Information Sheet

3. DRAINAGE

3.2 Mole drainage

Mole channels can be used as an alternative for, or a supplement to, conventional subsurface drainage. They provide a cheap and easy way to deal with perched water tables and excess surface water.

EQUIPMENT

The tractor used must be of sufficient size and power to draw the mole channel evenly and continuously at the specified depth.

Typical dimensions of a mole plough: foot 75 mm by ±350 mm; expander (mole) 85-100 mm by ±200 mm; leg thickness 25 mm; leg width 200 mm; leg length ±1000 mm.

CRITERIA

Factors such as slope, soil moisture content, soil bulk density, soil health (sodicity) and soil texture are important when considering mole drainage. The following are recommended standards for the installation of mole drains:

Depth

Mole drains should be drawn at a depth between 450 and 600 mm, penetrating into the clay layer. Uniformity of depth is important.

Soil moisture

Soil moisture at the depth of the mole drain must be within the plastic range, or just below field capacity. This condition can be estimated in the field by taking a soil sample at the depth of the mole drain and attempting to roll it into a thread about two millimetres in diameter. If this is possible, the soil is within the plastic range. The drier the soil above the moling depth, the greater the fissuring produced, and thus the more efficient the water removal.

Clay content

Soils in which mole drains are to be established should have a clay content of not less than 45%. Mole drains in soils with less than 45% clay tend to collapse more easily. Beware of soils with strong swell and shrink properties – the mole drains will collapse due to movement of the clay, and will thus not last long. Non-uniform soils containing sand or silt pockets are also prone to channel collapse in places, causing blockages.

Sodium salts

To ensure longevity and to prevent collapse of mole drains, the sodium adsorption ratio (SAR) values should be less than 6 and 10 for grey hydromorphic soils and heavy black clays respectively.

Slope

The ideal slope for mole drains is about 2%. If the gradient is less than this, the drains are likely to be unreliable. A gradient of more than 5% will result in drainage water with a high velocity, causing erosion of the walls and premature collapse of the drains.

Spacing

The maximum spacing between mole drains should be about three metres. Beyond this, the mole channel is unlikely to drain the soil profile adequately. For convenience, mole drains are usually drawn in every other interrow.

The mole plough in the start position in a ditch.

A mole plough seen from the back.

A mole plough in the operational position – note the long heavy drawbar for stability and evenness of the channel.

Length

The length of a mole drain will depend on the stability of the soil, and will vary from 80 m in very stable soils to 20 m in the less stable soils. Length may have to be reduced on steep gradients to avoid channel erosion.

SOIL SUITABILITY GUIDE

Very suitable Category I	Suitable Category II	Unsuitable Category III
Arcadia Rensburg Willowbrook	Katspruit Valsrivier Sterkspruit Bonheim Swartland	All sandy soils and soils with an E horizon

PRACTICAL TIPS

- Soil form should be used as a guide to the suitability of a field for mole drainage.
- The plough must be designed and adjusted so that the foot travels parallel to the general surface slope, otherwise a distorted and weak channel will result.
- Always start the moles from a ditch and draw them in a direction away from the ditch.
- Ditch maintenance is essential to ensure that the pipe drain outfalls are always clear, and submergence of the mole channels is avoided.
- Where mole drains are used in conjunction with subsurface drainage, care should be taken to draw the mole channels through the permeable sand envelope over the pipe.
- Support mole channel outlets by inserting short pieces of pipe (about 800 mm long) with the same outside diameter as the inside diameter of the mole channel.
- All mole channels deteriorate with time and eventually collapse. Plan remoling on a systematic basis after each crop, when moisture conditions are suitable. Mole channel outlets should also be checked during the rainy season.
- Keep remoling in the same direction as previous moling operations, but not in the same interrow.
- The mole drains can be back-filled with river sand as they are drawn, to ensure longevity.
- Keep drainage record plans in a prominent position and record moling dates.

ECONOMICS

The cost of mole drainage will depend on the draught of the moling implements and the type of tractor used for the installation, but it is less than 5% of the cost of subsurface drainage. It is important to redraw mole drains before the established system breaks down completely. However, following mole channel inspection, selective remoling of failed mole channels could be considered as a means of reducing costs. It is also likely that, in Category I soils (i.e. Katspruit), the frequency of remoling may be reduced after the second ratoon crop, to every other ratoon.

NOTES

- Because soil characteristics determine the applicability, depth, spacing and length of mole drains, growers should obtain specialised advice through their Extension Officer before using them as a means of draining sugarcane land.
- A copy of the plan of a mole drain plough can be obtained from the South African Sugarcane Research Institute at Mount Edgecombe through your local Extension Officer.

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