

## FEATURE ARTICLE – Salinity and land management on Western Australian farms

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### ABOUT SALINITY

Salinity, the build up of salts in the soil, occurs naturally in Australia. Vast underground salt stores have developed over thousands of years through the actions of wind and rainfall, carrying sea spray salt inland and depositing it on the land. Australia's native vegetation with its deep roots kept the ground water table well below the soil surface. However, the sustained clearing of native vegetation and the use of water for irrigated agriculture and domestic purposes, has caused the ground water table to rise and the salt stored beneath the ground to surface in many areas.

In recent years salinity has emerged as a growing environmental issue because of the threat it poses to agriculture through the loss of productive land; to roads, houses and infrastructure through salt damage; to our drinking water through increasing salt levels; and to biodiversity through the loss of native vegetation and salinisation of wetland areas.

There are two types of salinity — dryland and irrigated. In both types of salinity, water imbalances are the fundamental cause of salinisation. In Australia, dryland salinity is much more widespread than irrigated salinity. Dryland salinity is mainly caused by the clearing of native vegetation and its replacement with shallow-rooted crops and pastures that do not use as much water. Unused water leaks down into the water table and raises it, bringing the salt stored in the soil to the surface.

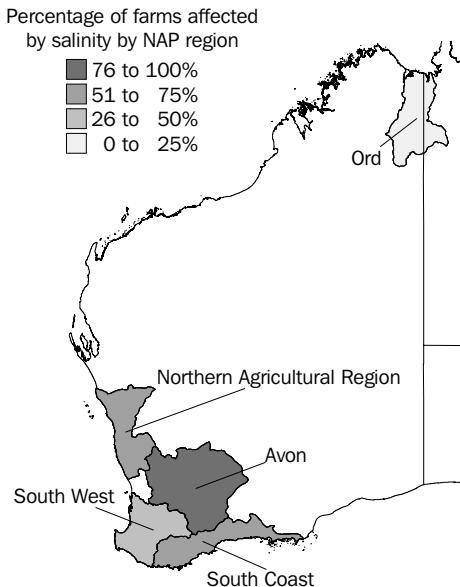
Farmers across Australia have implemented various strategies to manage and prevent salinity. This article reports on the extent of land in Western Australia showing signs of salinity, the strategies used by Western Australian farmers to manage and prevent salinity and the main drivers and barriers to land management change. Information was obtained from the 2002 Land Management and Salinity Survey conducted by the Australian Bureau of Statistics (ABS).

### NATIONAL ACTION PLAN FOR SALINITY AND WATER QUALITY

Results from the 2002 Land Management and Salinity Survey are presented in terms of the National Action Plan for Salinity and Water Quality (NAP) regions. The NAP is a joint project between Commonwealth and State and Territory governments adopted primarily to address dryland salinity. The goal of the Plan is to motivate and enable regional communities to prevent, stabilise and reverse trends in dryland salinity and to improve water quality. It identifies 21 high priority regions across Australia.

Nationally the NAP regions account for 17,000 farms, or 87% of total farms showing signs of salinity, and 1.3 million hectares or 66% of the total area of land showing signs of salinity.

The map below presents the five Western Australian NAP regions (Avon, South Coast, South West, Northern Agricultural Region and Ord) shaded according to the extent of salinity in the area.



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### SALINITY — A NATIONAL ISSUE

Across Australia almost 20,000 farms reported showing signs of salinity, accounting for almost 2 million hectares of agricultural land (covering both NAP and non–NAP regions). Of this affected land, around 42% (821,000 hectares) is unable to be used for production. Western Australia is the state most affected by salinity with 6,918 farms and almost 1.2 million hectares of agricultural land showing signs of salinity, and 45.7% (567,377 hectares) of salinised land unable to be used for production. Victoria and South Australia are the next most affected states, farmers reporting 4,834 farms (139,000 hectares of agricultural land) and 3,328 farms (350,000 hectares) respectively as showing signs of salinity.

Strategies to manage and prevent salinity have resulted in just over 3 million hectares of crops, pastures and fodder plants being planted across Australia; 466,000 hectares of land being fenced from grazing; 776,000 hectares of trees being planted; and 208,000 kilometres of earthworks (levees, banks and drains) being constructed by farmers to combat the salinity problem. Western Australia dominates in terms of trees planted (64.4% of national hectares planted) and land fenced from grazing (75.5% of national hectares fenced).

### WESTERN AUSTRALIAN FARMS IN CONTEXT

#### Irrigated and non-irrigated farms

Of the 13,475 farms in Western Australia, 2,460 farms (18.3%) are irrigated and the remaining 11,015 farms (81.7%) are non-irrigated. Salinity is significantly more prevalent on non-irrigated farms, with 60.6% of non-irrigated farms showing signs of salinity compared to 9.8% of irrigated farms. This confirms the priority given to dryland salinity by the National Action Plan. Overall, salinity affects 51.3% of farms in Western Australia.

### WESTERN AUSTRALIAN FARMS: IRRIGATED & NON-IRRIGATED

	Total farms no.	Farms with land showing signs of salinity no.	Proportion of total irrigated and/or non-irrigated farms showing signs of salinity %	Land showing signs of salinity ha	Salinised land unable to be used for production..... ha	%
Irrigated farms	2 460	240	9.8	6 798	3 189	46.9
Non-irrigated farms	11 015	6 678	60.6	1 233 845	564 188	45.7
<b>Total WA</b>	<b>13 475</b>	<b>6 918</b>	<b>51.3</b>	<b>1 240 643</b>	<b>567 377</b>	<b>45.7</b>

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### Industry

The major farming industries in Western Australia are beef and/or sheep farming, mixed grain and beef/sheep farming and grain growing. These three industries together account for 74.4% of farms. Mixed grain and beef/sheep farms are the worst affected by salinity, with 86.9% of these farms reporting signs of salinity, closely followed by grain growing farms with 85.0% of farms affected. Salinity affects 34.6% of beef and/or sheep farms.

### WESTERN AUSTRALIAN FARMS BY INDUSTRY

Industry	Total farms	Farms with land showing signs of salinity
	no.	%
Nurseries and flowers	347	10.4
Vegetables	571	6.3
Grapevines	537	11.0
Fruit	802	2.5
Grain	2 908	85.0
Mixed grain and beef/sheep	3 104	86.9
Beef and/or sheep	4 020	34.6
Dairy	428	20.8
Other livestock	300	15.0
Cotton	—	—
Other crops	—	—
Other industries	336	9.8
<b>Total WA</b>	<b>13 475</b>	<b>51.3</b>

### NAP REGIONS

Western Australian NAP regions capture 85.5% of farms in the state and 67.4% of the land reported by farmers as showing signs of salinity. The Ord region is excluded from this article as it extends partially into the Northern Territory and much of the data cannot be released due to the relatively small size of the region. The largest NAP region in Western Australia is the South West region, with just over one third (34.3%) of the state's farms (4,627). The smallest NAP region in Western Australia (excluding the Ord region) is the Northern Agricultural Region, with 11.8% of the state's farms (1,596).

### WESTERN AUSTRALIAN FARMS BY NAP REGION(a)

NAP Region	Total farms	Total farm area	Proportion of total farms in state
	no.	ha	%
South West	4 627	31 287 947	34.3
Avon	2 877	7 815 555	21.4
South Coast	2 312	3 155 582	17.2
Northern Agricultural Region	1 596	5 527 941	11.8
<b>Total NAP Regions(b)</b>	<b>11 412</b>	<b>109 215 482</b>	<b>85.5</b>

(a) See Appendix for a list of local government areas (LGAs) contained within each NAP region.

(b) Total NAP regions excludes Ord region.

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Area showing signs of salinity

The worst-affected NAP region in Western Australia is Avon, with 2,297 farms (or 79.8% of the farms in the region) and 451,044 hectares of land showing signs of salinity. Although the South West had the lowest proportion of farms affected by salinity (38.8% of farms in the region), it recorded the second highest area of land showing signs of salinity (156,572 hectares).

In the Avon region, 63.2% of salinised land is unable to be used for production, closely followed by the Northern Agricultural Region with 60.4%. The South West recorded the lowest proportion of salinised land unable to be used for production (50.6%).

### AREA OF LAND SHOWING SIGNS OF SALINITY, WESTERN AUSTRALIA

NAP Region	Farms with signs of salinity	Proportion of total farms in region	Land showing signs of salinity	Salinised land unable to be used for production.....	
	no.	%	ha	ha	%
Avon	2 297	79.8	451 044	285 064	63.2
South West	1 793	38.8	156 572	79 296	50.6
South Coast	1 428	61.8	74 959	42 883	57.2
Northern Agricultural Region	878	55.0	153 033	92 436	60.4
<b>Total WA(a)</b>	<b>6 918</b>	<b>51.3</b>	<b>1 240 643</b>	<b>567 377</b>	<b>45.7</b>

(a) Total WA includes both NAP and non-NAP regions.

### SALINITY MANAGEMENT PRACTICES USED BY FARMERS

Farmers in Western Australia have implemented various practices to manage and prevent salinity. The four major strategies are the planting of crops, pastures and fodder plants; the planting of trees; the fencing of land from grazing; and the construction of earthworks (levees, banks and drains). The choice of strategy depends on the characteristics of the land and strategies may only be partly for the management and prevention of salinity.

Farmers in the Avon region lead the way in salinity management practices, devoting 733,017 hectares to salinity management, which accounts for 9.1% of total farm land in the region. The Avon NAP region accounted for 63.2% of all trees planted in Western Australia as part of salinity management practices and 42.8% of earthworks constructed.

### SALINITY MANAGEMENT PRACTICES, WESTERN AUSTRALIA

NAP Region	Total area of crops, pastures and fodder plants	Total area of woods/trees	Total area fenced from grazing	Total length of earthworks
	ha	ha	ha	km
Avon	280 460	315 731	136 826	41 944
Northern Agricultural Region	114 215	48 386	63 718	16 179
South Coast	133 201	48 774	59 505	12 562
South West	74 124	51 676	64 425	20 010
<b>Total WA(a)</b>	<b>633 398</b>	<b>499 670</b>	<b>352 018</b>	<b>97 900</b>

(a) Total WA includes both NAP and non-NAP regions.

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### DRIVERS AND BARRIERS TO CHANGING LAND MANAGEMENT PRACTICES

A total of 6,453 farmers in Western Australia (73.0% of farmers who are affected by, or managing for, salinity) have changed their land management practices to manage or prevent salinity. In the Avon region, the region most affected by salinity, the proportion is even higher, with 81.5% of farmers having changed their land management practices.

### CHANGING LAND MANAGEMENT PRACTICES, WESTERN AUSTRALIA

NAP Region	Changed	Proportion of total farms in region	Not changed	Proportion of total farms in region
	no.	%	no.	%
Avon	2 116	81.5	481	18.5
Northern Agricultural Region	767	70.4	322	29.6
South Coast	1 421	77.2	420	22.8
South West	1 652	66.8	821	33.2
<b>Total WA(a)</b>	<b>6 453</b>	<b>73.0</b>	<b>2 388</b>	<b>27.0</b>

(a) Total WA includes both NAP and non-NAP regions.

### Reasons for change

Across Western Australia the reason that farmers reported as the most important motivation behind changing their land management practices was farm sustainability, with 91.8% of farmers who changed their practices stating this was of medium or high importance. Improved environment protection was the next most important reason, with 84.8% of farmers reporting this as being of medium or high importance. A significant proportion of farmers did not consider improved risk management and increased land value to be important reasons for changing land management practices, with 43.3% and 38.8% of farmers respectively reporting these as being of low importance or not being reasons for change.

### REASONS FOR CHANGING LAND MANAGEMENT PRACTICES, WESTERN AUSTRALIA

Reason	Not a reason/low importance.....	Medium/high importance.....	Total farms	Proportion of total farms in state	Total farms	Proportion of total farms in state
	no.	%	no.	%	no.	%
Increased productivity	1 441	22.7	4 906	77.3		
Increased land value	2 463	38.8	3 890	61.2		
Improved risk management	2 769	43.3	3 623	56.7		
Farm sustainability	524	8.3	5 824	91.8		
Improved environment protection	960	15.1	5 394	84.8		

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### Barriers to change

Lack of financial resources and lack of time were the most limiting barriers to changing land management practices, with 82.2% and 64.8% of farmers respectively reporting these factors as being limiting or very limiting. A significant proportion of farmers did not consider age or poor health and insufficient/inadequate information to be limiting barriers, with 84.9% and 68.7% of farmers respectively saying these were not very limiting or would not restrict them from changing their land management practices.

### BARRIERS TO CHANGING LAND MANAGEMENT PRACTICES, WESTERN AUSTRALIA

*Not a factor/not very limiting..... Limiting/very limiting.....*

Barrier	Total farms	Proportion of total farms in state	Total farms	Proportion of total farms in state
	no.	%	no.	%
Lack of financial resources	1 509	17.8	6 963	82.2
Lack of time	2 870	35.2	5 285	64.8
Insufficient/inadequate information	5 577	68.7	2 535	31.2
Doubts about likely success	5 121	62.0	3 148	38.1
Age or poor health	6 931	84.9	1 240	15.2

### THE ROLE OF GOVERNMENT IN SALINITY MANAGEMENT

Many state agencies and other organisations in Western Australia have become involved in salinity reduction measures including the Department of Agriculture, Department of Conservation and Land Management, Department of Environment Protection, the Water and Rivers Commission, the Commonwealth Scientific & Industrial Research Organisation (CSIRO) and local universities. Various strategies have been implemented to manage and prevent salinity, including the Rapid Catchment Appraisal scheme and the Rural Towns Program established by the Department of Agriculture, and the Engineering Evaluation Initiative currently being undertaken by the Water and Rivers Commission. Recently the state government replaced its long-running State Salinity Council with a Natural Resource Management Council (NRMC). This new council will aim to provide government with strategic and integrated policy advice on the sustainable management of land, water and biodiversity resources across the state. The work of the NRMC follows that begun by the 1996 Salinity Action Plan and the 2000 State Salinity Strategy.

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### APPENDIX: LOCAL GOVERNMENT AREAS WITHIN NAP REGIONS(a)(b)

#### NAP Region

#### *Local Government Areas*

#### Avon

Beverley (S), Brookton (S), Bruce Rock (S), Coolgardie (S), Corrigin (S), Cuballing (S), Cunderdin (S), Dalwallinu (S), Dowerin (S), Dumbleyung (S), Dundas (S), Goomalling (S), Jerramungup (S), Kellerberrin (S), Kent (S), Kondinin (S), Koorda (S), Kulin (S), Lake Grace (S), Merredin (S), Moora (S), Mount Marshall (S), Mukinbudin (S), Narembeen (S), Northam (S), Northam (T), Nungarin (S), Pingelly (S), Quairading (S), Ravensthorpe (S), Tammin (S), Toodyay (S), Trayning (S), Victoria Plains (S), Wandering (S), Westonia (S), Wickepin (S), Wongan-Ballidu (S), Wyalkatchem (S), Yilgarn (S), York (S)

#### Northern Agricultural Region

Carnamah (S), Chapman Valley (S), Chittering (S), Coorow (S), Dalwallinu (S), Dandaragan (S), Geraldton (S), Gingin (S), Greenough (S), Irwin (S), Mingenew (S), Moora (S), Morawa (S), Mullewa (S), Murchison (S), Northampton (S), Perenjori (S), Three Springs (S), Victoria Plains (S), Wanneroo (C), Wongan-Ballidu (S), Yalgo (S)

#### Ord

Halls Creek (S), Wyndham-East Kimberley (S), Unincorporated Northern Territory

#### South Coast

Albany (C), Broomehill (S), Cranbrook (S), Denmark (S), Esperance (S), Gnowangerup (S), Jerramungup (S), Katanning (S), Kent (S), Kojonup (S), Lake Grace (S), Manjimup (S), Plantagenet (S), Ravensthorpe (S), Tambellup (S)

#### South West

Armadale (C), Augusta-Margaret River (S), Boddington (S), Boyup Brook (S), Bridgetown-Greenbushes (S), Brookton (S), Broomehill (S), Bunbury (C), Busselton (S), Canning (C), Capel (S), Cockburn (C), Collie (S), Cranbrook (S), Cuballing (S), Dardanup (S), Denmark (S), Donnybrook-Balingup (S), Dumbleyung (S), East Fremantle (T), Fremantle (C), Gnowangerup (S), Gosnells (C), Harvey (S), Katanning (S), Kent (S), Kojonup (S), Kulin (S), Kwinana (T), Lake Grace (S), Mandurah (C), Manjimup (S), Melville (C), Mosman Park (T), Murray (S), Nannup (S), Narrogin (S), Narrogin (T), Pingelly (S), Rockingham (C), Serpentine-Jarrahdale (S), South Perth (C), Wagin (S), Wandering (S), Waroona (S), West Arthur (S), Wickepin (S), Williams (S), Woodanilling (S)

(a) NAP region boundaries (based on geographical features) and LGA boundaries are not in exact alignment. As a result, a small number of LGAs are located (partially) in more than one NAP region.

(b) The types of LGAs shown include cities (C), towns (T) and shires (S).