FINAL REPORT TO COTTON RESEARCH & DEVELOPMENT CORPORATION

CRDC185C — Soil management training course: Hillston

Project aims

The aim of the project was to provide cotton advisers and leading growers in the Hillston district (lower Lachlan Valley, NSW) with the latest information about soil assessment and management for the sustainable production of irrigated cotton.

The workshop also provided an opportunity to train recently appointed Industry Development Officers.

The value of decision support packages such as SOILpak for cotton growers, third edition and NUTRIpak was emphasised.

Date of the training course

4 June 2002

Course leaders

David McKenzie, Soil Management Consultant, Orange
Evan Brown, Cotton Industry Development Officer, Griffith

Cooperating cotton grower

Lachlan Farming Ltd., Yilgah , Hillston.

Participants

Farmers
Simon Anderson
Scott Mailler
Darryl Nesbit
Nathan Payne
Jess Shannon
Tim Watson

Consultants / Advisers
Rachel Davies
Chris Hetherington
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Program

See attached program and a summary of the overheads.

Field observations, laboratory data and management options

Red cracking clay (Field 18, Yilgah)

Poor cotton lint yield at the northern end of Field 18 was associated with dispersion problems that lead to waterlogging (see attached data; sampled using guidelines described in SOILpak for cotton growers, third edition). Dispersion was caused mainly by excessive sodium on the clay surfaces. This soil requires an application of coarse-grade mined gypsum at a rate of 5 t/ha, with on-going monitoring to assess the need for possible follow-up doses. The soil was too alkaline for lime application to be considered as an alternative source of calcium ions and electrolyte.

In the poor soil there was an elevated salinity value at a depth of 0—10 cm. Although not severe enough to adversely affect cotton, some rotation crops may be retarded. The soluble salt appears to have been imported via the bore water that is used for irrigation. There is an elevated electrical conductivity (EC) reading at a depth of 70—80 cm, but the salt there appeared to be gypsum rather than highly soluble chloride salts. There was evidence of boron toxicity in this depth interval.

The adjacent good soil in Field 18 did not have serious dispersion problems at the soil surface, but below a depth of 15 cm there was evidence of a need for extra electrolyte to stabilise the soil. The low salt content and relatively low pH of the good soil root zone indicated that substantial deep drainage must have occurred at that site.

Both the poor and good red soil had moderate subsoil compaction. Because of the reasonably good shrink-swell potential (as indicated by the CEC data), a winter cereal rotation was recommended, with planting on the shoulders of the beds. The importance of machinery guidance and narrow tyres was emphasised so that future compaction damage is minimised.

Grey cracking clay (Field 25, Yilgah)

Field 25 had major cotton yield problems in an area with soil chemical properties (to a depth of 80 cm) that were almost identical to those at the higher-yielding end. Pit inspections showed that the problem area had severe subsoil compaction, caused apparently by rice farming about 5 years earlier.

There was no evidence of a need for gypsum. However, the poor area urgently required deep loosening. Repair via the use of rotation crops was considered to be of limited value because of the severity of the damage. Therefore, it was recommended that safflower be grown to thoroughly dry the soil, followed by a one-off non-inversion deep ripping operation to a depth of 50 cm. The next step would be to re-establish the permanent wheel tracks as soon as possible using a guidance system such as Beeline .

Other issues

All of the sites appeared to have adequate phosphorus and potassium reserves, particularly near the soil surface. Most of the soil (Field 18-good was an exception) had adequate zinc near the soil surface, but all sites had very low subsoil reserves of this nutrient. All sites had pH values that generally were close to being optimal.

There was discussion about the potential value of remote sensing techniques for predicting soil condition in-between the soil inspection pits. On the red soil, an EM survey almost certainly would have defined the boundaries of the saline-sodic area, although the EM data would have to be collected when the soil was uniformly moist across the field. However, we could not think of a remote sensing technique that would be able to map the extent of the compaction problem across Field 25 — direct measurement via pits appeared to be the only option.

The unfarmed site near Field 25 had conditions for plant growth that were far from ideal. Although the topsoil had a very favourable structure and a relatively high organic matter content, the subsoil was very coarsely structured because of a combination of sodicity, and perhaps compaction caused by livestock grazing on the native pasture under wet conditions.

Outcomes of Hillston course

The field sites selected for the Hillston training course allowed the following soil management issues to be demonstrated and discussed very clearly:

- Soil compaction — this is an old, and often overlooked, issue that still is very important. The poor grey site provided dramatic evidence of the problem.
- Dispersion, sodicity, and the need for gypsum application were key issues at the poor red soil site.
- The value of assessing soil nutrients in both the topsoil and subsoil was emphasised.
- Deep drainage is a crucial issue that can be evaluated using salt balance data.
- Examination of unfarmed soil shows that the development of land for irrigated cotton production does not lead to irreversible soil degradation — some soil properties may even be improved.
- The systematic assessment and mapping of key soil factors is a vital part of yield map interpretation.
- SOILpak for cotton growers, third edition still is a very relevant document, although some sections require updating.

It is important to note that soil assessment and management for cotton production cannot be taught to consultants and farmers in just one day. To teach the entire topic well would require detailed on-going training, and thorough assessment, of the trainees. Nevertheless, the 1-day introductory course at Hillston on 4 June 2002 provided a useful overview for land managers associated with irrigated cotton production in the lower Lachlan Valley.

Trainees in one of the inspection pits near Hillston.

Publication arising from the project

Brown E (2002) Taking a close look at Hillston soils. *The Australian Cottongrower* **23(5)**, 18—20.

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