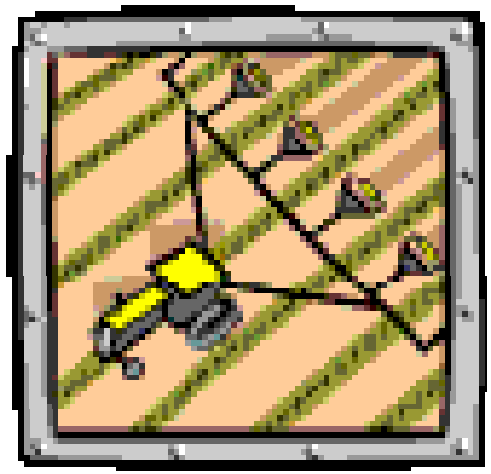
Cotton – What the industry is doing to ensure their soils sustain their agricultural systems

Guy Roth and Helen Squires



Cotton Catchment Communities CRC

healthy soils for sustainable farms
a natural heritage trust initiative

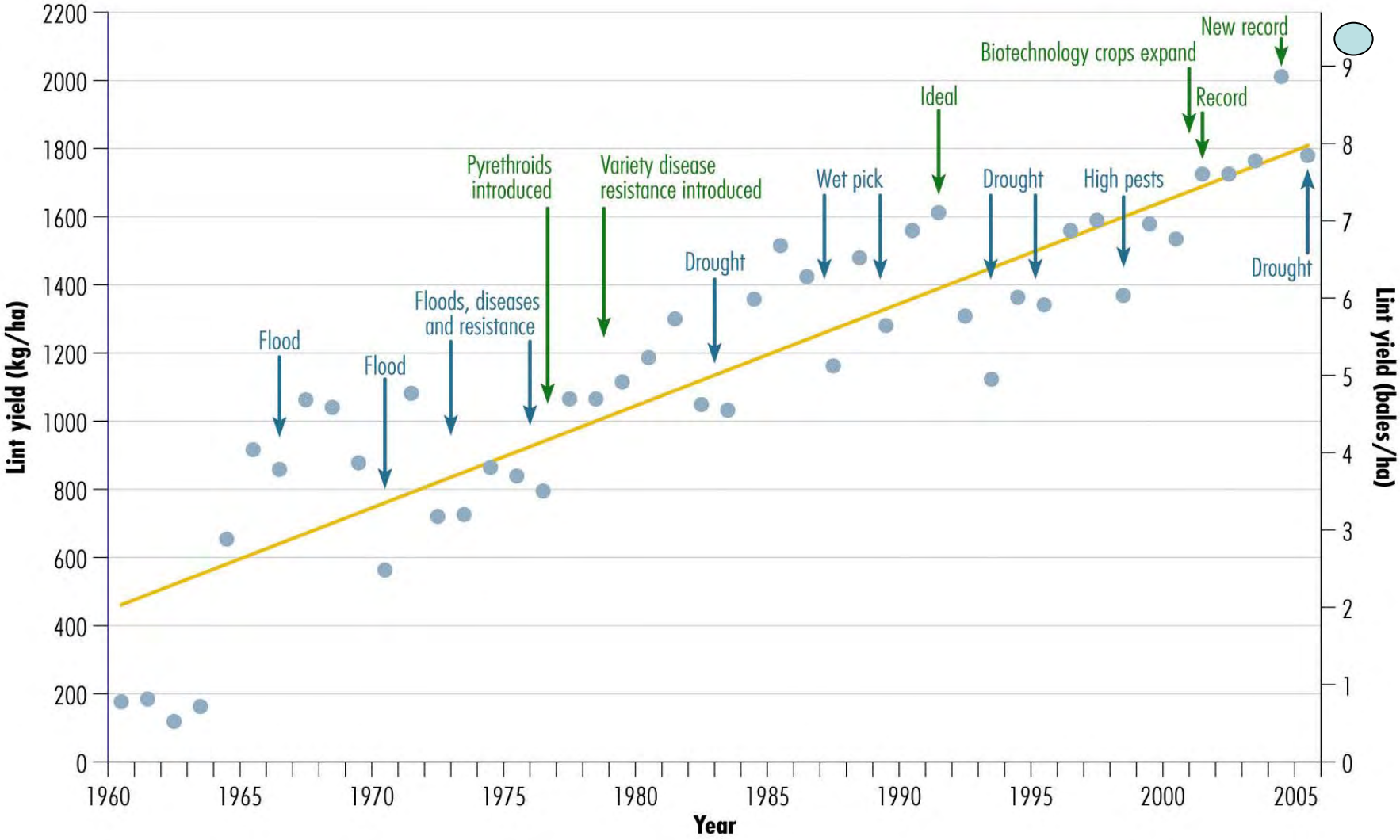
Potential cotton regions
(not to scale)

Existing cotton regions


CATERPILLAR

Cotton Catchment Communities CRC

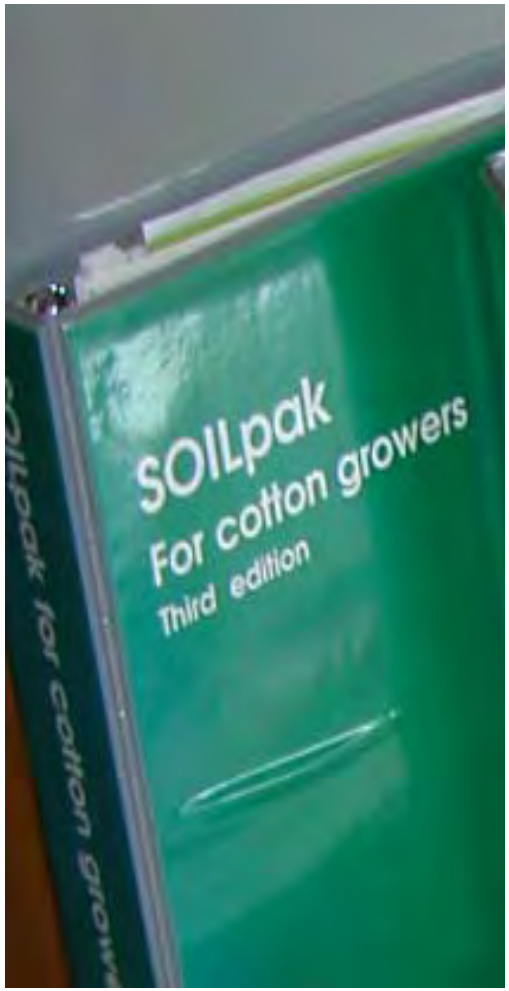
healthy soils for sustainable farms
a natural heritage trust initiative



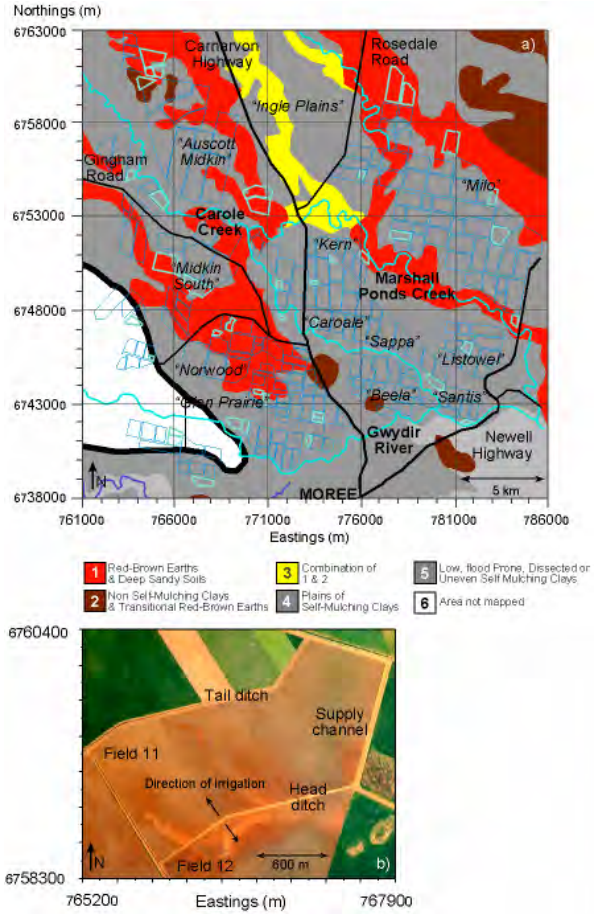
Soil health direction / sustainable?

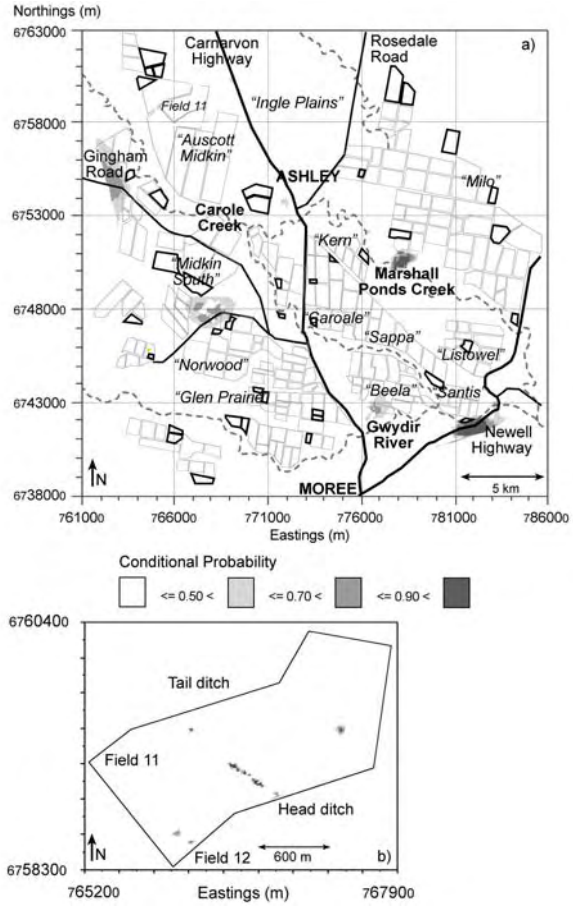
- Increasing yields
- Less tillage and controlled traffic
- Reduced chemical use
- Better irrigation and monitoring
- Greater awareness and skill in soil matters
- Soil (& water) testing
- Rotations, stubble retention, little burning

Some examples



EM surveys


Northings (m)
6763000
6758000
6753000
6748000
6743000
6738000
Carnarvon Highway
Rosedale Road
a)
"Ingle Plains"
"Auscott Midkin"
Gingham Road
"Milo"
Carole Creek
"Kern"
"Midkin South"
Marshall Ponds Creek
"Caroale"
"Sappa"
"Listowel"
"Norwood"
"Glen Prairie"
"Beela"
"Santis"
Gwydir River
Newell Highway
MOREE
5 km
761000
766000
771000
776000
781000
786000
Eastings (m)
1 Red-Brown Earths & Deep Sandy Soils
2 Non Self-Mulching Clays & Transitional Red-Brown Earths
3 Combination of 1 & 2
4 Plains of Self-Mulching Clays
5 Low, flood Prone, Dissected or Uneven Self Mulching Clays
6 Area not mapped
6760400
6758300
Tail ditch
Supply channel
Field 11
Direction of irrigation
Head ditch
Field 12
600 m
b)
765200
767900
Eastings (m)


Northings (m)
6763000
6758000
6753000
6748000
6743000
6738000
Carnarvon Highway
Rosedale Road
a)
Field 11
"Ingle Plains"
"Auscott Midkin"
Gingham Road
ASHLEY
"Milo"
Carole Creek
"Kern"
"Midkin South"
Marshall Ponds Creek
"Caroale"
"Sappa"
"Listowel"
"Norwood"
"Glen Prairie"
"Beela"
"Santis"
Gwydir River
Newell Highway
MOREE
5 km
761000
766000
771000
776000
781000
786000
Eastings (m)
Conditional Probability
<= 0.50 <
<= 0.70 <
<= 0.90 <
6760400
6758300
Tail ditch
Field 11
Head ditch
Field 12
600 m
b)
765200
767900
Eastings (m)

Cotton Catchment Communities CRC

healthy soils for sustainable farms
a natural heritage trust initiative

healthy soils case study

GREENHOUSE GASES

Improving Nitrogen Management and Reducing Greenhouse Gas Emissions

AT A GLANCE

Greenhouse gas emissions associated with growing crops include:

- Carbon dioxide from tillage
- Carbon dioxide from fuel use (during planting, cultivation, harvesting, chemical pumping)
- Nitrous oxide from fertiliser
- Nitrous oxide and methane from burning stubble (if applicable)
- Methane during extreme waterlogging

Generic rules to reduce nitrogen losses and maximise productivity and profitability:

- Reduce time between fertiliser application and planting
- Increase the amount of nitrogen applied later in the season relative to upfront applications
- Use urea in preference to ammonia in wider row applications
- Green manures can replace standard sources of nitrogen
- Set realistic yield goals based on the capacity and characteristics of the farm

"We have to start looking at the bigger picture and what we can do to help."

"Nitrogen is getting more expensive – why lose it?"

Brett Cocker and gas chamber containing the greenhouse gases released from his cotton crop near Dalby

The background

The principal greenhouse gases are carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). While methane and nitrous oxide are emitted in smaller quantities than carbon dioxide, they have much higher global warming potentials than carbon dioxide. In fact, in terms of their contribution to the global warming and the greenhouse effect, one molecule of methane is equivalent to 20 molecules of carbon dioxide and nitrous oxide is equivalent to over 310 molecules of carbon dioxide.

But what relevance does agriculture – and more specifically the cotton industry – have to the

healthy soils case study

DEEP DRAINAGE

Using Electromagnetic Maps to Track Down Deep Drainage

An Auscott Midkin case study

Good management of irrigated land is an important factor in ensuring sustainable and viable agricultural production. Inefficient irrigation practices can result in the creation of perched water tables, waterlogging, rising water tables and salt mobilisation in various cotton growing districts. A common cause of these problems can be deep drainage, which is defined as water that passes beyond the root-zone. With increasing pressures on water resources and expectations from the community regarding natural resource management, it is important that irrigators are able to identify if and where deep drainage may occur. This will assist in determining where improvements can be made in water delivery, application and storage.

Why act?

Auscott Midkin, a commercial cotton farm north-west of Moree, estimated that during a standard year the farm's dual cell reservoir was losing over 3570 megalitres per year, with 43 per cent of this due to deep drainage. These losses were the result of various combining factors:

- Firstly, the reservoir was positioned over gravel-based paleochannels which were once prior water channels located further down the soil profile; this was not identified during the reservoirs construction in 1981 due to technology limitations.
- Secondly, the reservoir had a relatively large surface area to volume ratio, resulting in high levels of evaporation.
- Finally, trees within the reservoir, which had once served as a windbreak to reduce evaporation, had died and their decayed roots have left deep channels through the soil profile.

What is science saying?

The Salt and Leaching Fraction (SaLF program) developed by the Queensland Department of Natural Resources, can provide deep drainage estimates from data routinely available from soil databases: for example, clay content and cation exchange capacity (CEC).

"Long term management is the way to resource preservation and economic rewards."

Terry Haynes at the new pumping station on the commercial cotton farm Auscott Midkin near Moree

Crop Nutrition R & D & E

COTTON NUTRITION AND FERTILIZER PLANNING

N, P, K, Zn

Sodicity

Fertilizers - Cotton Nutrition Notes

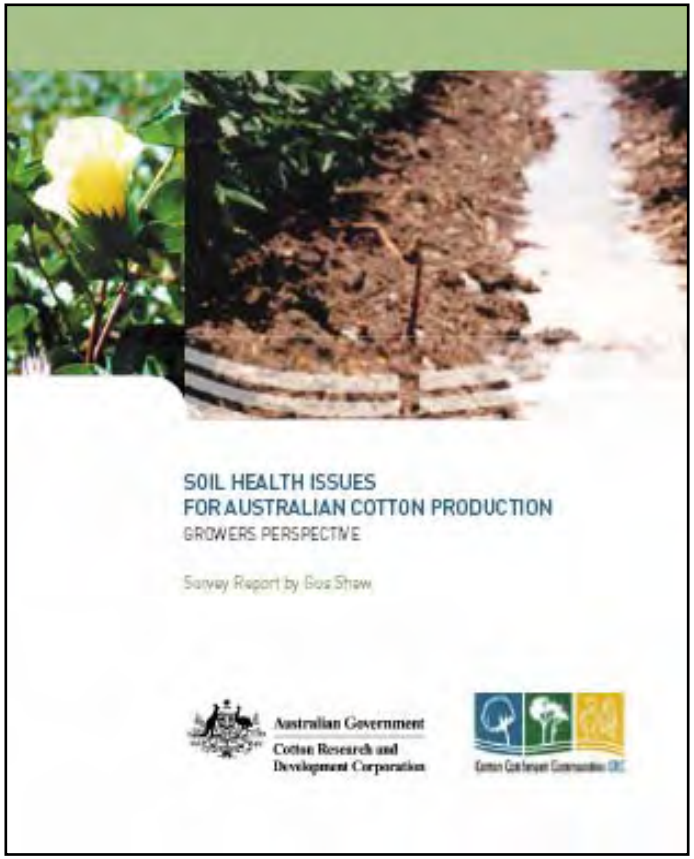
Updated :27/03/2007

Reviewed : C Dowling

Nutrient Management Systems

Cotton Catchment Communities CRC

healthy soils for sustainable farms
a natural heritage trust initiative



Cotton Catchment Communities CRC

healthy soils for sustainable farms
a natural heritage trust initiative

Current Hot Topics

- VAM
- Other soil biota and organic C
- Crop Nutrition

- Soil structure
  - Improving and measuring water storage

Cotton Catchment Communities CRC

healthy soils for sustainable farms
a natural heritage trust initiative

Healthy Soils Extension Series

- Soil Biology
- Soil Fertility/Crop Nutrition
- Soil Physical Constraints
- Benchmarking & Precision Ag

NSW DEPARTMENT OF PRIMARY INDUSTRIES

Namoi Catchment Management Authority

Border Rivers-Gwydir CMA Catchment Management Authority

Australian Government
Cotton Research and Development Corporation

Queensland Murray Darling Committee Inc.

Condamine Alliance
COMPLETE CATCHMENT CARE

Cotton Catchment Communities CRC

healthy soils for sustainable farms
a natural heritage trust initiative

People

- Soil Biologist
- 4 new Phds
- New Nutrition scientist
- New Farming systems scientist

Cotton Catchment Communities CRC

healthy soils for sustainable farms
a natural heritage trust initiative

LAND AND WATER MANAGEMENT – WORKSHEET 6

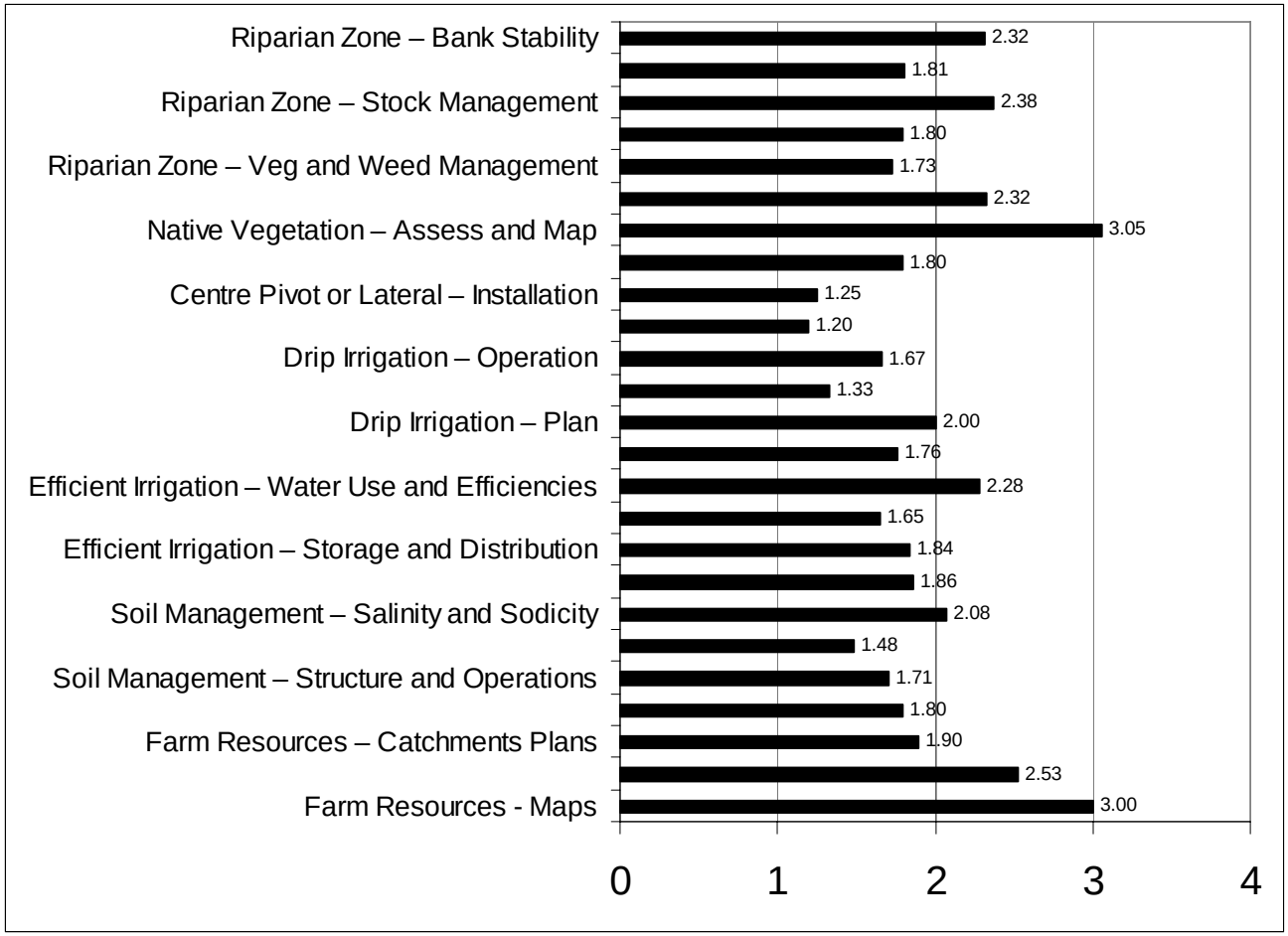
Date completed

Objective 2: Good soil management (pages 11–14 of the Land and Water Management Booklet)

	Rank 1	Rank 2	Rank 3	Rank 4	Your Ranking
Salinity and sodicity management SOILpak chapters C7, D4 WATERpak sections 5.3–5.5	Water and soil test results are used to determine salinity and sodicity risks Irrigation accounts for salinity and sodicity risks (eg. use of inferior quality water) Action is taken to reduce salinity or sodicity risks Regular monitoring of soil/water conditions around the root zone depth is carried out where risk has been identified Water table depths are monitored regularly Current knowledge of district ground water conditions used in management of enterprise	Water and soil test results are used to determine salinity and sodicity risks Irrigation accounts for salinity and sodicity risks (eg. use of inferior quality water) Action is taken to reduce salinity or sodicity risks Seasonal shallow water tables in irrigated areas are monitored	Water and soil test results are used to determine salinity and sodicity risks Action is taken to reduce salinity or sodicity risks where production is compromised Water table conditions monitored as necessary	No plan to manage salinity or sodicity risks	

The risk of developing salinity may be related to the farm's location in the landscape. Growers should be aware of whether an inherent salinity risk exists on their property. Where such a risk does exist growers should, where possible, work with their neighbours, and/or the catchment managers to minimise the risk of salinity becoming a serious problem.

Records: Soil test results, water test results


Riparian Zone – Bank Stability
2.32
1.81
Riparian Zone – Stock Management
2.38
1.80
Riparian Zone – Veg and Weed Management
1.73
2.32
Native Vegetation – Assess and Map
3.05
1.80
Centre Pivot or Lateral – Installation
1.25
1.20
Drip Irrigation – Operation
1.67
1.33
Drip Irrigation – Plan
2.00
1.76
Efficient Irrigation – Water Use and Efficiencies
2.28
1.65
Efficient Irrigation – Storage and Distribution
1.84
1.86
Soil Management – Salinity and Sodicity
2.08
1.48
Soil Management – Structure and Operations
1.71
1.80
Farm Resources – Catchments Plans
1.90
2.53
Farm Resources - Maps
3.00
0
1
2
3
4

Summary

- A lot of change in practices and skill
- Biology, fertiliser efficiencies, soil water & rotation systems
- Healthy soils are the foundation plank towards high yields and quality