surface will require additional preparation for ripping. The rip implement will have to be fitted with one or a combination of the following:

- A coulter to cut the trash in front of the ripper tine
- Residue coulter wheels designed to continuously remove any trash that might build up in front of the ripper tine (see Figure 1).

**Figure 1. A straight tip subsoiler (left) and a paraplough (right).**

## Cultivation

Subsoiling is a good alternative to ploughing when a minimum tillage system is considered. The benefits include:

- Minimum soil disturbance.
- Break surface and subsoil compacted layers.
- Improved water infiltration resulting in the efficient use of rainfall.
- Interrow cultivation option with no or minimal effect on the current crop.
- Deep incorporation of ameliorants is possible.
- Requires less energy (fuel) compared to conventional ploughing.

## Yield response

Field trials in South Africa showed a statistically significant response to subsoiling in only one field trial (Kroonstad soil). Three field trials showed statistically significant yield reductions (Glenrosa, Milkwood and Arcadia), whereas the rest showed no response to subsoiling under a range of conditions (i.e. dry or moist, rainfed or irrigated, trash or no trash). Swaziland experiments, which included 'no cultivation' treatments in some trials, also showed no response to ripping under the conditions tested (these included 'moist' or 'dry' at the time of treatment). Delayed ripping (11 weeks after harvest) tended to affect yields adversely.

## Soil compaction

Soil compaction should be distinguished from stool damage (driving over the stools) which is potentially far more costly compared to soil compaction. Soil compaction in the sugar industry occurs mainly at the soil surface to a depth of between 15 to 25 cm depending on the soil type, clay content and water content at the time of compaction. Wet sandier soils with little organic matter will compact to greater depths compared to dry clayey soils with much organic matter. Grey soils are the most susceptible to compaction, with black soils being the least and red soils being intermediate. Subsurface compaction (between depths of 20 to 45 cm) in the form of a plough layer is less common but has a severe rooting depth and water infiltration limitation. Both types of compaction (surface and subsurface) can be alleviated with ripping, while taking the soil water content into account for maximum effect.

## Surface capping

Capping (or crusting) is mainly caused by water droplets hitting the surface causing structural collapse and blocked pores creating a thin, but very effective, sealed

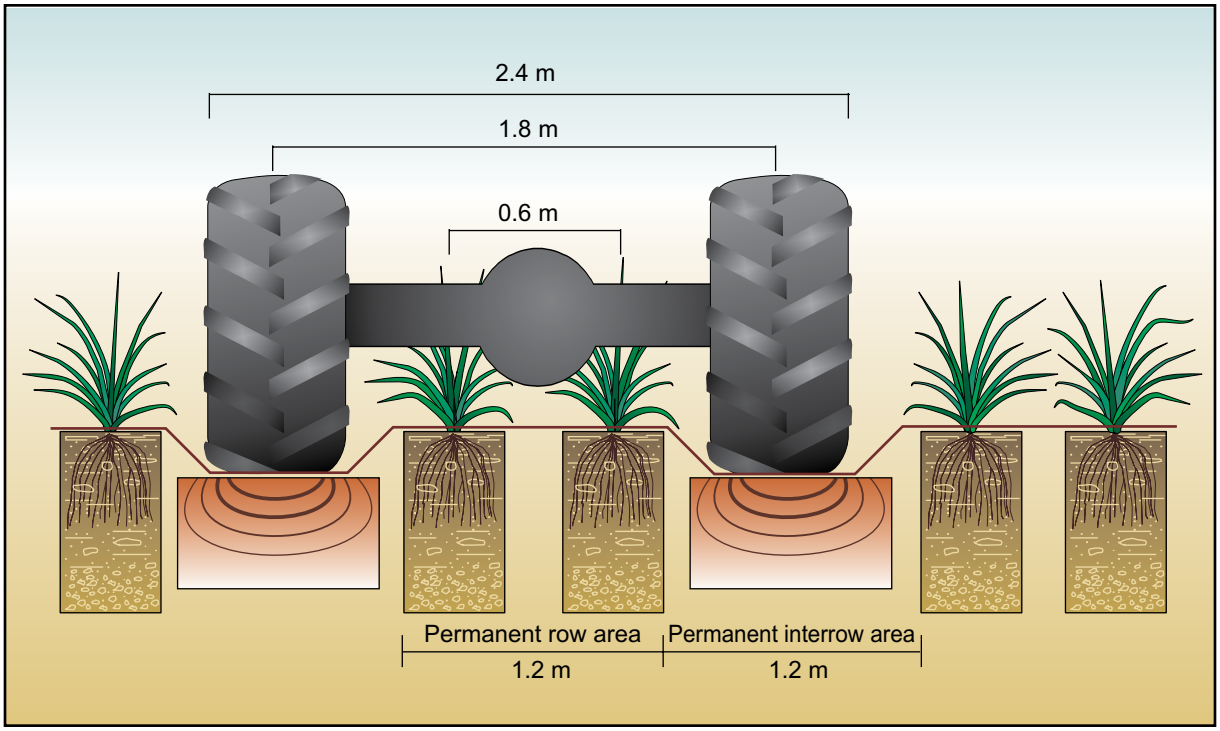


**Figure 2. The 1.2 m interrow spacing combined with a 0.6 m row spacing arrangement that should be suitable for most farms.**

layer. Grey soils are in general very susceptible to capping followed by red soils. Alleviation is very easy *via* a light cultivation with a scarifier. Deep ripping is not required unless a compacted layer is present at depth. Leaving tops scattered or a trash blanket are excellent alternatives to protect the soil surface from capping.

## Conclusions

In general, there is no evidence to recommend the repeated use of ripping in ratoon cane to improve cane yields. However, where soil compaction is present, some loosening of the soil surface may be beneficial. Yield losses are also possible due to pruning of wide stools in older ratoons due to ripping or cultivating. Interrow ripping to a shallow depth will only partially alleviate the problem by improving water infiltration and thereby reducing run-off and erosion.

A policy of 'prevention is better than cure' should always be followed to minimise the effects of compaction. The following are practices that can be employed to prevent the occurrence of compaction:

- Wheels should not run over the cane rows. Make use of permanent control traffic zones to prevent wheels from driving over cane stools (i.e. tramline system – see Figure 2). In a manually harvested system, the tramlines need only be in every six or seventh row depending on your specific loader operation.
- Restrict large haulage trucks to loading zones.
- Avoid using infield transport when soils are wet. In addition, ensure that high flotation tyres are fitted in order to reduce the resulted compaction effort.
- Use soil form information to plan a harvesting schedule. Harvest fields on well-drained soils during the wet months and confine the harvesting of poorly drained soils to the winter months.
- The reasons for reduced yields after ripping treatments may in many trials be ascribed either to the disturbance of the soil root interface while the crop is still reliant on the old root system, or to stool pruning.

## References for further reading


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