

# Field Selection, Preparation & Rotation

By **DALLAS KING, NILANTHA HULUGALLE** (DPI NSW) & **TRACEY LEVEN** (CRDC)

## Cotton soils

Soils that are relatively fertile, with good internal drainage and reasonably high water holding capacity are preferred for cotton. Crops are more likely to produce high yields when their roots are able to grow freely. Understanding the soils into which the cotton will be planted is important for many management decisions.

The soils on which cotton is grown in Australia are inherently fertile. They are dominated by cracking clays (Vertosols) which are naturally fertile, alkaline, with high clay content and high organic matter as they initially supported brigalow/belah associations. Other soil types on which cotton is grown include red-brown earths (in the Macquarie, Namoi and Gwydir valleys) and in many of the Queensland districts Solodic and Solodised-Solonetz form a part of the soil.

Large values of Plant Available Water Capacity (PAWC), which are found in some clay-rich alluvial soil types and deep black earths, allow a longer interval between furrow irrigations. Under dryland conditions, if the profile starts out full, large values of PAWC delay the onset of moisture stress in crops.

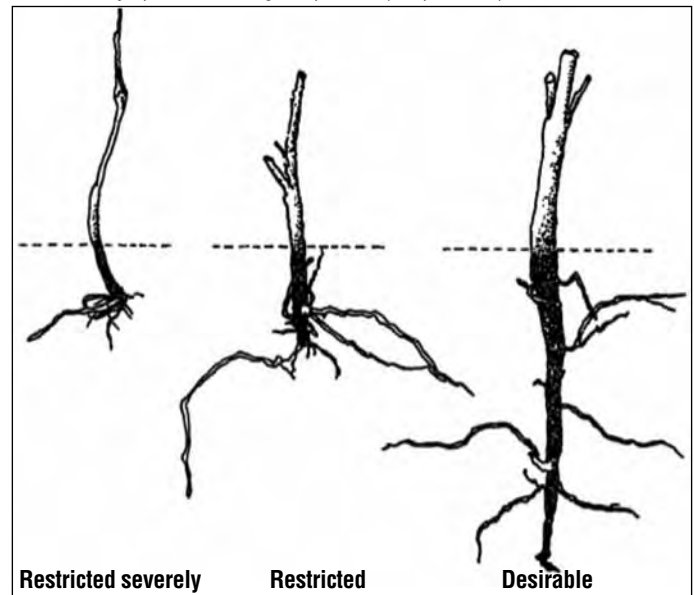
Cotton has poor tolerance of water logging. To allow adequate water entry, and to encourage root exploration by quickly re-establishing aeration after irrigation and

## BEST PRACTICE

- Crop growth will be easier to manage in a field with a uniform soil type.
- Fix problems associated with land forming before planting cotton
- Favour fields that have most recently grown a crop other than cotton, where stubble has been retained and there is low risk of herbicide residues
- Consider alternative irrigation systems i.e. would lateral moves or pivots be more appropriate on lighter soils than flood irrigation.
- Consider suitable run lengths not just for cotton but possible rotation crops.

**FIGURE 1:**

Cotton root symptoms following compaction. (Soilpak C4-1)



rainfall, cotton soil needs to have good porosity for infiltration and internal drainage.

Soil types with dense, sodic subsoils have poor profile permeability (the ability of water to move through the soil), and hence limit root development.

Compaction (Structural damage), may create large platy clods. Such damage restricts permeability and will also affect plant growth. Root growth is retarded by the same factors that restrict water entry and seedling growth. Subsoil sodicity tends, however, to cause water logging by the process of excessive swelling rather than dispersion of clay particles.

While the root zone should be permeable, the deep subsoil should be slow draining; excessive deep drainage may cause water tables to rise. Irrigation management and crop rotation should aim to minimise the amount of water draining to the deep subsoil.

Soil properties within a field are variable, and good quality soil survey information provides the opportunity to minimise the impact of soil variation within each management unit. refer to Chapter 11 for more information about mapping variation.

## Land forming

An appropriate slope and field length, in combination with furrows and hills/beds, will ensure good surface drainage and reduce water logging. Land forming using laser grading usually is needed to provide the required slope across all parts of a field, particularly under irrigation.

Surface drainage and tail drains must be designed to minimise flooding during heavy rain, the consequences of which may be disastrous during the seedling stage. Furrow-edge compaction and water application rates need to be matched so that the root zone does not become waterlogged due to excessive water intake. Slopes that are too steep create erosion hazards.

Land forming of cotton fields can create soil problems that should be dealt with before cotton is grown. The main issue is the exposure and spreading of unstable subsoil.

Subsoil exposure is usually unavoidable because of the need to provide an even slope in irrigated fields. Even drip irrigated fields have to be land formed because of the need to quickly dispose of runoff water after heavy rain. At best, the exposed subsoil will have inadequate organic matter. At worst, it will be sodic, depleted of mycorrhiza, have a high pH and perhaps be saline.

Where sodic subsoil is exposed, the scraped material also has poor physical properties. It may be spread thinly over low lying areas which previously had a favourable soil structure. Therefore it is desirable to stockpile the original topsoil, landform the subsoil, and then replace the topsoil.

If stockpiling and replacement of the topsoil is not possible, the exposed sodic soil will have to be reclaimed by the use of gypsum, and perhaps by the growth of a well-fertilised cereal crop (e.g. Barley). Zinc fertiliser may need to be added.

Due to the tight schedules of land forming contractors, it is difficult to reshape fields at the recommended soil water content, particularly when there is a mix of grey and red soil. Nevertheless, a well fertilised crop such as wheat should be grown just before land forming to maximise the chances of the soil being dry enough.

For more information on soil constraints refer to Chapter 7.

## Rotation & previous crop history

A vital component of any farming system is the inclusion of a rotation phase. Planning should take into account a range of issues, including weed, insect, diseases, water use, and soil structural issues, to maximise the advantages and minimise the disadvantage at a field and whole of farm basis. Rotation crops can be used as a tool within the farming system. For example there is evidence of improved cotton yields after a corn crop which is most likely due to increased organic matter and better soil structure.

Crop rotations and fallow can be an important part of an integrated weed management system, providing the opportunity to use different groups of herbicides, as well as incorporate other measures such as strategic cultivation and crop competition. Refer to the IWM Chapter 15 for more information.

One of the difficulties with the use of alternative herbicides however is that residual properties may be toxic on following crops. Keep good records and always check the label for plant back periods. Consider the following two crops you may plant when planning rotations as some residual herbicides have very long (>18month) plant back periods.

Rotations and fallows can also be an important consideration in disease management, because they affect



**Rotation crops are an important part of a farming system, with each crop providing benefits such as an opportunity to rotate herbicide groups as well as risks and management considerations such as impacting disease inoculum levels.**

the survival and reproduction of plant pathogens, as well as the biology and quality of the soil. Using rotation crops that are not hosts will usually help in preventing the amount of pathogen in the soil from building up. Crop residues should be managed based on best practice for the diseases present, and be aware that some crop residues may also have allopathic effect on cotton. Disease risks are generally higher in back to back cotton fields. Refer to Chapter 16 for more information.

The Cotton rotation finder, provides a comprehensive matrix as to the different rotation crops available and their positive and negative impacts.

For more information the following resources and tools are available at [https://www.mybmp.com.au/auth\\_user/grower\\_tools\\_and\\_resources.aspx](https://www.mybmp.com.au/auth_user/grower_tools_and_resources.aspx)

- ASPX
- Rotation Crops Comparison Tool
- Cotton Symptoms Guide
- Herbicide Damage ID Web Tool
- Cotton Pest Management Guide



# MORE OPTIONS

**With DuPont Pioneer, you have a wide range of maturity and marketing choices.**

Options are always good. And Pioneer has the right hybrid for every paddock, no matter what your area or conditions. So for dryland or irrigated choices, a range of maturities, as well as processing, feed or silage options, you have the flexibility to choose the Pioneer brand corn that fits your farm best.

**(07) 4637 3600 [www.pioneer.com](http://www.pioneer.com)**