



Water Use on Australian Farms 2002-03



New
Issue

Water Use on Australian Farms

2002–03

Dennis Trewin
Australian Statistician

AUSTRALIAN BUREAU OF STATISTICS

EMBARGO: 11.30AM (CANBERRA TIME) THURS 31 MAR 2005

ABS Catalogue No. 4618.0

ISBN 0642479844

© Commonwealth of Australia 2005

This work is copyright. Apart from any use as permitted under the *Copyright Act 1968*, no part may be reproduced by any process without prior written permission from the Commonwealth. Requests and inquiries concerning reproduction and rights in this publication should be addressed to The Manager, Intermediary Management, Australian Bureau of Statistics, Locked Bag 10, Belconnen ACT 2616, by telephone (02) 6252 6998, fax (02) 6252 7102, or email: <intermediary.management@abs.gov.au>.

In all cases the ABS must be acknowledged as the source when reproducing or quoting any part of an ABS publication or other product.

Produced by the Australian Bureau of Statistics

INQUIRIES

- For further information about these and related statistics, contact the National Information and Referral Service on 1300 135 070.

CONTENTS

	<i>page</i>
List of tables and maps	iv
Abbreviations	vi
Introduction	vii

CHAPTERS

Summary of findings	1
Irrigation water usage	8
Irrigation water availability	20
Irrigation water management	26
Irrigation finances	30

ADDITIONAL INFORMATION

Explanatory notes	32
Appendix 1 - Climate conditions	36
Appendix 2 - Statistical divisions	40
Glossary	42

LIST OF TABLES AND MAPS

page

CHAPTER 1 SUMMARY OF FINDINGS

TABLES

1.1 Irrigation activity, by State, 2002-03	1
1.2 Irrigation activity, percentage, by State, 2002-03	2

MAPS

1.3 Agricultural establishments irrigating, percentage, by Statistical Division, 2002-03	2
1.4 Agricultural land irrigated, percentage, by Statistical Division, 2002-03	3
1.5 Average application rate, by Statistical Division, 2002-03	4

CHAPTER 2 IRRIGATION WATER USAGE

TABLES

2.1 Pastures and crops irrigated, Australia, 2002-03	8
2.2 Pastures and crops irrigated, New South Wales, 2002-03	9
2.3 Pastures and crops irrigated, Victoria, 2002-03	10
2.4 Pastures and crops irrigated, Queensland, 2002-03	11
2.5 Pastures and crops irrigated, South Australia, 2002-03	12
2.6 Pastures and crops irrigated, Western Australia, 2002-03	13
2.7 Pastures and crops irrigated, Tasmania, 2002-03	14
2.8 Pastures and crops irrigated, Northern Territory, 2002-03	15
2.9 Irrigation activity, by Statistical Division, 2002-03	16
2.10 Pastures and crops irrigated, Australia, by industry, 2002-03	18

CHAPTER 3 IRRIGATION WATER AVAILABILITY

TABLES

3.1 Sources of irrigation water, by State, 2002-03	20
3.2 Type of water entitlement, by State, 2002-03	21
3.3 Allocation of volume entitlements, by State, 2002-03	21
3.4 Extra water purchased on a temporary basis, by State, 2002-03	22
3.5 Extra water purchased on a permanent basis, by State, 2002-03	23
3.6 Water sold on a temporary basis, by State, 2002-03	24
3.7 Water sold on a permanent basis, by State, 2002-03	25

CHAPTER 4 IRRIGATION WATER MANAGEMENT

TABLES

4.1 Irrigation methods, by State, 2002-03	26
4.2 Irrigation decision-making, by State, 2002-03	27
4.3 Changes to irrigation practices, by State, Five years to 30 June 2003	27
4.4 Intended changes to irrigation practices, by State	28
4.5 Barriers to changing irrigation practices, by State, 2002-03	29

page

CHAPTER 4 IRRIGATION WATER MANAGEMENT *continued*

4.6 Other on-farm water management, by State, 2002-03	29
---	----

CHAPTER 5 IRRIGATION FINANCES

TABLES

5.1 Irrigation expenditure, by State, 2002-03	30
5.2 Capital expenditure on irrigation, by State, 1998-99 to 2002-03	31
5.3 Gross value of agricultural production, by State, 2002-03	31

APPENDIX 1 CLIMATE CONDITIONS

MAPS

A1.1 Australian Rainfall Analysis, 1 July 2002 - 30 June 2003	38
A1.2 Australian Rainfall Deciles, 1 July 2002 - 30 June 2003	38
A1.3 Australian Rainfall Deciles, 1 October 1996 - 30 June 2003	39
A1.4 Maximum Temperature Anomaly (°C), 1 July 2002 - 30 June 2003	39

APPENDIX 2 STATISTICAL DIVISIONS

MAPS

A2.1 Statistical Divisions, Australia, 2002-03	40
--	----

TABLES

A2.2 Statistical Divisions, Australia, 2002-03	41
--	----

ABBREVIATIONS

'000	thousand
\$'000	thousand dollars
ACT	Australian Capital Territory
ANZSIC	Australian and New Zealand Standard Industrial Classification
Aust.	Australia
EVAO	Estimated Value of Agricultural Operations
ha	hectare
mm	millimetre
ML	megalitre
ML/ha	megalitres per hectare
n.e.c.	not elsewhere classified
no.	number
NSW	New South Wales
NT	Northern Territory
Qld	Queensland
RSE	relative standard error
SA	South Australia
SE	standard error
Tas.	Tasmania
Vic.	Victoria
WA	Western Australia
°C	degrees Celsius

INTRODUCTION

BACKGROUND

This publication presents estimates of agricultural irrigation water use and management in Australia in 2002–03. The estimates have been compiled from the first detailed collection of data on irrigation water use and management from irrigating agricultural establishments. The Water Survey - Agriculture 2002–03 was developed in response to strong demand for nationally consistent information on water use, particularly from government agencies responsible for the environment, natural resources, and agriculture and related industries. The survey forms part of a suite of natural resource management surveys conducted, and to be developed, by the Australian Bureau of Statistics. It is intended to compile estimates of agricultural water use for future reference periods.

The agriculture industry is the major water user in the Australian economy, with estimates in the *Water Account Australia 2000–01* (cat. no. 4610.0) showing that agriculture accounted for 67% of water consumption in 2000–01. The estimates in this publication show details of the area of different crops that were irrigated, the volume of water applied and the sources of water, as well as information on water management practices and financial information relating to irrigation¹. Information relating to agriculture, compiled from the Agriculture Survey 2002–03 and the Vineyards Survey 2003, is provided in some tables as contextual information for the irrigated agriculture data from this survey. Where data are used from these other surveys, they are clearly identified as such.

An appendix has been included containing climate information for 2002–03, supplied by the Bureau of Meteorology. This is particularly relevant due to the severe drought affecting much of Australia which peaked in 2002–03, following low rainfall levels in many areas for the several years prior. The drought proved to be one of the worst recorded in Australia, particularly in terms of the area affected. The information from the Bureau of Meteorology shows that for the eight month period ending in October 2002, 97% of Australia experienced below normal rainfall, and 71% experienced rainfall below the tenth percentile. The level of rainfall can impact significantly on irrigation, both in terms of the availability of water to use for irrigation and the need to irrigate to supplement rainfall. One megalitre per hectare of irrigation equates to 100 millimetres of rainfall.

This is the first publication presenting detailed estimates on agricultural water use and management, and the ABS welcomes feedback on the content in terms of its relevance, usefulness, quality and range of data presented. Please send any comments to the Director, Environment and Energy Business Statistics Centre, GPO Box 66, Hobart, TAS 7001, or phone (03) 6222 5804.

¹ The information on volume of water used by agriculture presented in this publication is not strictly comparable to the water use estimates from the Water Account (see Explanatory Notes, paragraph 10).

CHAPTER 1

SUMMARY OF FINDINGS

OVERVIEW

During 2002–03, 43,774 Australian agricultural establishments applied 10,404 gigalitres of irrigation water to 2.4 million hectares of crops and pastures, an average application rate of 4.4 megalitres per irrigated hectare. This was nearly one third of the number of agricultural establishments in Australia in scope of the Water Survey Agriculture 2002–03, but only half a percent of the total area of all agricultural establishments, which includes large grazing establishments with little or no irrigation.

1.1 IRRIGATION ACTIVITY, By State—2002–03

	Agricultural establishments no.	Agricultural establishments irrigating no.	Area of agricultural land '000 ha	Area irrigated '000 ha	Volume applied ML	Application rate ML/ha(a)
NSW(b)	41 184	11 230	65 175	939	4 272 705	4.6
Vic.	33 212	12 005	13 413	593	2 464 357	4.2
Qld	27 688	10 278	139 042	525	2 229 009	4.3
SA	14 262	5 471	54 139	183	899 530	4.9
WA	12 270	2 731	102 728	48	313 248	6.5
Tas.	3 969	1 923	1 771	87	208 956	2.4
NT	397	136	63 263	3	15 953	4.7
Aust.	132 983	43 774	439 531	2 378	10 403 759	4.4

(a) Averaged across all irrigated pastures and crops.

(b) Includes ACT.

Note: Number of agricultural establishments and area of agricultural land sourced from *Agricultural Commodities 2002–03* (cat. no. 7121.0). The number of irrigating establishments differs from the number of customers serviced by water authorities. This is because not all customers fall within the scope of the survey and because an agricultural establishment may be more than one customer of a water authority.

Of the States/Territories, Tasmania reported the highest percentage of agricultural establishments irrigating (48%), and Western Australia reported the lowest percentage (22%). Tasmania also reported the highest proportion of agricultural land irrigated (4.9%), followed by Victoria (4.4%).

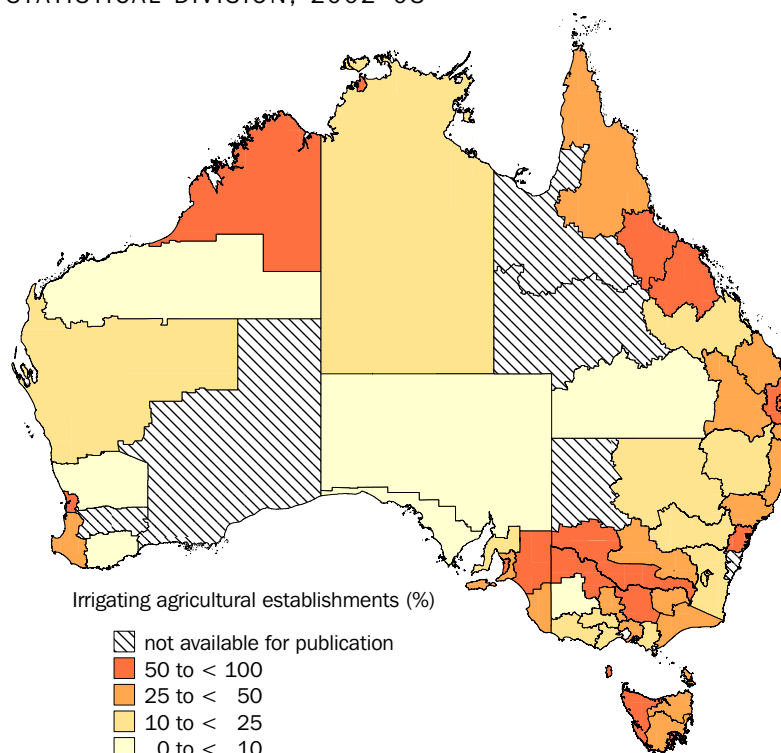
OVERVIEW *continued***1.2** IRRIGATION ACTIVITY, Percentage—By State—2002–03

	Agricultural establishments irrigating	Agricultural land irrigated
	%	%
NSW(a)	27.3	1.4
Vic.	36.2	4.4
Qld	37.1	0.4
SA	38.4	0.3
WA	22.3	0.1
Tas.	48.4	4.9
NT	34.3	—
Aust.	32.9	0.5

— nil or rounded to zero (including null cells)

(a) Includes ACT.

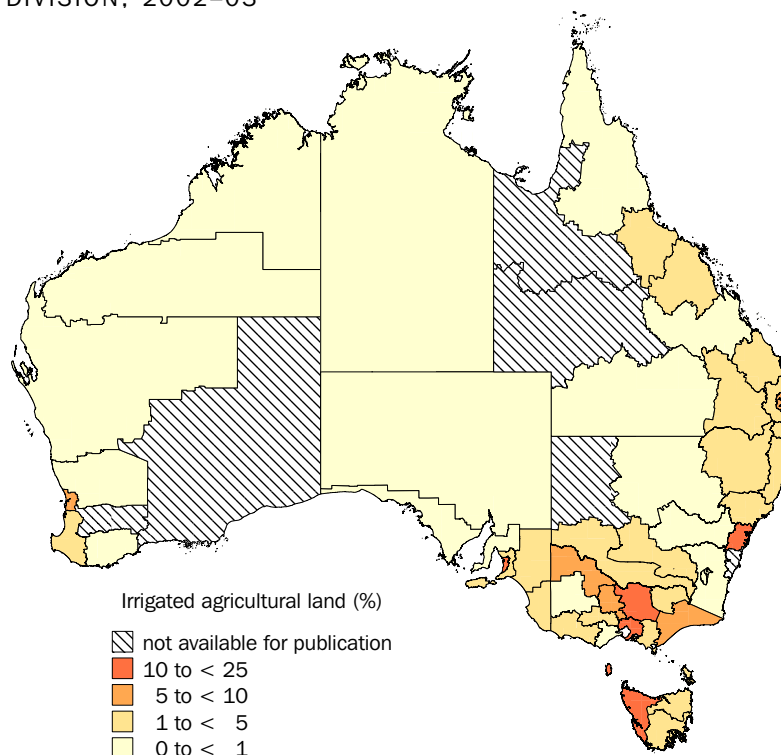
Map 1.3 shows that there are two Statistical Divisions in each State/Territory with 50% or more of agricultural establishments irrigating, except for the Northern Territory with one, and Queensland with four.

1.3 AGRICULTURAL ESTABLISHMENTS IRRIGATING, PERCENTAGE, BY STATISTICAL DIVISION, 2002–03

OVERVIEW *continued*

Map 1.4 shows the percentage of agricultural land irrigated for Statistical Divisions. There are five Statistical Divisions in the top category (10% to less than 25% of agricultural land irrigated) - Melbourne and Goulburn in Victoria, Mersey-Lyell in Tasmania, Sydney and Adelaide.

1.4 AGRICULTURAL LAND IRRIGATED, PERCENTAGE, BY STATISTICAL DIVISION, 2002–03



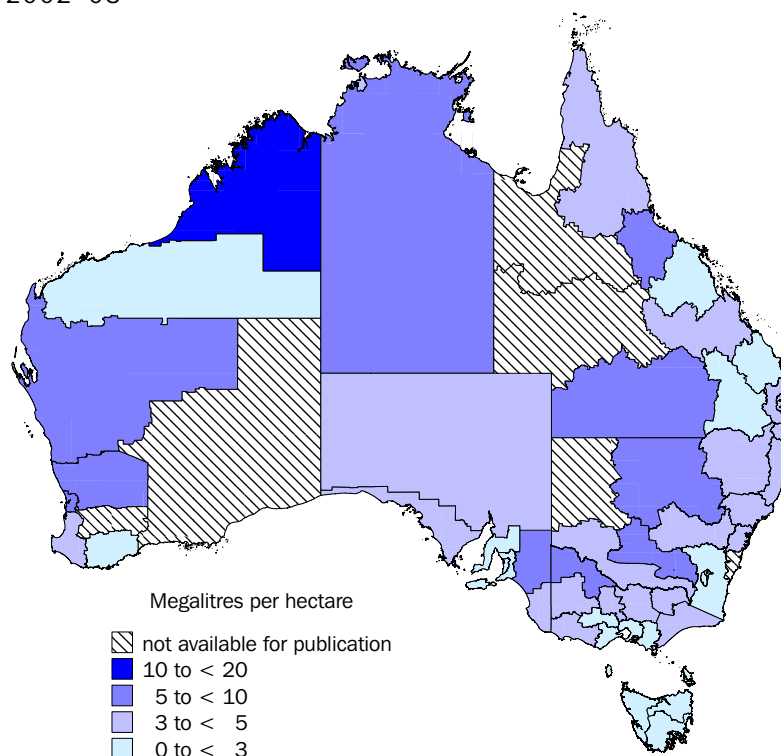
New South Wales was the largest irrigating State/Territory, with 11,230 irrigating establishments applying 4,273 gigalitres, or 41% of the Australian total volume applied, on 939,000 hectares, or 39% of the Australian total irrigated land. Whilst Victoria and Queensland reported similarly high numbers of irrigating establishments, (12,005 and 10,278 respectively) the volume of water applied in these two states was significantly less than New South Wales. In Victoria, the volume of water applied was 58% of the volume applied in New South Wales, and Queensland applied 52% of the New South Wales volume. Together, the three eastern mainland states applied 86% of the Australian total volume of irrigation water, and contributed 87% of the total area irrigated.

Western Australia reported the highest average application rate (6.5 megalitres per irrigated hectare) while Tasmania reported the lowest average application rate (2.4 megalitres per irrigated hectare). The other States/Territories reported average application rates close to the Australian figure (4.4 megalitres per irrigated hectare). In Map 1.5, Kimberley is the only Statistical Division in Australia with an application rate in the top range, ten to less than twenty megalitres per irrigated hectare. The average application rate across all crops in the Kimberley Statistical Division was 14.5 megalitres per irrigated hectare. The Northern Statistical Division in Queensland also reported a

OVERVIEW *continued*

high average application rate of 9.4 megalitres per irrigated hectare. The Statistical Division that used the most irrigation water was Murrumbidgee in New South Wales, which applied 1,318 gigalitres at an average rate of 5.4 megalitres per irrigated hectare.

1.5 AVERAGE APPLICATION RATE, BY STATISTICAL DIVISION, 2002–03

IRRIGATION WATER
USAGE

The most extensive use of irrigation in Australia was pasture for grazing. Nationally 14,419 irrigating establishments or almost one-third of irrigating establishments, irrigated pasture for grazing. Of these, 6,262 (43%) were classified as predominantly in the dairy cattle industry, 5,011 (35%) in the other major grazing industries (sheep and beef cattle), 1,096 (8%) in combined grain-sheep or grain-beef cattle industries and 1,972 (14%) were in other agricultural industries. Irrigation of pasture for grazing covered 710,000 hectares, which was 30% of the total area of irrigated crops, using 2,827 gigalitres, amounting to 27% of the total volume of irrigation water applied. The average application rate to pasture for grazing was 4.0 megalitres per irrigated hectare. After pasture for grazing, cotton was the next biggest water user nationally, accounting for 15% of the volume applied and 10% of the area of crops and pasture irrigated.

The crop with the highest average application rate nationally was rice, with a rate of 14.1 megalitres per irrigated hectare, more than three times the average application rate across all crops and pasture. The next highest national average application rate was cotton, at 6.5 megalitres per irrigated hectare. At the State level, the crop with the highest average application rate was sugar cane crops in Western Australia, in the Kimberley Statistical Division, with a rate of 20.3 megalitres per irrigated hectare. By

IRRIGATION WATER USAGE *continued*

comparison, the average application rate on sugar cane in Queensland was 5.2 megalitres per irrigated hectare.

At the State level, pasture for grazing was the predominant use of irrigation in Victoria and Tasmania. In Victoria, 1,611 gigalitres, nearly two-thirds of the volume applied in that State, was to pasture for grazing, accounting for 57% of the volume applied to pasture for grazing nationally. In Tasmania, the volume applied to pasture for grazing was nearly half the irrigation water used in that State. Sugar cane was the predominant crop irrigated in Queensland (1,213 gigalitres) and Western Australia (80 gigalitres), making up 54% of the volume of irrigation water applied in Queensland, and 26% in Western Australia. Fruit (fruit trees, nut trees, plantation and berry fruits) and vegetables, were also significant crops irrigated in Western Australia. In New South Wales, the greatest volume of water was applied to cotton (1,212 gigalitres), while the largest area irrigated, 282,000 hectares, was cereal crops for grain or seed. In South Australia, grapevines was the predominant crop in terms of area irrigated (66,000 hectares), although there was slightly higher volume applied to pasture for grazing than to grapevines. Fruit was the main crop irrigated in the Northern Territory, amounting to 8 gigalitres, or just over half the volume applied.

IRRIGATION WATER AVAILABILITY

The most common source of irrigation water in Australia in 2002–03 was surface water, with 31,691 establishments (72% of irrigating establishments) reporting it as one of their sources. The next most common source nationally was groundwater, with 32% of establishments reporting it as one of their sources. In the Northern Territory, 127 establishments (93%) reported groundwater as one of their sources compared with 4% reporting surface water. South Australia was the only State to show a significant proportion (20%) of irrigating establishments reporting town or country reticulated mains supply as one of their sources.

Nationally, 11,640 establishments, or 27% of irrigating establishments, reported irrigating without a water entitlement of some form, with all States/Territories reporting significant proportions, particularly in the Northern Territory (81%). Of irrigation establishments reporting a water entitlement, the most common type of entitlement was a volume entitlement, reported by almost two-thirds of irrigating establishments. Of the almost 14,000 gigalitres of volume entitlement reported by these establishments, 9,250 gigalitres, or 66%, was allocated to them for 2002–03.

Across Australia, 5,429 irrigating agricultural establishments purchased 991 gigalitres of extra water on a temporary basis, costing \$124m, an average rate of \$125 per megalitre. Fifty-seven percent of the water purchased was in New South Wales, contributing 47% of the amount spent nationally. The highest average cost for water purchased on a temporary basis was in South Australia at \$242 per megalitre. Extra water purchased on a permanent basis, including transfers of entitlements, was more expensive, with the highest rate also in South Australia at \$1,109 per megalitre. Nationally 140 gigalitres was purchased on a permanent basis, costing \$92m at an average rate of \$652 per megalitre.

Of the 944 gigalitres of water sold nationally by irrigating establishments, more than two-thirds, on both a temporary and permanent basis, was sold by establishments in Victoria.

IRRIGATION WATER MANAGEMENT

The most common irrigation method was surface irrigation, such as flood, furrow, basin, or border check. Nationally, 12,970 establishments, or 30% of irrigating agricultural establishments, reported surface irrigation as one of their methods of irrigating, used on 1,344,000 hectares, or 57% of the area irrigated by all methods. The highest percentage of establishments reporting surface irrigation, as one of their methods, was in Victoria, where 50% of establishments reported this as one of their methods. Surface irrigation in New South Wales was 691,000 hectares, which was just over three-quarters of the area irrigated by all methods in New South Wales, and just over half the area surface irrigated nationally.

In a fairly consistent pattern across Australia, farmers used their own knowledge and observation as the most widely used tool in deciding when to irrigate and how much water to apply. Nationally, 91% of irrigating establishments reported using this as one of their decision-making tools. Across Australia 13% of establishments used soil probes as one of their decision-making tools. In South Australia, 30% of establishments used soil probes as one of their decision-making tools.

Nationally 30,563, or 70% of irrigating establishments, made one or more changes to irrigation practices in the five years to 30 June 2003. Of the establishments making one or more changes, almost two-thirds reported changing to more efficient irrigation techniques as one of their changes, and over half reported that more efficient irrigation scheduling was one of the changes made.

During the reference period 19,212 irrigating establishments (44%) were intending to make one or more changes to their irrigation practices in the year ending 30 June 2004. Of these establishments, 50% reported changing to more efficient irrigation techniques as one of their intended changes, and 39% reported that more efficient irrigation scheduling was one of the changes intended. Nationally 34,219 establishments (78%) saw barriers to making changes to their irrigation practices, with 61% of these reporting lack of financial resources, and 36% seeing uncertainty of water allocation as major barriers to change.

Across Australia, over half of the irrigating agricultural establishments had on-farm water storage in 2002-03. In the Northern Territory, only 8% of establishments had storage, while in Tasmania, 82% reported storage capacity. On-farm water recycling for agricultural production was carried out by 8,705 establishments (20%) nationally, including 3,522 in Victoria. The number of establishments reporting areas of land laser-levelled for irrigation was 11,647 (or 27% of all irrigating establishments), with 1,809,000 hectares levelled. New South Wales accounted for 59% of the laser-levelled land, Victoria 21%, and Queensland 18%.

IRRIGATION FINANCES

During 2002-03, irrigating agricultural establishments in Australia outlayed \$1,492m in current and capital expenditure on irrigation (36% of which was capital expenditure). Licence and application charges, volumetric and usage charges, and irrigation fees and charges made up 28%, whilst 36% was operating and other irrigation expenses. Irrigators in Victoria reported volumetric and usage charges of \$106m, or 36% of the Australian total, while reporting 24% of the total Australian volume of irrigation water applied. By comparison, New South Wales accounted for 38% of volumetric and usage charges and

IRRIGATION FINANCES

continued

41% of the volume applied, and Queensland accounted for 16% of the volumetric and usage charges and 21% of the volume applied nationally.

In most States, capital expenditure on irrigation accounted for between 31% and 41% of irrigation expenditure. The exceptions were Tasmania, where capital expenditure accounted for 60% of irrigation expenditure, and the Northern Territory, where capital expenditure was 15% of irrigation expenditure.

Of the total number of irrigating establishments in Australia, 41% outlayed less than \$10,000 on capital expenditure for irrigation over the five years to June 2003. A further 19,450 establishments (44%) outlayed between \$10,000 and \$100,000. Across Australia 481 establishments (1%) outlayed \$1m or more over the five years, of which, 238 (49%) were in New South Wales.

For 2002-03, 30% of irrigating establishments reported a gross value of irrigated agricultural production of less than \$25,000. At the other end of the scale, 4% of irrigators reported gross value of irrigated agricultural production of \$1m or more. By comparison, total agricultural production (irrigated and non-irrigated) amounted to less than \$25 000 for 18% of irrigating establishments, and \$1m or more for 6% of irrigating establishments.

CHAPTER 2

IRRIGATION WATER USAGE

2.1 PASTURES AND CROPS IRRIGATED, Australia—2002–03

	<i>Agricultural establishments no.</i>	<i>Agricultural establishments irrigating no.</i>	<i>Area under pasture or crop '000 ha</i>	<i>Area irrigated '000 ha</i>	<i>Volume applied ML</i>	<i>Application rate ML/ha(a)</i>
Pasture for grazing	102 419	14 419	341 336	710	2 826 854	4.0
Pasture for seed production	1 520	^ 572	91	^ 32	^ 138 752	4.4
Pasture for hay and silage	23 783	6 206	740	162	682 737	4.2
Cereal crops cut for hay	10 758	2 215	505	^ 66	^ 245 599	3.7
Cereal crops for grain or seed(b)	37 504	3 569	17 351	365	1 001 579	2.8
Cereal crops not for grain or seed	10 360	^ 1 764	841	42	^ 127 110	3.0
Rice	647	631	46	44	615 375	14.1
Sugar cane	5 146	2 710	568	238	^ 1 293 099	5.4
Cotton	659	647	245	234	^ 1 525 502	6.5
Other broadacre crops(c)	21 688	1 879	3 540	68	172 184	2.5
Fruit trees, nut trees, plantation or berry fruits(d)	11 373	8 604	187	138	659 893	4.8
Vegetables for human consumption	5 484	5 225	121	112	439 229	3.9
Vegetables for seed	644	341	6	4	8 455	2.3
Nurseries, cutflowers or cultivated turf	2 992	2 956	16	13	77 920	5.8
Grapevines	8 219	8 114	157	150	588 794	3.9
Total(e)	(f) 132 983	(f) 43 774	(g) 439 531	2 378	10 403 759	4.4

^ estimate has a relative standard error of 10% to less than 25% and should be used with caution

(a) Averaged across all irrigated pastures or crops.

(b) Excludes rice.

(c) Excludes sugar cane and cotton.

(d) Excludes grapevines.

(e) Totals include other pastures or crops not elsewhere classified.

(f) Total agricultural establishments does not equal the sum of agricultural establishments as many establishments grow or irrigate more than one pasture or crop.

(g) Total area of agricultural land does not equal the sum of area under pasture or crop as not all agricultural land is under pasture or crop.

Note: Number of agricultural establishments and area under pasture or crop sourced from *Agricultural Commodities 2002–03* (cat. no. 7121.0).

2.2 PASTURES AND CROPS IRRIGATED, New South Wales(a)—2002–03

	<i>Agricultural establishments no.</i>	<i>Agricultural establishments irrigating no.</i>	<i>Area under pasture or crop '000 ha</i>	<i>Area irrigated '000 ha</i>	<i>Volume applied ML</i>	<i>Application rate ML/ha(b)</i>
Pasture for grazing	33 468	3 813	49 423	208	677 639	3.3
Pasture for seed production	*137	np	*4	np	np	np
Pasture for hay and silage	3 838	1 977	101	^ 59	^ 251 518	4.2
Cereal crops cut for hay	2 728	^ 908	165	^ 37	^ 164 420	4.5
Cereal crops for grain or seed(c)	12 022	1 953	4 391	282	805 558	2.9
Cereal crops not for grain or seed	4 526	^ 729	327	^ 23	^ 80 035	3.5
Rice	637	np	45	np	np	np
Sugar cane	553	—	39	—	—	—
Cotton	367	^ (d) 386	^ 177	^ 173	^ 1 211 732	7.0
Other broadacre crops(e)	5 964	^ 344	788	^ 29	^ 71 683	2.5
Fruit trees, nut trees, plantation or berry fruits(f)	3 651	2 279	49	30	151 943	5.1
Vegetables for human consumption	913	807	17	15	67 960	4.7
Vegetables for seed	^ 69	*37	^ —	^ —	^ 1 000	3.0
Nurseries, cutflowers or cultivated turf	1 053	(d) 1 084	4	4	31 404	7.0
Grapevines	1 576	(d) 1 614	37	34	140 690	4.2
Total(g)	(h) 41 184	(h) 11 230	(i) 65 175	939	4 272 705	4.6

^ estimate has a relative standard error of 10% to less than 25% and should be used with caution

* estimate has a relative standard error of 25% to 50% and should be used with caution

— nil or rounded to zero (including null cells)

np not available for publication but included in totals where applicable, unless otherwise indicated

(a) Includes ACT.

(b) Averaged across all irrigated pastures or crops.

(c) Excludes rice.

(d) See Explanatory Notes, paragraph 9.

(e) Excludes sugar cane and cotton.

(f) Excludes grapevines

(g) Totals include other pastures or crops not elsewhere classified.

(h) Total agricultural establishments does not equal the sum of agricultural establishments as many establishments grow or irrigate more than one pasture or crop.

(i) Total area of agricultural land does not equal the sum of area under pasture or crop as not all agricultural land is under pasture or crop.

Note: Number of agricultural establishments and area under pasture or crop sourced from *Agricultural Commodities 2002–03* (cat. no. 7121.0).

2.3 PASTURES AND CROPS IRRIGATED, Victoria—2002–03

	Agricultural establishments no.	Agricultural establishments irrigating no.	Area under pasture or crop '000 ha	Area irrigated '000 ha	Volume applied ML	Application rate ML/ha (a)
Pasture for grazing	26 531	6 558	7 541	368	1 611 486	4.4
Pasture for seed production	^ 262	np	^ 19	np	np	np
Pasture for hay and silage	10 558	^ 1 709	362	^ 57	^ 204 806	3.6
Cereal crops cut for hay	1 860	^ 515	55	*13	*39 115	2.9
Cereal crops for grain or seed(b)	8 081	^ 536	2 367	^ 27	^ 51 312	1.9
Cereal crops not for grain or seed	^ 1 544	*415	^ 67	*5	*16 995	3.3
Rice	**10	np	**1	np	np	np
Sugar cane	(c)—	—	(c)—	—	—	—
Cotton	(c)—	—	(c)—	—	—	—
Other broadacre crops(d)	4 667	^ 323	686	^ 8	^ 17 495	2.2
Fruit trees, nut trees, plantation or berry fruits(e)	1 686	1 305	^ 45	^ 39	172 755	4.5
Vegetables for human consumption	1 048	928	27	25	78 956	3.2
Vegetables for seed	166	83	^ 2	^ 1	^ 2 972	2.2
Nurseries, cutflowers or cultivated turf	520	491	4	3	10 680	4.2
Grapevines	2 559	2 491	38	35	205 451	5.8
Total(f)	(g) 33 212	(g) 12 005	(h) 13 413	593	2 464 357	4.2

^ estimate has a relative standard error of 10% to less than 25% and should be used with caution

* estimate has a relative standard error of 25% to 50% and should be used with caution

** estimate has a relative standard error greater than 50% and is considered too unreliable for general use

— nil or rounded to zero (including null cells)

np not available for publication but included in totals where applicable, unless otherwise indicated

(a) Averaged across all irrigated pastures or crops.

(b) Excludes rice.

(c) Data not collected.

(d) Excludes sugar cane and cotton.

(e) Excludes grapevines.

(f) Totals include other pastures or crops not elsewhere classified.

(g) Total agricultural establishments does not equal the sum of agricultural establishments as many establishments grow or irrigate more than one pasture or crop.

(h) Total area of agricultural land does not equal the sum of area under pasture or crop as not all agricultural land is under pasture or crop.

Note: Number of agricultural establishments and area under pasture or crop sourced from *Agricultural Commodities 2002–03* (cat. no. 7121.0).

2.4 PASTURES AND CROPS IRRIGATED, Queensland—2002–03

	Agricultural establishments no.	Agricultural establishments irrigating no.	Area under pasture or crop '000 ha	Area irrigated '000 ha	Volume applied ML	Application rate ML/ha (a)
Pasture for grazing	19 329	^ 1 761	117 205	^ 44	^ 129 953	3.0
Pasture for seed production	^ 315	*83	^ 19	*2	*5 484	2.6
Pasture for hay and silage	2 510	^ 1 719	51	^ 25	^ 96 582	3.9
Cereal crops cut for hay	1 554	^ 664	55	*13	^ 30 287	2.3
Cereal crops for grain or seed(b)	3 980	^ 758	1 115	^ 48	^ 128 393	2.7
Cereal crops not for grain or seed	2 327	^ 473	251	^ 11	^ 19 764	1.8
Rice	(c)—	—	(c)—	—	—	—
Sugar cane	4 580	2 696	524	235	^ 1 212 802	5.2
Cotton	292	^ 261	68	61	^ 313 770	5.1
Other broadacre crops(d)	2 122	^ 404	164	^ 11	^ 32 542	2.9
Fruit trees, nut trees, plantation or berry fruits(e)	2 897	2 278	50	35	125 713	3.6
Vegetables for human consumption	1 784	1 670	35	34	110 618	3.3
Vegetables for seed	*80	*16	*—	**—	**286	3.7
Nurseries, cutflowers or cultivated turf	700	(f) 761	3	3	14 052	4.1
Grapevines	230	^ (f) 317	2	^ (f) 3	^ 8 291	3.1
Total(g)	(h) 27 688	(h) 10 278	(i) 139 042	525	2 229 009	4.3

^ estimate has a relative standard error of 10% to less than 25% and should be used with caution

* estimate has a relative standard error of 25% to 50% and should be used with caution

** estimate has a relative standard error greater than 50% and is considered too unreliable for general use

— nil or rounded to zero (including null cells)

(a) Averaged across all irrigated pastures or crops.

(b) Excludes rice.

(c) Data not collected.

(d) Excludes sugar cane and cotton.

(e) Excludes grapevines.

(f) See Explanatory Notes, paragraph 9.

(g) Totals include other pastures or crops not elsewhere classified.

(h) Total agricultural establishments does not equal the sum of agricultural establishments as many establishments grow or irrigate more than one pasture or crop.

(i) Total area of agricultural land does not equal the sum of area under pasture or crop as not all agricultural land is under pasture or crop.

Note: Number of agricultural establishments and area under pasture or crop sourced from *Agricultural Commodities 2002–03* (cat. no. 7121.0).

2.5 PASTURES AND CROPS IRRIGATED, South Australia—2002–03

	Agricultural establishments no.	Agricultural establishments irrigating no.	Area under pasture or crop '000 ha	Area irrigated '000 ha	Volume applied ML	Application rate ML/ha (a)
Pasture for grazing	9 764	1 114	43 065	^ 42	^ 226 199	5.4
Pasture for seed production	^ 325	^ 204	^ 22	^ 14	^ 75 231	5.5
Pasture for hay and silage	2 667	^ 591	89	^ 16	^ 117 116	7.1
Cereal crops cut for hay	1 921	^ 86	87	* 2	* 10 218	4.7
Cereal crops for grain or seed(b)	6 471	* 172	3 417	^ 4	^ 7 928	2.3
Cereal crops not for grain or seed	968	* 50	^ 94	* 2	** 7 910	4.5
Rice	(c)—	—	(c)—	—	—	—
Sugar cane	(c)—	—	(c)—	—	—	—
Cotton	(c)—	—	(c)—	—	—	—
Other broadacre crops(d)	4 014	* 93	632	* 3	* 8 648	2.5
Fruit trees, nut trees, plantation or berry fruits(e)	1 557	1 349	22	18	145 665	8.1
Vegetables for human consumption	500	(f) 501	14	13	74 536	5.6
Vegetables for seed	^ 111	^ 51	* 2	* 1	^ 1 720	1.8
Nurseries, cutflowers or cultivated turf	^ 292	213	^ 1	^ 1	* 6 835	6.5
Grapevines	2 893	2 773	67	66	217 496	3.3
Total(g)	(h) 14 262	(h) 5 471	(i) 54 139	183	899 530	4.9

^ estimate has a relative standard error of 10% to less than 25% and should be used with caution

* estimate has a relative standard error of 25% to 50% and should be used with caution

** estimate has a relative standard error greater than 50% and is considered too unreliable for general use

— nil or rounded to zero (including null cells)

(a) Averaged across all irrigated pastures or crops.

(b) Excludes rice.

(c) Data not collected.

(d) Excludes sugar cane and cotton.

(e) Excludes grapevines.

(f) See Explanatory Notes, paragraph 9.

(g) Totals include other pastures or crops not elsewhere classified.

(h) Total agricultural establishments does not equal the sum of agricultural establishments as many establishments grow or irrigate more than one pasture or crop.

(i) Total area of agricultural land does not equal the sum of area under pasture or crop as not all agricultural land is under pasture or crop.

Note: Number of agricultural establishments and area under pasture or crop sourced from *Agricultural Commodities 2002–03* (cat. no. 7121.0).

2.6 PASTURES AND CROPS IRRIGATED, Western Australia—2002–03

	<i>Agricultural establishments no.</i>	<i>Agricultural establishments irrigating no.</i>	<i>Area under pasture or crop '000 ha</i>	<i>Area irrigated '000 ha</i>	<i>Volume applied ML</i>	<i>Application rate ML/ha (a)</i>
Pasture for grazing	9 797	np	82 254	np	np	np
Pasture for seed production	^ 368	np	^ 23	np	np	np
Pasture for hay and silage	2 142	**19	89	^—	2 352	5.8
Cereal crops cut for hay	2 568	np	^ 141	np	np	np
Cereal crops for grain or seed(b)	6 308	np	6 037	np	np	np
Cereal crops not for grain or seed	829	np	^ 98	np	np	np
Rice	—	—	—	—	—	—
Sugar cane	^ 13	^ (c)14	4	4	80 298	20.3
Cotton	—	—	—	—	—	—
Other broadacre crops(d)	3 921	np	1 244	np	np	np
Fruit trees, nut trees, plantation or berry fruits(e)	1 171	1 031	^ 12	^ 10	^ 46 154	4.9
Vegetables for human consumption	544	600	10	9	63 864	7.1
Vegetables for seed	*49	^ 21	^—	—	505	3.7
Nurseries, cutflowers or cultivated turf	315	^ 301	^ 2	2	13 491	8.3
Grapevines	783	^ 777	12	^ 10	^ 12 215	1.2
Total(f)	(g)12 270	(g)2 731	(h)102 728	48	313 248	6.5

^ estimate has a relative standard error of 10% to less than 25% and should be used with caution

* estimate has a relative standard error of 25% to 50% and should be used with caution

** estimate has a relative standard error greater than 50% and is considered too unreliable for general use

— nil or rounded to zero (including null cells)

np not available for publication but included in totals where applicable, unless otherwise indicated

(a) Averaged across all irrigated pastures or crops.

(b) Excludes rice.

(c) See Explanatory Notes, paragraph 9.

(d) Excludes sugar cane and cotton.

(e) Excludes grapevines.

(f) Totals include other pastures or crops not elsewhere classified.

(g) Total agricultural establishments does not equal the sum of agricultural establishments as many establishments grow or irrigate more than one pasture or crop.

(h) Total area of agricultural land does not equal the sum of area under pasture or crop as not all agricultural land is under pasture or crop.

Note: Number of agricultural establishments and area under pasture or crop sourced from *Agricultural Commodities 2002–03* (cat. no. 7121.0).

2.7 PASTURES AND CROPS IRRIGATED, Tasmania—2002–03

	Agricultural establishments no.	Agricultural establishments irrigating no.	Area under pasture or crop '000 ha	Area irrigated '000 ha	Volume applied ML	Application rate ML/ha(a)
Pasture for grazing	3 370	729	1 199	36	99 329	2.8
Pasture for seed production	109	^ 83	^ 4	^ 2	^ 3 348	1.4
Pasture for hay and silage	2 029	^ 186	39	^ 4	^ 8 564	2.0
Cereal crops cut for hay	^ 119	*31	^ 1	^ —	^ 247	1.0
Cereal crops for grain or seed(b)	641	131	23	^ 4	^ 4 661	1.3
Cereal crops not for grain or seed	^ 165	^ 94	^ 3	^ 2	^ 2 126	1.4
Rice	(c)—	—	(c)—	—	—	—
Sugar cane	(c)—	—	(c)—	—	—	—
Cotton	(c)—	—	(c)—	—	—	—
Other broadacre crops(d)	966	705	22	16	33 745	2.1
Fruit trees, nut trees, plantation or berry fruits(e)	290	257	5	^ 4	^ 9 542	2.4
Vegetables for human consumption	683	(f) 712	17	17	42 543	2.6
Vegetables for seed	^ 169	^ 133	^ 1	^ 1	^ 1 973	2.6
Nurseries, cutflowers or cultivated turf	83	(f) 84	—	—	^ 1 161	3.6
Grapevines	172	^ 137	1	^ 1	^ 1 702	2.0
Total(g)	(h) 3 969	(h) 1 923	(i) 1 771	87	208 956	2.4

^ estimate has a relative standard error of 10% to less than 25% and should be used with caution

* estimate has a relative standard error of 25% to 50% and should be used with caution

— nil or rounded to zero (including null cells)

(a) Averaged across all irrigated pastures or crops.

(b) Excludes rice.

(c) Data not collected.

(d) Excludes sugar cane and cotton.

(e) Excludes grapevines.

(f) See Explanatory Notes, paragraph 9.

(g) Totals include other pastures or crops not elsewhere classified.

(h) Total agricultural establishments does not equal the sum of agricultural establishments as many establishments grow or irrigate more than one pasture or crop.

(i) Total area of agricultural land does not equal the sum of area under pasture or crop as not all agricultural land is under pasture or crop.

Note: Number of agricultural establishments and area under pasture or crop sourced from *Agricultural Commodities 2002–03* (cat. no. 7121.0).

2.8 PASTURES AND CROPS IRRIGATED, Northern Territory—2002–03

	<i>Agricultural establishments no.</i>	<i>Agricultural establishments irrigating no.</i>	<i>Area under pasture or crop '000 ha</i>	<i>Area irrigated '000 ha</i>	<i>Volume applied ML</i>	<i>Application rate ML/ha (a)</i>
Pasture for grazing	160	np	40 649	np	np	np
Pasture for seed production	4	—	—	—	—	—
Pasture for hay and silage	40	5	8	—	1 797	6.9
Cereal crops cut for hay	7	np	—	np	np	np
Cereal crops for grain or seed(b)	3	np	—	np	np	np
Cereal crops not for grain or seed	2	np	—	np	np	np
Rice	—	—	—	—	—	—
Sugar cane	(c)—	—	(c)—	—	—	—
Cotton	(c)—	—	(c)—	—	—	—
Other broadacre crops(d)	34	np	3	np	np	np
Fruit trees, nut trees, plantation or berry fruits(e)	122	105	2	2	8 121	3.5
Vegetables for human consumption	13	7	—	—	752	3.3
Vegetables for seed	—	—	—	—	—	—
Nurseries, cutflowers or cultivated turf	29	21	—	—	298	6.5
Grapevines	6	5	—	—	2 950	9.3
Total(f)	(g) 397	(g) 136	(h) 63 263	3	15 953	4.7

— nil or rounded to zero (including null cells)

np not available for publication but included in totals where applicable, unless otherwise indicated

(a) Averaged across all irrigated pastures or crops.

(b) Excludes rice.

(c) Data not collected.

(d) Excludes sugar cane and cotton.

(e) Excludes grapevines.

(f) Totals include other pastures or crops not elsewhere classified.

(g) Total agricultural establishments does not equal the sum of agricultural establishments as many establishments grow or irrigate more than one pasture or crop.

(h) Total area of agricultural land does not equal the sum of area under pasture or crop as not all agricultural land is under pasture or crop.

Note: Number of agricultural establishments and area under pasture or crop sourced from *Agricultural Commodities 2002–03* (cat. no. 7121.0).

2.9

IRRIGATION ACTIVITY, By Statistical Division(a)—2002–03

	Agricultural establishments no.	Agricultural establishments irrigating no.	Area of agricultural land '000 ha	Area irrigated '000 ha	Volume applied ML	Application rate ML/ha(b)
New South Wales(c)						
Sydney	1 786	1 091	^ 68	8	36 160	4.6
Hunter	3 011	^ 1 041	1 538	^ 40	^ 143 438	3.6
Illawarra	953	np	112	np	np	np
Richmond-Tweed	2 996	^ 867	^ 377	^ 8	^ 29 068	3.9
Mid-North Coast	2 920	^ 978	712	^ 15	*54 236	3.5
Northern	6 264	^ 885	8 157	^ 187	^ 891 364	4.8
North Western	4 337	^ 652	16 710	^ 105	^ 650 617	6.2
Central West	5 468	^ 946	5 546	^ 51	^ 228 575	4.5
South Eastern(d)	4 464	^ 573	2 701	^ 15	^ 28 954	1.9
Murrumbidgee	4 665	1 840	5 629	246	1 318 286	5.4
Murray	4 015	2 135	^ 9 098	257	844 579	3.3
Far West	304	np	14 529	np	np	np
Total	41 184	11 230	65 175	939	4 272 705	4.6
Victoria						
Melbourne	2 594	1 189	217	26	^ 68 305	2.6
Barwon	1 785	*227	467	*3	*7 430	2.5
Western District	4 305	^ 731	1 617	*28	*109 282	3.8
Central Highlands	1 971	^ 353	759	^ 8	^ 22 536	2.9
Wimmera	2 806	*196	2 466	*17	*65 712	3.9
Mallee	4 097	2 748	2 599	142	731 131	5.1
Loddon	2 035	726	1 034	^ 55	^ 166 719	3.0
Goulburn	5 781	3 302	1 636	209	947 408	4.5
Ovens-Murray	2 132	^ 792	710	^ 17	^ 60 073	3.6
East Gippsland	2 364	^ 1 058	^ 1 433	^ 76	^ 255 338	3.4
Gippsland	3 343	*681	477	*12	*30 422	2.5
Total	33 212	12 005	13 413	593	2 464 357	4.2
Queensland						
Brisbane	908	587	^ 60	^ 4	^ 11 758	3.1
Moreton	3 400	1 768	1 250	42	^ 134 234	3.2
Wide Bay-Burnett	5 115	2 174	^ 4 080	92	242 318	2.6
Darling Downs	6 007	^ 1 516	8 158	89	^ 261 712	3.0
South West	1 615	^ 105	26 898	^ 24	*125 246	5.2
Fitzroy	2 760	^ 542	^ 13 684	^ 43	^ 175 383	4.1
Central West	661	np	27 380	np	np	np
Mackay	2 057	1 173	^ 6 510	89	^ 227 818	2.6
Northern	1 816	^ 947	^ 8 922	^ 90	^ 844 013	9.4
Far North	2 906	1 438	^ 13 715	^ 50	^ 204 869	4.1
North West	443	np	^ 28 385	np	np	np
Total	27 688	10 278	139 042	525	2 229 009	4.3

^ estimate has a relative standard error of 10% to less than 25% and should be used with caution

* estimate has a relative standard error of 25% to 50% and should be used with caution

np not available for publication but included in totals where applicable, unless otherwise indicated

(a) See Appendix 2.

(b) Averaged across all irrigated pastures or crops.

(c) Includes ACT.

(d) Includes Canberra and ACT balance.

Note: Number of agricultural establishments and area of agricultural land sourced from *Agricultural Commodities 2002–03* (cat. no. 7121.0).

2.9**IRRIGATION ACTIVITY, By Statistical Division(a)—2002–03** *continued*

	Agricultural establishments no.	Agricultural establishments irrigating no.	Area of agricultural land '000 ha	Area irrigated '000 ha	Volume applied ML	Application rate ML/ha(b)
South Australia						
Adelaide	911	766	^ 54	11	29 066	2.6
Outer Adelaide	2 738	1 278	^ 922	^ 30	^ 76 406	2.5
Yorke and Lower North	2 049	^ 264	2 500	^ 5	*5 174	1.0
Murray Lands	3 344	2 031	3 159	61	443 984	7.3
South East	2 534	999	1 763	75	^ 341 295	4.6
Eyre	1 490	**62	4 734	**—	**1 949	4.9
Northern	1 196	*72	41 007	*—	*1 657	3.7
<i>Total</i>	14 262	5 471	54 139	183	899 530	4.9
Western Australia						
Perth	1 113	742	91	5	36 006	6.6
South West	2 548	1 078	992	24	112 814	4.8
Lower Great Southern	2 027	*195	2 725	*3	^ 4 770	1.4
Upper Great Southern	1 650	np	3 729	np	np	np
Midlands	2 906	^ 280	8 337	*6	*41 979	6.7
South Eastern	618	np	^ 13 394	np	np	np
Central	1 205	^ 212	45 118	^ 2	10 799	6.0
Pilbara	58	—	^ 13 786	—	—	—
Kimberley	145	81	^ 14 557	7	106 525	14.5
<i>Total</i>	12 270	2 731	102 728	48	313 248	6.5
Tasmania						
Greater Hobart	^ 237	^ 134	^ 56	^ 2	^ 3 555	1.7
Southern	807	357	678	^ 18	^ 48 576	2.7
Northern	1 426	629	751	37	84 827	2.3
Mersey-Lyell	1 499	803	286	30	71 998	2.4
<i>Total</i>	3 969	1 923	1 771	87	208 956	2.4
Northern Territory						
Darwin	129	92	216	2	5 657	3.3
Northern Territory - Bal	268	44	63 047	2	10 296	6.1
<i>Total</i>	397	136	63 263	3	15 953	4.7
Australia	132 983	43 774	439 531	2 378	10 403 759	4.4

^ estimate has a relative standard error of 10% to less than 25% and should be used with caution

* estimate has a relative standard error of 25% to 50% and should be used with caution

** estimate has a relative standard error greater than 50% and is considered too unreliable for general use

— nil or rounded to zero (including null cells)

np not available for publication but included in totals where applicable, unless otherwise indicated

(a) See Appendix 2.

(b) Averaged across all irrigated pastures or crops.

Note: Number of agricultural establishments and area of agricultural land sourced from *Agricultural Commodities 2002–03* (cat. no. 7121.0).

2.10**PASTURES AND CROPS IRRIGATED, Australia—By Industry—2002–03**

	<i>Pasture for grazing</i>	<i>Pasture for seed production</i>	<i>Pasture for hay and silage</i>	<i>Cereal crops cut for hay</i>	<i>Cereal crops for grain or seed</i>	<i>Cereal crops not for grain or seed</i>	<i>Rice</i>	<i>Sugar cane</i>	<i>Cotton</i>
NUMBER OF ESTABLISHMENTS IRRIGATING									
ANZSIC(a)									
0111 Plant nurseries	^ 83	np	*28	np	*7	**17	—	np	—
0112 Cut flower and flower seed growing	np	—	np	—	—	np	—	—	—
0113 Vegetable growing	374	^ 37	^ 342	^ 153	221	^ 33	*9	^ 82	**5
0114 Grape growing	*207	np	*86	**15	**18	np	—	—	—
0115 Apple and pear growing	*26	—	np	np	np	—	—	—	—
0116 Stone fruit growing	*11	—	**28	np	np	—	—	—	—
0117 Kiwi fruit growing	—	—	—	—	—	—	—	—	—
0119 Fruit growing n.e.c.	^ 92	**13	*77	*27	*24	**20	—	*56	—
0121 Grain growing	^ 400	^ 86	^ 277	^ 102	1 079	*79	459	np	*72
0122 Grain-sheep and grain-beef cattle farming	1 096	*63	^ 702	^ 240	952	*135	^ 150	—	np
0123 Sheep-beef cattle farming	^ 581	np	^ 495	*192	*64	**173	—	—	—
0124 Sheep farming	^ 739	^ 90	^ 416	^ 191	^ 201	*66	—	—	**27
0125 Beef cattle farming	3 691	*94	^ 1 648	^ 483	*292	*449	—	**37	**29
0130 Dairy cattle farming	6 262	**34	^ 1 286	^ 447	*213	^ 641	np	—	np
0141 Poultry farming (meat)	^ 49	—	np	np	np	np	—	np	—
0142 Poultry farming (eggs)	*6	—	*5	np	np	np	—	—	—
0151 Pig farming	^ 130	—	^ 56	*12	*43	*17	—	—	—
0152 Horse farming	*50	—	np	np	—	np	—	—	—
0159 Livestock farming n.e.c.	^ 171	—	np	np	—	np	—	—	—
0161 Sugar cane growing	np	**10	**68	*83	**42	np	—	2 475	—
0162 Cotton growing	**7	—	np	*37	^ 189	**12	—	—	495
0169 Crop and plant growing n.e.c.	^ 341	*138	^ 599	^ 184	^ 157	*61	np	**36	np
<i>All Agriculture</i>	14 341	np	6 152	2 210	3 528	np	np	np	np
All Other Industries	*78	np	*54	*5	*42	np	np	np	np
Total	14 419	^ 572	6 206	2 215	3 569	^ 1 764	631	2 710	647

^ estimate has a relative standard error of 10% to less than 25% and should be used with caution

* estimate has a relative standard error of 25% to 50% and should be used with caution

** estimate has a relative standard error greater than 50% and is considered too unreliable for general use

— nil or rounded to zero (including null cells)

np not available for publication but included in totals where applicable, unless otherwise indicated

(a) No establishments classified to ANZSIC 0153 Deer-farming reported irrigation.

2.10**PASTURES AND CROPS IRRIGATED, Australia—By Industry—2002–03** *continued*

	Other broadacre crops	Fruit trees, nut trees, plantation or berry fruits	Vegetables for human consumption	Vegetables for seed	Nurseries, cutflowers or cultivated turf	Grapevines	Total(a) (b)
NUMBER OF ESTABLISHMENTS IRRIGATING							
ANZSIC(c)							
0111 Plant nurseries	^ 11	^ 82	*53	np	1 819	*48	1 876
0112 Cut flower and flower seed growing	np	*27	**17	—	705	np	715
0113 Vegetable growing	338	^ 384	3 813	201	^ 50	^ 146	4 093
0114 Grape growing	**25	^ 786	*97	np	*23	6 129	6 228
0115 Apple and pear growing	np	839	**28	—	np	**36	851
0116 Stone fruit growing	np	1 153	*67	np	**17	^ 134	1 199
0117 Kiwi fruit growing	—	*38	—	—	—	—	*38
0119 Fruit growing n.e.c.	*97	4 234	^ 360	np	*77	^ 614	4 447
0121 Grain growing	^ 321	*111	*33	np	**23	^ 113	1 680
0122 Grain-sheep and grain-beef cattle farming	^ 185	**112	**36	np	—	*116	2 134
0123 Sheep-beef cattle farming	*34	**19	**19	np	np	*27	^ 1 151
0124 Sheep farming	^ 167	*124	^ 87	^ 58	np	*244	1 428
0125 Beef cattle farming	*121	*225	^ 154	*13	**13	*208	5 662
0130 Dairy cattle farming	*115	*47	*76	**20	np	**14	6 671
0141 Poultry farming (meat)	^ 3	*18	**10	—	*6	np	^ 78
0142 Poultry farming (eggs)	np	**21	np	—	—	np	*34
0151 Pig farming	*12	*25	4	—	—	np	^ 234
0152 Horse farming	—	—	—	—	—	—	*74
0159 Livestock farming n.e.c.	—	np	**14	—	np	—	^ 203
0161 Sugar cane growing	**33	*174	*197	—	np	—	2 614
0162 Cotton growing	*43	np	np	—	—	**12	495
0169 Crop and plant growing n.e.c.	^ 325	^ 75	^ 99	*11	np	*30	1 210
<i>All Agriculture</i>	1 849	8 495	5 171	333	2 795	7 887	43 116
All Other Industries	**30	*109	*54	*8	^ 161	*228	^ 658
Total	1 879	8 604	5 225	341	2 956	8 114	43 774

^ estimate has a relative standard error of 10% to less than 25% and should be used with caution

* estimate has a relative standard error of 25% to 50% and should be used with caution

** estimate has a relative standard error greater than 50% and is considered too unreliable for general use

— nil or rounded to zero (including null cells)

np not available for publication but included in totals where applicable, unless otherwise indicated

(a) Total agricultural establishments does not equal the sum of agricultural establishments as many establishments grow or irrigate more than one pasture or crop.

(b) Totals include other pastures or crops not elsewhere classified.

(c) No establishments classified to ANZSIC 0153 Deer-farming reported irrigation.

CHAPTER 3

IRRIGATION WATER AVAILABILITY

3.1 SOURCES OF IRRIGATION WATER, By State—2002–03

	Surface water	Groundwater	Town or country reticulated mains supply	Recycled or re-used water from off farm sources	Other
.....					
NUMBER OF ESTABLISHMENTS (a)					
NSW(b)	9 301	2 426	^ 605	^ 231	*70
Vic.	10 237	2 297	^ 625	^ 437	**43
Qld	6 520	4 812	^ 271	^ 243	*49
SA	2 444	2 662	^ 1 073	^ 114	**22
WA	1 477	1 340	^ 132	np	np
Tas.	1 707	^ 271	^ 144	*25	—
NT	5	127	6	np	np
Aust.	31 691	13 935	2 855	^ 1 053	^ 195

-
- ^ estimate has a relative standard error of 10% to less than 25% and should be used with caution
- * estimate has a relative standard error of 25% to 50% and should be used with caution
- ** estimate has a relative standard error greater than 50% and is considered too unreliable for general use
- nil or rounded to zero (including null cells)
- np not available for publication but included in totals where applicable, unless otherwise indicated
- (a) Establishments reporting more than one source are shown against each source reported.
- (b) Includes ACT.

3.2**TYPE OF WATER ENTITLEMENT(a), By State—2002–03**

	<i>Total irrigating</i>	<i>Volume entitlement(b)</i>	<i>Area entitlement</i>	<i>Other entitlement(c)</i>	<i>Unrestricted entitlement</i>	<i>No entitlement</i>
NUMBER OF ESTABLISHMENTS						
NSW(d)	11 230	8 052	^ 792	np	np	2 349
Vic.	12 005	10 262	**84	np	np	1 650
Qld	10 278	4 904	^ 1 119	np	np	4 245
SA	5 471	2 957	996	np	np	1 503
WA	2 731	1 439	*82	np	np	1 207
Tas.	1 923	1 317	np	np	np	577
NT	136	24	np	np	np	110
Aust.	43 774	28 956	3 095	*32	*51	11 640

- ^ estimate has a relative standard error of 10% to less than 25% and should be used with caution
- * estimate has a relative standard error of 25% to 50% and should be used with caution
- ** estimate has a relative standard error greater than 50% and is considered too unreliable for general use
- np not available for publication but included in totals where applicable, unless otherwise indicated
- (a) For definition see Glossary.
- (b) Includes agricultural establishments reporting both volume and area entitlements.
- (c) Not restricted by area or volume.
- (d) Includes ACT.

3.3**ALLOCATION OF VOLUME ENTITLEMENTS(a)(b), By State—2002–03**

	<i>Irrigating agricultural establishments with volume entitlement no.</i>	<i>Volume of entitlements ML</i>	<i>Volume of entitlements allocated ML</i>
NSW(c)	8 052	7 962 325	4 077 819
Vic.	10 262	2 825 506	2 417 086
Qld	4 904	1 835 236	1 466 491
SA	2 957	^ 692 874	^ 670 234
WA	1 439	419 431	380 546
Tas.	1 317	235 361	222 322
NT	24	15 197	15 197
Aust.	28 956	13 985 930	9 249 695

- ^ estimate has a relative standard error of 10% to less than 25% and should be used with caution
- (a) Allocation received by irrigating establishments that held an entitlement restricted by volume that were in scope of the Water Survey - Agriculture 2002–03 (see Explanatory Notes, paragraph 5).
- (b) For definition see Glossary.
- (c) Includes ACT.

3.4 EXTRA WATER PURCHASED ON A TEMPORARY BASIS (a), By State—2002–03

	<i>Irrigating agricultural establishments purchasing extra water no.</i>	<i>Volume purchased ML</i>	<i>Purchases no.</i>	<i>Amount spent \$'000</i>
NSW(b)	1 744	560 604	4 279	58 823
Vic.	2 234	^ 228 885	^ 5 511	^ 50 262
Qld	^ 911	^ 153 160	^ 1 448	* 7 788
SA	^ 252	^ 26 138	* 630	* 6 322
WA	^ 140	^ 14 313	^ 199	* 302
Tas.	^ 147	^ 8 052	^ 205	474
NT	—	—	—	—
Aust.	5 429	991 152	12 272	123 972

^ estimate has a relative standard error of 10% to less than 25% and should be used with caution

* estimate has a relative standard error of 25% to 50% and should be used with caution

— nil or rounded to zero (including null cells)

(a) Purchases of extra water do not equal sales of water as water trading is undertaken between irrigating agricultural establishments, non-irrigating agricultural establishments and non-agricultural water users and suppliers.

(b) Includes ACT.

3.5**EXTRA WATER PURCHASED ON A PERMANENT BASIS(a), By State—2002–03**

	<i>Irrigating agricultural establishments purchasing extra water no.</i>	<i>Volume purchased ML</i>	<i>Purchases no.</i>	<i>Amount spent \$'000</i>
NSW(b)	*132	*42 465	*166	*36 195
Vic.	*136	**28 133	*196	*12 767
Qld	*133	**63 687	**279	**36 320
SA	*47	*5 583	*50	*6 190
WA	np	np	np	np
Tas.	np	np	np	np
NT	—	—	—	—
Aust.	^ 455	*140 448	^ 697	*91 528

^ estimate has a relative standard error of 10% to less than 25% and should be used with caution

* estimate has a relative standard error of 25% to 50% and should be used with caution

** estimate has a relative standard error greater than 50% and is considered too unreliable for general use

— nil or rounded to zero (including null cells)

np not available for publication but included in totals where applicable, unless otherwise indicated

(a) Purchases of extra water do not equal sales of water as water trading is undertaken between irrigating agricultural establishments, non-irrigating agricultural establishments and non-agricultural water users and suppliers.

(b) Includes ACT.

3.6 WATER SOLD ON A TEMPORARY BASIS(a), By State—2002–03

	<i>Irrigating agricultural establishments selling water no.</i>	<i>Volume sold ML</i>	<i>Sales no.</i>	<i>Amount received \$'000</i>
NSW(b)	1 412	^ 206 255	2 685	^ 23 464
Vic.	^ 1 468	664 570	^ 3 036	172 015
Qld	^ 324	^ 55 782	^ 517	*3 131
SA	^ 146	^ 11 602	*278	^ 1 597
WA	*22	**4 780	*35	**99
Tas.	^ 26	*1 191	^ 44	*53
NT	—	—	—	—
Aust.	3 398	944 180	6 595	200 359

^ estimate has a relative standard error of 10% to less than 25% and should be used with caution

* estimate has a relative standard error of 25% to 50% and should be used with caution

** estimate has a relative standard error greater than 50% and is considered too unreliable for general use

— nil or rounded to zero (including null cells)

(a) Sales of water do not equal purchases of extra water as water trading is undertaken between irrigating agricultural establishments, non-irrigating agricultural establishments and non-agricultural water users and suppliers.

(b) Includes ACT.

3.7 WATER SOLD ON A PERMANENT BASIS(a), By State—2002–03

	<i>Irrigating agricultural establishments selling water no.</i>	<i>Volume sold ML</i>	<i>Sales no.</i>	<i>Amount received \$'000</i>
NSW(b)	3	2 750	11	np
Vic.	**31	**12 399	**31	**1 562
Qld	**76	**2 417	**76	**1 391
SA	*18	*834	*18	*927
WA	np	np	np	np
Tas.	np	np	np	np
NT	—	—	—	—
Aust.	*133	*18 535	*141	^ 5 670

- ^ estimate has a relative standard error of 10% to less than 25% and should be used with caution
- * estimate has a relative standard error of 25% to 50% and should be used with caution
- ** estimate has a relative standard error greater than 50% and is considered too unreliable for general use
- nil or rounded to zero (including null cells)
- np not available for publication but included in totals where applicable, unless otherwise indicated
- (a) Sales of water do not equal purchases of extra water as water trading is undertaken between irrigating agricultural establishments, non-irrigating agricultural establishments and non-agricultural water users and suppliers.
- (b) Includes ACT.

CHAPTER 4

IRRIGATION WATER MANAGEMENT

4.1

IRRIGATION METHODS, By State—2002–03

	NSW(a)	Vic.	Qld	SA	WA	Tas.	NT	Aust.
NUMBER OF ESTABLISHMENTS (b)								
Surface	3 949	5 986	1 956	^ 699	^ 324	^ 57	—	12 970
Drip or trickle								
Above ground	1 962	1 873	1 753	2 235	1 418	365	26	9 632
Subsurface	*199	^ 136	^ 600	*27	^ 183	*8	5	1 156
Sprinkler								
Microspray	1 503	1 028	1 808	1 278	661	^ 104	88	6 469
Portable irrigators	^ 2 034	^ 1 373	1 974	^ 510	^ 85	^ 252	5	6 231
Hose irrigators	1 825	^ 1 329	3 315	^ 355	np	1 229	np	8 122
Large mobile machines	^ 739	^ 498	^ 674	589	^ 30	^ 192	7	2 730
Solid set	1 053	1 424	1 359	1 046	426	164	14	5 487
Other	*158	*187	^ 288	*96	np	*35	np	^ 848
AREA IRRIGATED ('000 ha) (c)								
Surface	691	386	208	^ 35	^ 17	^ 6	—	1 344
Drip or trickle								
Above ground	31	^ 42	^ 29	55	^ 17	^ 5	1	180
Subsurface	^ 5	^ 3	^ 13	*—	^ 1	*—	—	23
Sprinkler								
Microspray	^ 15	18	24	17	^ 5	^ 1	2	80
Portable irrigators	^ 45	^ 28	^ 35	^ 4	^ 1	^ 10	—	123
Hose irrigators	^ 54	^ 32	154	^ 5	np	44	np	289
Large mobile machines	^ 55	^ 40	^ 50	44	1	19	1	209
Solid set	^ 15	^ 32	^ 18	^ 20	4	^ 2	—	91
Other	*2	*5	*5	^ 1	np	*1	np	^ 14

^ estimate has a relative standard error of 10% to less than 25% and should be used with caution

* estimate has a relative standard error of 25% to 50% and should be used with caution

— nil or rounded to zero (including null cells)

np not available for publication but included in totals where applicable, unless otherwise indicated

(a) Includes ACT.

(b) Establishments reporting irrigating by more than one method are shown against each method reported.

(c) Areas reported as being irrigated by more than one method are shown against each method reported.

4.2**IRRIGATION DECISION-MAKING, By State—2002–03**

NSW(a) Vic. Qld SA WA Tas. NT Aust.

NUMBER OF ESTABLISHMENTS**Tools used(b)**

Evaporation figures or graphs	1 221	^ 787	^ 983	^ 606	^ 360	^ 254	8	4 218
Tensiometers	^ 828	^ 845	1 038	^ 579	^ 483	319	28	4 119
Soil probes	1 422	^ 1 188	1 040	1 644	^ 245	255	12	5 806
Government or commercial scheduling service	^ 311	*363	*226	^ 125	**27	*67	4	^ 1 122
Calendar or rotational scheduling	1 230	^ 1 812	^ 1 201	795	^ 418	^ 248	16	5 720
Knowledge or observation	10 370	11 058	9 500	4 630	2 430	1 701	110	39 799
Other	^ 324	^ 389	^ 462	^ 366	*78	^ 44	3	1 667

^ estimate has a relative standard error of 10% to less than 25% and should be used with caution

** estimate has a relative standard error greater than 50% and is considered too unreliable for general use

* estimate has a relative standard error of 25% to 50% and should be used with caution

(a) Includes ACT.

(b) Agricultural establishments reporting more than one tool are shown against each tool reported.

4.3**CHANGES TO IRRIGATION PRACTICES, By State—Five Years to 30 June 2003**

NSW(a) Vic. Qld SA WA Tas. NT Aust.

NUMBER OF ESTABLISHMENTS

Total irrigating	11 230	12 005	10 278	5 471	2 731	1 923	136	43 774
Made no changes	3 316	3 470	3 198	1 526	991	644	65	13 211
Made one or more changes	7 914	8 535	7 080	3 945	1 739	1 278	71	30 563
Type of change(b)								
More efficient irrigation application techniques	5 399	5 272	4 720	2 785	1 144	886	41	20 247
More efficient irrigation scheduling	3 761	4 185	3 898	2 584	1 082	640	36	16 186
Piping or covered open channels to reduce water loss	1 066	^ 1 125	^ 1 144	^ 413	^ 174	238	10	4 171
Levee banks and/or drains	1 803	^ 1 281	^ 1 042	^ 136	np	^ 136	np	4 526
Laser-levelled	2 604	2 989	1 908	^ 379	^ 138	np	np	8 035
Irrigation water re-use or recycling	1 969	2 167	^ 1 032	^ 133	*63	^ 59	—	5 423
On-farm soil moisture monitoring	1 370	^ 1 179	1 506	1 631	^ 312	391	31	6 420
Documented farm water plan	1 576	^ 845	^ 457	^ 406	^ 148	^ 107	5	3 544
Other	^ 961	^ 786	^ 729	^ 389	^ 242	^ 127	6	3 240

^ estimate has a relative standard error of 10% to less than 25% and should be used with caution

np not available for publication but included in totals where applicable, unless otherwise indicated

* estimate has a relative standard error of 25% to 50% and should be used with caution

(a) Includes ACT.

(b) Agricultural establishments reporting more than one change are shown against each change reported.

— nil or rounded to zero (including null cells)

4.4 INTENDED CHANGES TO IRRIGATION PRACTICES(a), By State

	NSW(b)	Vic.	Qld	SA	WA	Tas.	NT	Aust.
NUMBER OF ESTABLISHMENTS								
Total irrigating	11 230	12 005	10 278	5 471	2 731	1 923	136	43 774
No intended changes	5 249	7 115	6 150	2 994	1 820	1 141	93	24 562
Intending to make one or more changes	5 981	4 890	4 128	2 477	911	782	43	19 212
Type of change(c)								
More efficient irrigation application techniques	3 057	2 196	2 149	1 329	^ 425	432	34	9 623
More efficient irrigation scheduling	2 207	^ 1 838	1 638	1 076	^ 362	316	14	7 450
Piping or covered open channels to reduce water loss	^ 487	^ 300	^ 346	*126	*38	^ 101	7	1 406
Levee banks and/or drains	^ 860	^ 256	^ 350	*24	*44	^ 33	—	1 567
Laser-level	1 635	^ 1 263	^ 733	*97	^ 100	*12	—	3 840
Irrigation water re-use or recycling	1 076	^ 486	^ 393	^ 77	*57	*23	—	2 112
On-farm soil moisture monitoring	1 162	^ 864	^ 752	^ 652	^ 231	^ 217	3	3 881
Document farm water plan	1 083	^ 458	^ 484	^ 287	^ 133	np	np	2 507
Other	1 126	^ 536	^ 620	^ 435	^ 178	^ 171	13	3 079

- ^ estimate has a relative standard error of 10% to less than 25% and should be used with caution
- * estimate has a relative standard error of 25% to 50% and should be used with caution
- nil or rounded to zero (including null cells)
- np not available for publication but included in totals where applicable, unless otherwise indicated
- (a) Intention held in the year ending 30 June 2003 to make one or more changes in the year ending 30 June 2004.
- (b) Includes ACT.
- (c) Agricultural establishments reporting more than one intended change are shown against each change reported.

4.5**BARRIERS TO CHANGING IRRIGATION PRACTICES, By State—2002–03**

NSW(a) Vic. Qld SA WA Tas. NT Aust.

NUMBER OF ESTABLISHMENTS

Total irrigating	11 230	12 005	10 278	5 471	2 731	1 923	136	43 774
No barriers	1 900	2 387	1 801	1 735	1 158	508	65	9 554
One or more barriers	9 330	9 618	8 477	3 736	1 573	1 415	71	34 219
Type of barrier(b)								
Inadequate water quality	^ 656	^ 721	^ 849	^ 459	^ 306	np	np	3 033
Uncertainty of water allocation	4 285	3 747	2 785	1 058	^ 249	246	—	12 370
Lack of financial resources	5 685	6 096	5 464	2 145	777	819	41	21 027
Lack of time	1 501	^ 1 436	^ 1 294	^ 687	^ 288	^ 266	16	5 488
Insufficient or inadequate information	^ 411	^ 349	^ 338	^ 293	^ 156	^ 45	7	1 600
Doubts about likely success	^ 1 184	^ 820	^ 796	^ 473	^ 215	^ 98	5	3 591
Age or poor health	^ 1 171	^ 1 601	^ 1 337	^ 474	^ 228	^ 258	4	5 074
Inadequate water availability	3 470	2 808	3 902	^ 557	^ 403	399	7	11 546
Other	1 257	^ 1 177	^ 1 013	^ 758	^ 274	^ 224	15	4 718

^ estimate has a relative standard error of 10% to less than 25% and should be used with caution

(a) Includes ACT.

— nil or rounded to zero (including null cells)

(b) Agricultural establishments reporting more than one barrier are shown against each barrier reported.

np not available for publication but included in totals where applicable, unless otherwise indicated

4.6**OTHER ON-FARM WATER MANAGEMENT, By State—2002–03**

NSW(a) Vic. Qld SA WA Tas. NT Aust.

NUMBER OF ESTABLISHMENTS

Total irrigating	11 230	12 005	10 278	5 471	2 731	1 923	136	43 774
On-farm water storage	5 966	6 214	5 397	1 786	1 635	1 573	11	22 582
On-farm recycled water for agricultural production	2 827	3 522	1 631	^ 362	^ 153	^ 207	3	8 705
Land laser-levelled for irrigation(b)	3 539	4 690	2 573	^ 538	^ 275	*29	3	11 647

('000 ha)

Area laser-levelled for irrigation(b)	1 063	379	318	^ 33	16	np	np	1 809
---------------------------------------	-------	-----	-----	------	----	----	----	-------

^ estimate has a relative standard error of 10% to less than 25% and should be used with caution

np not available for publication but included in totals where applicable, unless otherwise indicated

* estimate has a relative standard error of 25% to 50% and should be used with caution

(a) Includes ACT.

(b) Includes laser-levelling undertaken prior to the reference year.

5.1 IRRIGATION EXPENDITURE, By State—2002–03

	NSW(a)	Vic.	Qld	SA	WA	Tas.	NT	Aust.
(\$'000)								
Water licence and application charges	^ 40 142	23 777	^ 17 256	^ 5 072	^ 2 933	^ 698	—	89 879
Irrigation water volumetric and usage charges	110 752	106 150	^ 47 023	np	4 737	1 154	np	292 673
Irrigation fees and charges	13 411	^ 9 817	^ 2 252	np	2 572	^ 191	np	33 999
Purchase of irrigation equipment	^ 132 855	^ 83 510	98 767	42 510	20 244	26 773	682	405 342
Irrigation operating expenditure	174 342	73 115	141 747	55 823	23 693	18 801	3 730	491 251
Construction of earthworks for irrigation purposes	78 041	^ 14 175	^ 25 465	^ 4 293	*5 069	^ 5 739	—	132 781
Other	^ 19 686	^ 5 868	^ 10 207	^ 6 146	**3 092	^ 956	173	46 128
Total	569 229	316 413	342 715	142 420	62 340	54 313	4 623	1 492 054

^ estimate has a relative standard error of 10% to less than 25% and should be used with caution

* estimate has a relative standard error of 25% to 50% and should be used with caution

** estimate has a relative standard error greater than 50% and is considered too unreliable for general use

— nil or rounded to zero (including null cells)

np not available for publication but included in totals where applicable, unless otherwise indicated

(a) Includes ACT.

5.2**CAPITAL EXPENDITURE ON IRRIGATION, By State—1998–99 to 2002–03**

	NSW(a)	Vic.	Qld	SA	WA	Tas.	NT	Aust.
NUMBER OF ESTABLISHMENTS								
Less than \$9 999	4 803	4 995	4 049	1 966	1 220	660	47	17 740
\$10 000 to \$99 999	4 407	5 558	4 618	2 732	1 191	873	71	19 450
\$100 000 to \$499 999	1 610	^ 1 324	1 363	625	^ 284	346	13	5 566
\$500 000 to \$999 999	^ 172	np	^ 144	np	**23	*33	—	537
\$1 Million to \$5 Million	^ 229	*37	^ 93	^ 66	*12	^ 10	5	^ 452
Greater than \$5 Million	9	np	*12	np	—	—	—	^ 29

^ estimate has a relative standard error of 10% to less than 25% and should be used with caution

* estimate has a relative standard error of 25% to 50% and should be used with caution

** estimate has a relative standard error greater than 50% and is considered too unreliable for general use

— nil or rounded to zero (including null cells)

np not available for publication but included in totals where applicable, unless otherwise indicated

(a) Includes ACT.

5.3**GROSS VALUE OF AGRICULTURAL PRODUCTION, By State—2002–03**

	NSW(a)	Vic.	Qld	SA	WA	Tas.	NT	Aust.
TOTAL AGRICULTURAL PRODUCTION (NUMBER OF ESTABLISHMENTS)								
Less than \$24 999	2 274	^ 2 153	2 069	^ 813	^ 521	^ 197	32	8 059
\$25 000 to \$49 999	^ 1 265	^ 1 097	^ 1 380	^ 620	^ 248	^ 169	23	4 803
\$50 000 to \$99 999	^ 1 500	1 740	^ 1 372	^ 1 034	^ 470	^ 331	24	6 471
\$100 000 to \$149 999	1 268	^ 1 221	^ 1 153	^ 667	^ 273	^ 187	7	4 776
\$150 000 to \$199 999	^ 884	^ 1 199	^ 853	^ 595	^ 275	^ 196	20	4 023
\$200 000 to \$349 999	1 458	^ 2 206	1 556	^ 602	^ 320	338	8	6 489
\$350 000 to \$499 999	836	^ 830	^ 665	^ 385	np	^ 225	np	3 148
\$500 000 to \$999 999	939	^ 1 013	732	398	^ 279	164	9	3 534
\$1 Million to \$2 Million	580	^ 408	332	^ 244	^ 82	^ 99	5	1 750
Greater than \$2 Million	^ 224	^ 137	167	^ 113	np	17	np	721

IRRIGATED AGRICULTURAL PRODUCTION (NUMBER OF ESTABLISHMENTS)

Less than \$24 999	3 366	3 685	3 239	1 320	^ 839	440	33	12 922
\$25 000 to \$49 999	1 587	^ 1 428	^ 1 016	^ 886	^ 315	^ 297	26	5 554
\$50 000 to \$99 999	1 675	^ 1 444	^ 1 365	^ 1 033	^ 427	^ 332	26	6 301
\$100 000 to \$149 999	1 084	^ 1 297	^ 1 160	^ 491	^ 221	195	6	4 453
\$150 000 to \$199 999	^ 699	^ 968	^ 766	^ 411	^ 236	^ 160	18	3 256
\$200 000 to \$349 999	1 170	1 595	1 188	^ 552	^ 291	244	7	5 048
\$350 000 to \$499 999	^ 529	^ 575	^ 524	^ 253	np	^ 107	np	2 108
\$500 000 to \$999 999	585	^ 609	615	^ 286	^ 172	^ 75	9	2 352
\$1 Million to \$2 Million	^ 350	^ 290	^ 274	^ 140	^ 78	^ 67	6	1 206
Greater than \$2 Million	^ 185	^ 115	131	^ 101	np	5	np	573

^ estimate has a relative standard error of 10% to less than 25% and should be used with caution

np not available for publication but included in totals where applicable, unless otherwise indicated

(a) Includes ACT.

EXPLANATORY NOTES

INTRODUCTION

1 This publication presents results from the ABS Water Survey - Agriculture 2002–03 which was conducted as a supplement to the Agricultural Survey 2002–03.

SCOPE AND COVERAGE

2 The scope of the Agricultural Survey 2002–03 is establishments undertaking agricultural activity with an estimated value of agricultural operations (EVAO) of \$5,000 or more.

3 For the Agricultural Survey 2001–02, a stratified random sample of 35,000 farms was selected. For the Agricultural Survey 2002–03, a sub-sample of 28,000 units from the 2001–02 selections was used. This helped control the estimates of movement for that year which was particularly important given the impact of the drought.

4 The Water Survey - Agriculture 2002–03 was targeted at the reference population of farm establishments which answered yes to the question, 'Did you irrigate between 1 July 2002 and 30 June 2003?', in the Agricultural Survey 2002–03. In addition, large units which did not respond to the question were included. The survey results in this publication are based on a sample of approximately 8,000 farm establishments and the results have been weighted to cover the full reference population. Estimates were adjusted for errors in response to the trigger question. A response rate of 91% was achieved.

5 A number of agricultural establishments hold water entitlements that are not included in the estimates presented in this publication. These include entitlements used for other agricultural practices, eg. stock watering, dairy wash-down and produce cleaning, establishments that did not irrigate during the reference period and establishments with an EVAO of less than \$5,000. These establishments fall outside the scope of this survey.

AGRICULTURAL ESTABLISHMENTS

6 The unit for which statistics were reported in the survey was the establishment unit. For the Water Survey - Agriculture 2002–03, the concept of an establishment is the same as that used in the Agricultural Census and the Agricultural Survey. An agricultural establishment is the smallest accounting unit within a State or Territory controlling its productive activities and maintaining a specified range of detailed data enabling value-added to be calculated. In general an establishment covers all operations at a physical location, but may consist of a group of locations provided they are within the same Statistical Local Area (SLA) or contiguous SLAs. The majority of agricultural establishments operate at one location only.

REFERENCE PERIOD

7 Data contained in the tables in this publication relate to agricultural businesses within the survey scope (see paragraph 2), which operated in Australia at any time during the year ended June 2003.

ADDITIONAL DATA

8 Data related to the number of agricultural establishments, the total area of agricultural land and the area of land planted to crops was collected in the Agricultural Survey 2002–03 and the Vineyards Survey 2003.

COMPARABILITY WITH ADDITIONAL DATA

9 Some estimates of irrigating agricultural establishments and area of crop irrigated presented in this publication are higher than the estimates of total agricultural establishments and area of land planted to that crop. Analysis has shown this has arisen due to issues associated with the comparison of data sourced from three separate

COMPARABILITY WITH
ADDITIONAL DATA *continued*

collections. Each of these three collections is subject to both sampling error and non-sampling errors (such as reporting errors and non-response). Several measures have been implemented to minimise the discrepancies, including extensive data editing, follow up with respondents to verify reported values and adjustments for non-response. For further information please contact the Director, Environment and Energy Business Statistics Centre, on (03) 6222 5804.

COMPARABILITY WITH WATER
ACCOUNT

10 Estimates of water usage presented in this publication differ from those presented in the *Water Account Australia 2000–01* (cat. no. 4610.0). Estimates from the Water Survey - Agriculture 2002–03 represent only water used for the irrigation of pastures and crops during the reference period as reported by irrigating agricultural establishments. Estimates of water usage presented in the Water Account represent water used for all agricultural purposes. For the Water Account, water use was determined by applying regional water application rates, obtained from water supplier surveys and state and territory or industry contacts, to the area of irrigated crops and livestock numbers. For further information please contact the Director, Centre of Environment and Energy Statistics, on (02) 6252 7348.

INDUSTRY CLASSIFICATION

11 Units in the Water Survey - Agriculture 2002–03 have been classified according to the methodology described in *Australian and New Zealand Standard Industrial Classification (ANZSIC)* (cat. no. 1292.0).

RELIABILITY OF DATA

12 The estimates in this publication are subject to sampling and non-sampling errors.

SAMPLING ERRORS

13 The estimates in this publication are based on information obtained from a sample drawn from the total farm population in scope of the collection, and are subject to sampling variability; that is, they may differ from figures that would have been produced if all farms had been included in the survey. One measure of the likely difference is given by the standard error (SE), which indicates the extent to which an estimate might have varied by chance because only a sample of units was included. There are about two chances in three that a sample estimate will differ by less than one SE from the figure that would have been obtained if a census had been conducted, and approximately nineteen chances in twenty that the difference will be less than two SEs.

14 In this publication, 'sampling' variability of the estimates is measured by the relative standard error (RSE) which is obtained by expressing the SE as a percentage of the estimates to which it refers.

15 Where the RSE of an estimate included in this publication falls in the range of 10% to less than 25%, it has been annotated with the symbol '^' indicating that the estimate should be used with caution as it is subject to sampling variability too high for some purposes. Where the RSE of an estimate is 25% to 50%, it has been annotated with the symbol '*', indicating that the estimate should be used with caution as it is subject to sampling variability too high for most practical purposes. Where the RSE of an estimate exceeds 50%, it has been annotated with the symbol '**', indicating that the sampling variability causes the estimate to be considered too unreliable for general use. Separate indication of the RSEs of all estimates is available on request.

16 The following table contains estimates of RSEs for a selection of the statistics presented in this publication.

RELATIVE STANDARD ERRORS OF SELECTED ESTIMATES, By State—2002–03

	NSW(a)	Vic.	Qld	SA	WA	Tas.	NT	Aust.
	%	%	%	%	%	%	%	%
Total area irrigated (ha)	4.1	4.4	4.1	4.8	6.6	4.1	—	2.2
Total volume applied (ML)	5.2	4.3	7.5	5.3	5.6	4.6	—	2.9
Cereal crops for grain or seed - area irrigated (ha)	5.4	14.9	12.2	19.5	11.8	12.9	—	4.6
Cereal crops for grain or seed - volume applied (ML)	6.3	13.9	15.6	19.2	4.7	15.8	—	5.5
Vegetables for human consumption - area irrigated (ha)	5.3	3.1	4.2	5.0	5.2	3.1	—	1.8
Vegetables for human consumption - volume applied (ML)	7.9	3.7	5.4	5.4	4.1	3.6	—	2.3
Nurseries cutflowers or cultivated turf - area irrigated (ha)	8.4	6.0	6.1	15.7	4.5	7.8	—	3.6
Nurseries cutflowers or cultivated turf - volume applied (ML)	9.6	7.0	5.9	29.8	6.1	16.4	—	5.0
Ongoing water entitlement - number	3.3	4.0	4.7	3.6	6.1	4.2	—	1.9
Ongoing water entitlement - volume (ML)	4.1	4.7	7.0	12.6	7.5	6.4	—	2.8
Quantity of ongoing entitlement allocated - (ML)	5.0	4.2	7.5	13.0	8.1	6.7	—	2.9
Irrigation methods - surface - area irrigated (ha)	5.1	5.3	7.8	15.5	11.0	21.7	—	3.3
Irrigation methods - sprinkler - microspray - area irrigated (ha)	17.9	8.3	6.4	6.3	10.1	14.6	—	4.5

— nil or rounded to zero (including null cells)

(a) Includes ACT

NON-SAMPLING ERRORS

17 Errors other than those due to sampling may occur because of deficiencies in the list of units from which the sample was selected, non-response, and errors in reporting by providers. Inaccuracies of this kind are referred to as non-sampling error, which may occur in any collection, whether it be a census or a sample. Every effort has been made to reduce non-sampling error to a minimum by careful design and testing of questionnaires, operating procedures and systems used to compile the statistics.

ABS DATA AVAILABLE ON REQUEST

18 As well as the statistics included in this and related publications, the ABS may have other relevant data available on request. Inquiries should be made to either the National Information and Referral Service on 1300 135 070 or Cherie Poulton on (03) 6222 5983.

RELATED PUBLICATIONS

19 A range of environmental and agricultural publications is produced by the ABS, including:

- *Water Account, Australia* (cat. no. 4610.0)
- *Agricultural Commodities, Australia* (cat. no. 7121.0)
- *Environment Expenditure Local Government* (cat. no. 4611.0)

20 Current publications and other products released by the ABS are listed in the *Catalogue of Publications and Products* (cat. no. 1101.0). The Catalogue is available from any ABS office or the ABS web site <<http://www.abs.gov.au>>. The ABS also issues a daily Release Advice on the web site which details products to be released in the week ahead.

ACKNOWLEDGMENT

21 ABS publications draw extensively on information provided freely by individuals, businesses, governments and other organisations. Their continued cooperation is very much appreciated; without it, the wide range of statistics published by the ABS would not be available. Information received by the ABS is treated in strict confidence, as required by the *Census and Statistics Act 1905*.

CLIMATE CONDITIONS IN
2002-03

2002-03 saw the peak of a severe drought, which affected almost all of Australia from March 2002 onwards, associated with an El Niño event which developed during the autumn of 2002. By late 2002, the drought had become one of the most severe experienced in Australia, particularly in terms of its spatial extent. For the 8-month period ending in October 2002, 97% of Australia experienced below-normal rainfall, and 71% experienced rainfall below the 10th percentile. The only region which experienced sustained above-normal rainfall over this period was western Tasmania.

The drought began easing in north-western Australia from November 2002, and in many other parts of Australia from February 2003, as the El Niño began to break down. Nevertheless, there were numerous areas, notably in Victoria and southern New South Wales, where severe rainfall deficiencies still existed in mid-2003 (and beyond).

For 2002-03 as a whole, rainfall was significantly below average through most of eastern mainland Australia, as well as the agricultural regions of South Australia and parts of south-western Western Australia. Record low 12-month rainfall totals occurred in parts of southern Victoria from Melbourne eastwards, as well as in southern inland New South Wales, west of Canberra.

The national average rainfall for 2002-03 was 398mm, 16% below the 1961-90 normal and ranking 27th lowest in 103 years of records. Most of this rainfall occurred from January 2003 onwards, with the July-December 2002 total of 94mm (44% below normal) being the lowest on record. The 2002-03 totals in New South Wales (354mm, 38% below normal) and Victoria (460mm, 30% below normal) both ranked 5th lowest on record, whilst the Murray-Darling Basin total was fourth-lowest on record (317mm, 37% below normal) and the lowest since 1928-29.

Daytime maximum temperatures were well above normal throughout 2002-03, with the exception of March 2003, and over Australia as a whole were the highest on record by a substantial margin. 2002-03 maximum temperatures were 1.10°C above the 1961-90 normal, well above the previous record of +0.73°C set in 1997-98. Records were also set in all States and Territories except Tasmania (3rd highest) and the Northern Territory (5th highest). The high daytime temperatures were particularly persistent in the first half of the period, during the peak of the drought, with all the months from July to December 2002 experiencing maximum temperature anomalies exceeding 1°C. The largest maximum temperature anomalies (exceeding +2°C in places) occurred in inland New South Wales and southern Queensland, but virtually all of Australia exceeded the long-term average.

The most notable extreme temperature events occurred in January 2003, when record high temperatures occurred at numerous locations in south-eastern Australia around the time of the severe bushfires affecting the region and Melbourne (44.1°C) had its hottest day since 1939. In October 2002, Port Hedland set a new Australian October record of 46.9°C and monthly records occurred at many locations in Queensland, Western Australia and New South Wales.

Overnight minimum temperatures for 2002-03 were slightly (0.25°C) above normal averaged over Australia, with most places being within 1°C of normal. Characteristically for an El Niño year, minimum temperatures were generally below normal in the winter of 2002, switching to above normal during summer 2002-03. Low minimum temperatures

CLIMATE CONDITIONS IN
2002-03 *continued*

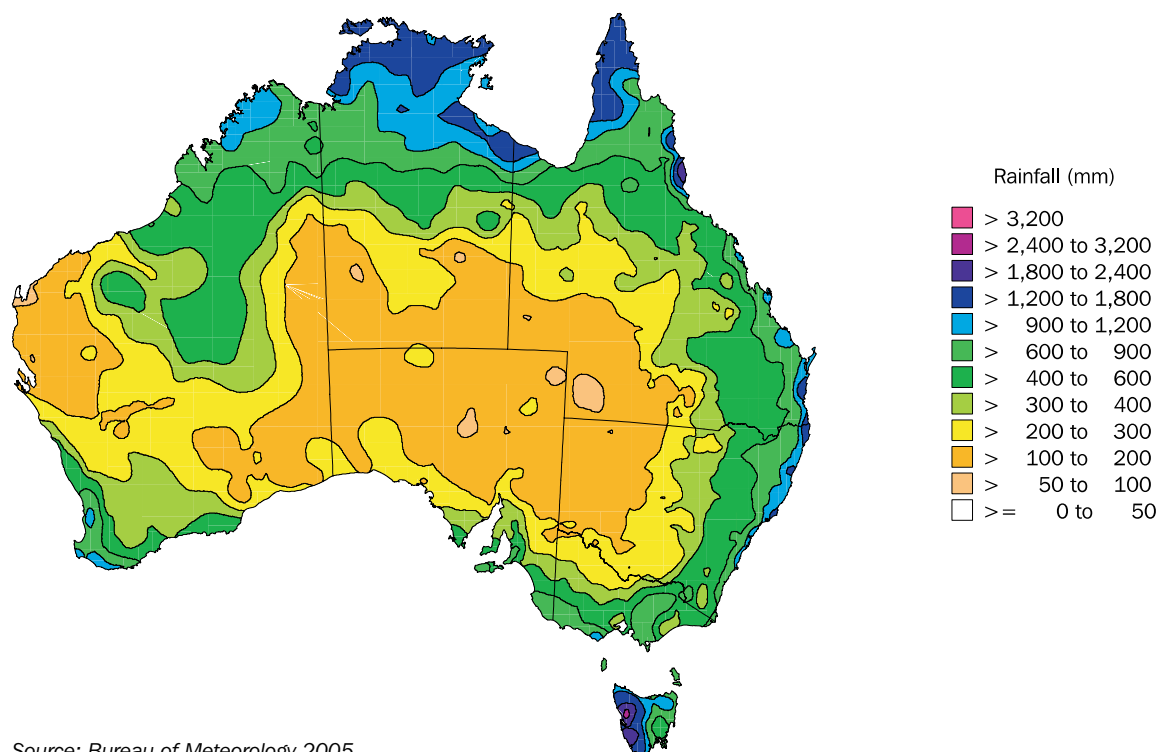
were particularly pronounced in inland Australia during July and August 2002, with all-time records being set at a number of locations in northern New South Wales in July, and Woolbrook (near Armidale) falling below -10°C on 9 nights.

Other notable regional and shorter-term features included:

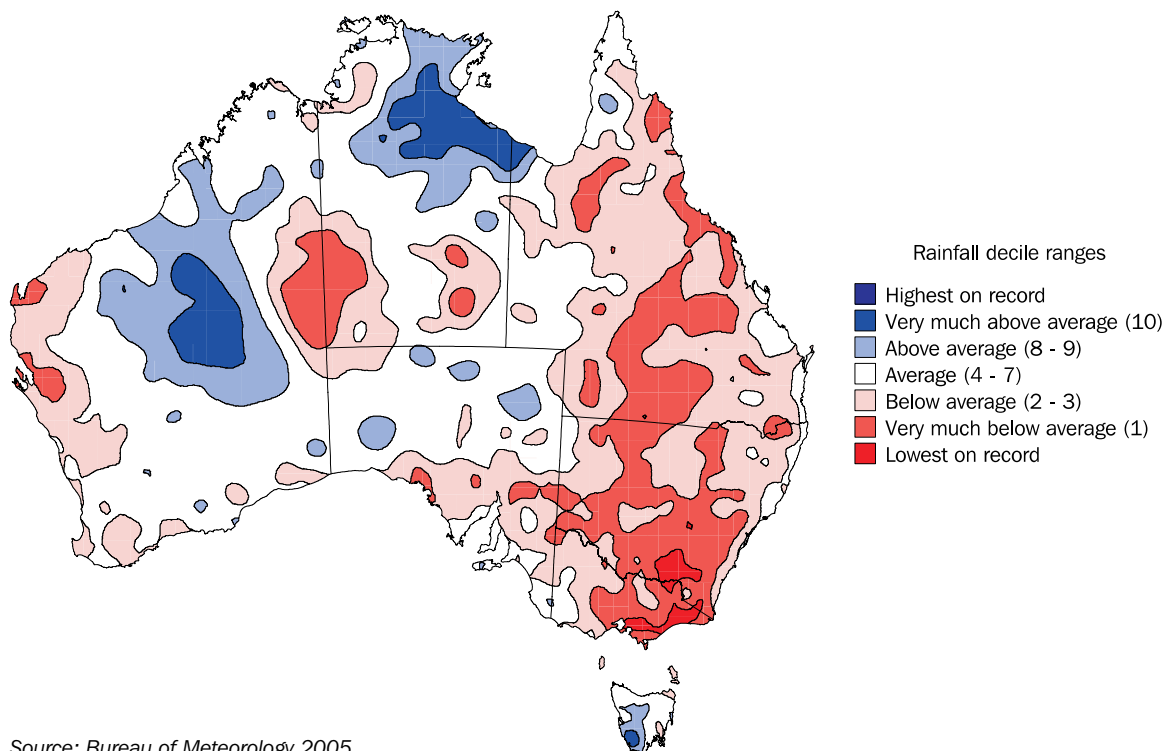
- Whilst most of the individual months during the drought were not exceptional in their own right, major exceptions were October 2002 (very dry everywhere except Tasmania, and the driest on record in large parts of NSW) and January 2003 (driest on record in much of the south-eastern quarter of Queensland).
- Along most of the NSW coast, very dry conditions prevailed from July 2002 until May 2003, when a single rain event (225mm in six days at Sydney) provided widespread relief. The 12 months ending in February 2003 (486mm) was the driest 12-month period on record in Sydney.
- Long-term rainfall anomalies which have been present since 1996 or earlier continued in a number of areas; persistent dry conditions continued to affect southern Victoria, south-western Western Australia and parts of the central and southern coasts of Queensland, whilst rainfall in the first half of 2003 continued a pattern of generally above-normal rainfall in much of the north-western quadrant of Australia. Whilst rainfall anomalies in the Sydney region over this seven-year period have been modest, a notable feature has been an absence of any extreme wet months since 1998, particularly away from the immediate vicinity of the coast.
- A major rain event affected north-eastern Northern Territory and the far north-west of Queensland in January 2003, in contrast with the dry conditions that prevailed elsewhere during this period. Redbank Mine, near the Gulf of Carpentaria coast in the eastern NT, recorded 1076mm in 9 days from 9-17 January 2003, and 1252mm for the month as a whole, the highest monthly rainfall on record for any Northern Territory location.
- Tasmanian rainfall in 2002-03 was something of an exception to the national pattern, with the statewide total of 1241mm being 6% above normal. In general, rainfall was above normal in the west and below normal in the east, although anomalies in the east were well short of those experienced during 1999-2001.
- Heavy rainfall inland in the first half of 2003, particularly during January and February, resulted in Western Australia (351mm) and the Northern Territory (548mm) recording rainfall for 2002-03 equal to the long-term normal.

Source: Bureau of Meteorology 2005.

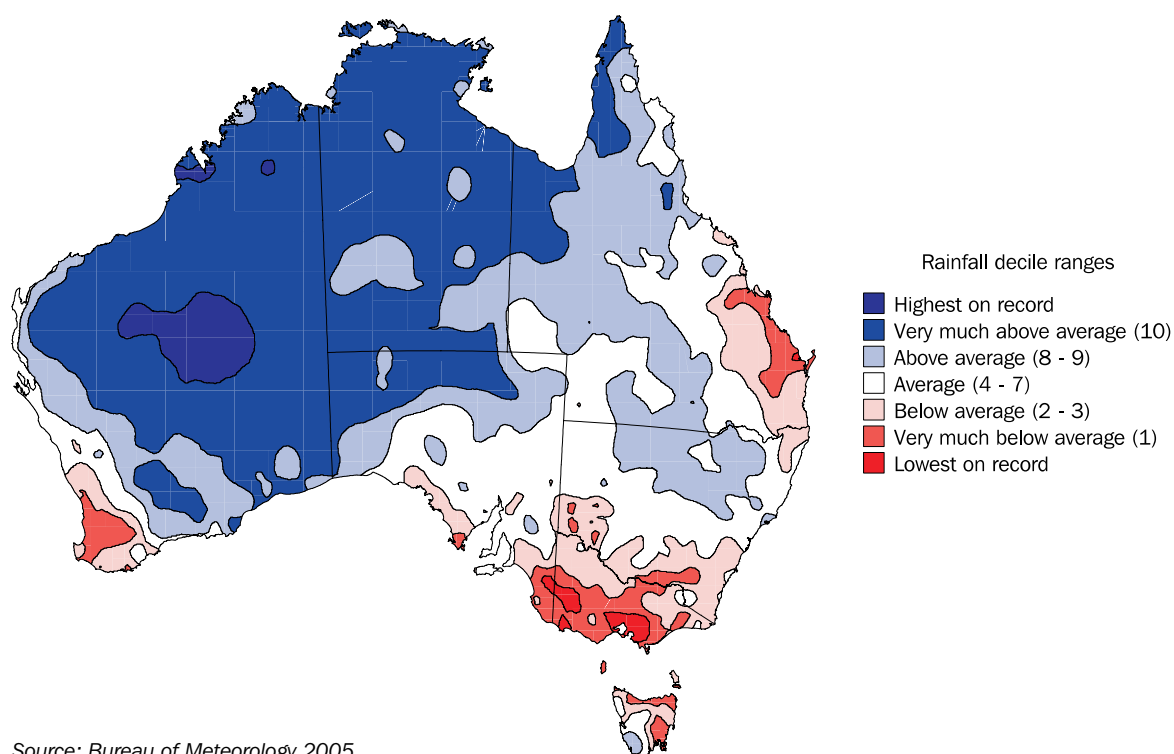
A1.1 AUSTRALIAN RAINFALL ANALYSIS, 1 JULY 2002 TO 30 JUNE 2003



A1.2 AUSTRALIAN RAINFALL DECILES, 1 JULY 2002 TO 30 JUNE 2003

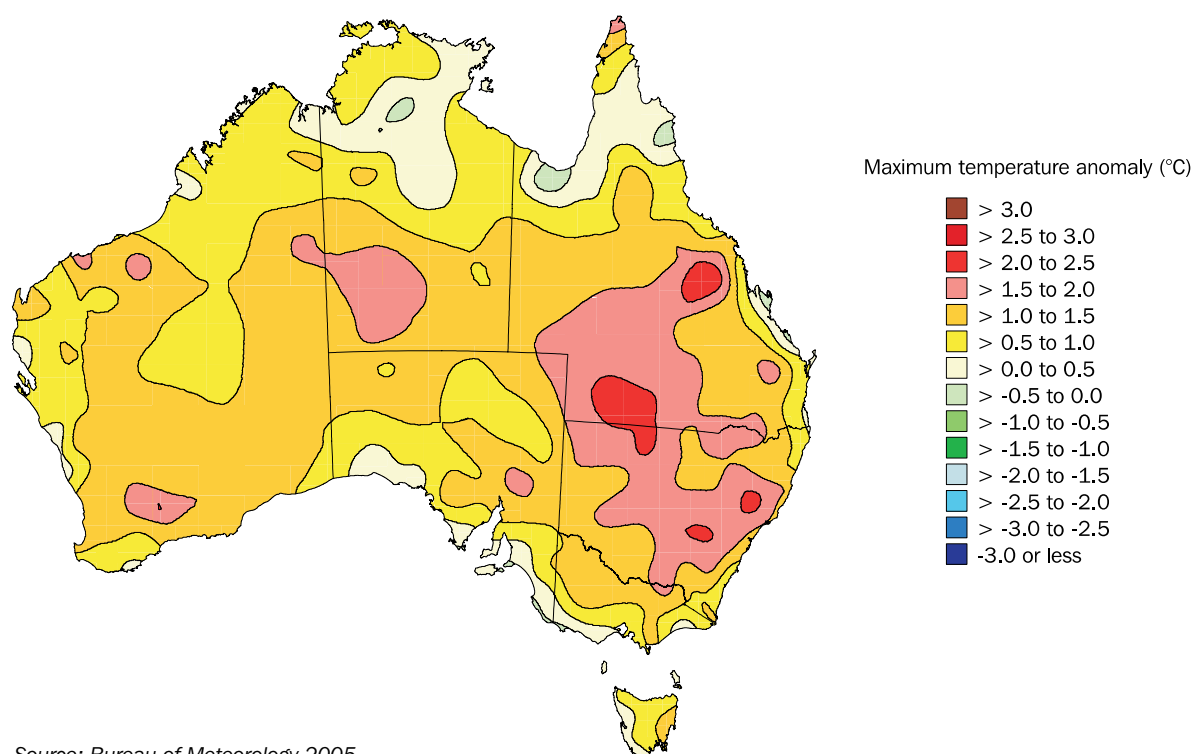


A1.3 AUSTRALIAN RAINFALL DECILES, 1 OCTOBER 1996 TO 30 JUNE 2003

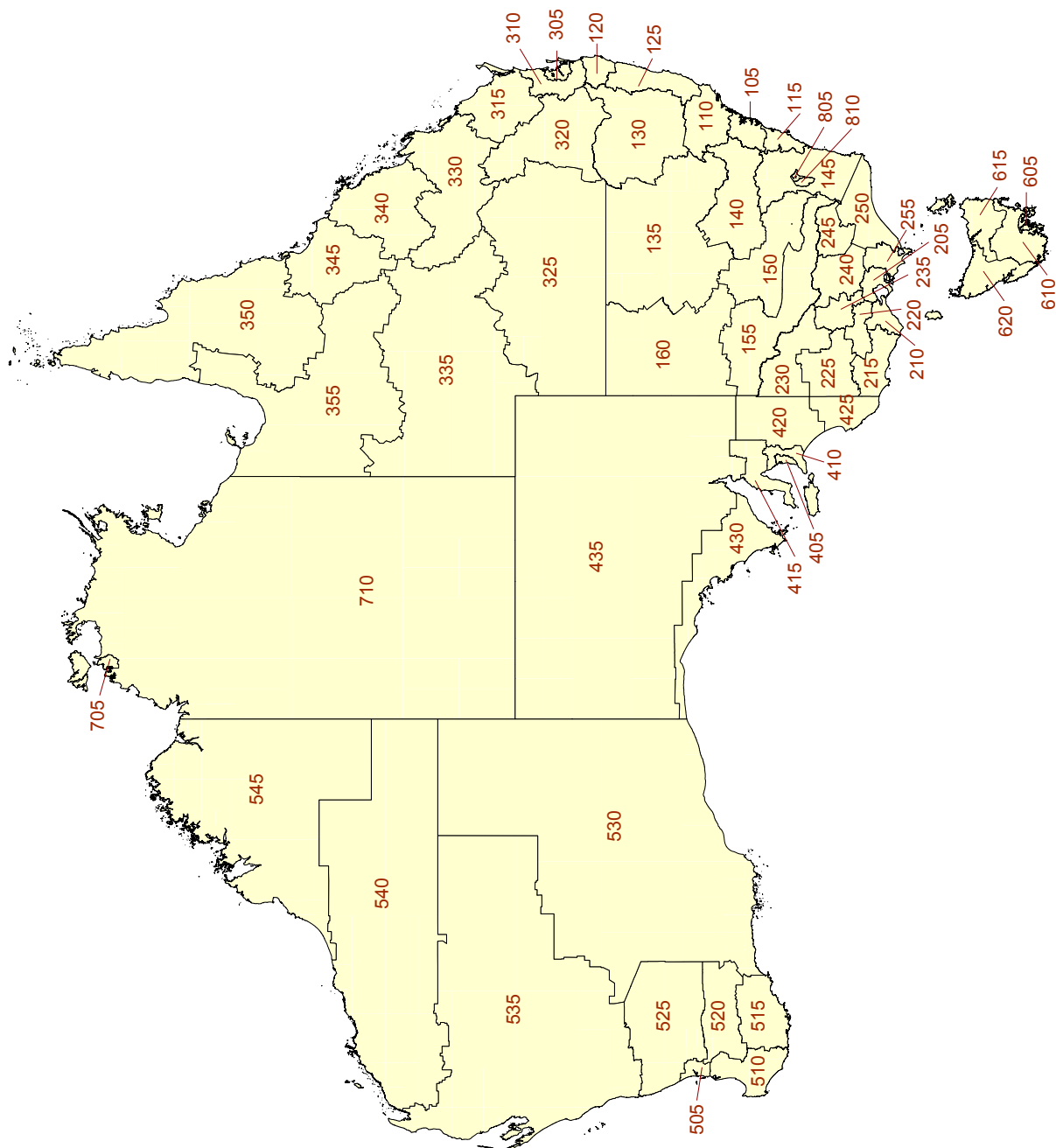


Source: Bureau of Meteorology 2005.

A1.4 MAXIMUM TEMPERATURE ANOMALY (°C), 1 JULY 2002 TO 30 JUNE 2003



Source: Bureau of Meteorology 2005.

A2.1 STATISTICAL DIVISIONS, AUSTRALIA, 2002-03

A2.2 STATISTICAL DIVISIONS, Australia—2002–03**New South Wales**

105 Sydney
 110 Hunter
 115 Illawarra
 120 Richmond-Tweed
 125 Mid-North Coast
 130 Northern
 135 North Western
 140 Central West
 145 South Eastern
 150 Murrumbidgee
 155 Murray
 160 Far West

Victoria

205 Melbourne
 210 Barwon
 215 Western District
 220 Central Highlands
 225 Wimmera
 230 Mallee
 235 Loddon
 240 Goulburn
 245 Ovens-Murray
 250 East Gippsland
 255 Gippsland

Queensland

305 Brisbane
 310 Moreton
 315 Wide Bay-Burnett
 320 Darling Downs
 325 South West
 330 Fitzroy
 335 Central West
 340 Mackay
 345 Northern
 350 Far North
 355 North West

South Australia

405 Adelaide
 410 Outer Adelaide
 415 Yorke and Lower
 North
 420 Murray Lands
 425 South East
 430 Eyre
 435 Northern

Western Australia

505 Perth
 510 South West
 515 Lower Great
 Southern
 520 Upper Great
 Southern
 525 Midlands
 530 South Eastern
 535 Central
 540 Pilbara
 545 Kimberley

Tasmania

605 Greater Hobart
 610 Southern
 615 Northern
 620 Mersey-Lyell

Northern Territory

705 Darwin
 710 Northern Territory -
 Bal

Australian Capital Territory

805 Canberra
 810 Australian Capital
 Territory - Bal

GLOSSARY

Agricultural establishment	An establishment which is engaged mainly in agricultural activities.
Allocation	The volume of water allocated for use either within or external to a surface water management area by way of licensing arrangements and formal entitlements to water.
Area of holding	Includes all occupied and maintained land owned, leased or rented, land worked by sharefarmers and all road permits by a particular agricultural establishment. Excludes land leased or rented to others.
Application rate	Rate at which water is applied to an area or crop, measured in megalitres per hectare.
Area entitlement	An ongoing right to access water, the quantity of which is restricted by area.
Centre pivot	Automated sprinkler irrigation achieved by automatically rotating the sprinkler pipe or boom, supplying water to the sprinkler heads or nozzles, as a radius from the centre of the field to be irrigated.
Drip irrigation	An irrigation technique that applies water to crops by methods that deliver the water to individual plants or rows of crops (also termed 'trickle' techniques).
Entitlement	An individual's ongoing right to access water.
Entitlement allocated	The quantity of an individuals total entitlement that they are allowed to access in a given period.
Estimated value of agricultural operations (EVAO)	An estimation of the value of agricultural activity undertaken by an agricultural establishment. Three-year average weighted prices are applied to livestock turnoff and livestock numbers on the farm, and to area and production data for crops. The resultant aggregation of these commodity values is the EVAO. It is not an indicator of the value of receipts of individual farms but rather an indicator of the extent of agricultural activity.
Gigalitre	One thousand million litres.
Groundwater	Water occurring below the ground's surface.
Groundwater rights	The legal right to access water naturally occurring below the ground surface.
Irrigation scheduling	The process of making decisions about when to irrigate and how much water to apply to an irrigated crop to maximise net returns.
Laser levelling	The use of a laser guided land plane to re-level the paddock surface, filling low spots and removing high spots to give a uniform paddock surface and to create a suitable slope for improving watering efficiency.
Levees/banks	Includes contour, graded and interceptor banks.
Licensed allocation	The maximum volume of water available to the holder of a licence to extract water.
Megalitre	One million litres.
Micro spray/micro-irrigation	System of irrigation designed to use low pressure and small flows of water to mini-sprays, mini-sprinklers, drippers and piping with a series of small openings.
Permanent transfer of water rights	The transfer of water entitlements to a new owner.
Recycled or re-used water (off-farm)	Waste water, that may have been treated to some extent, that is used again without first being discharged to the environment eg. sewage water brought onto a property for the purpose of irrigation.

Recycled or re-used water (on-farm)	Water reused on-site.
Soil probes	A soil moisture monitoring system, used to assist in determining when to irrigate and also how much water to apply.
Sprinkler irrigation	Irrigation applied from various forms of overhead sprays (also known as spray irrigation).
Surface irrigation	Irrigation in the form of controlled flooding of paddocks or irrigation bays.
Surface water	Water flowing or held in streams, rivers and other wetlands in the landscape.
Temporary transfer of water rights	The lease of water entitlements for a specified period of time, usually one year.
Tensiometer	Device used to measure the water content of soil by measuring the tension with which the water is held in the soil.
Town or country reticulated mains supply	Water supplied through a non-natural network where an economic transaction has occurred for the exchange of this water.
Trickle irrigation	As for drip irrigation.
Volume entitlement	An ongoing right to access water, the quantity of which is restricted by volume.
Water right(s)	A formally established, or legal authority to take water from a body of water and to retain the benefits of its use. Rights may be attenuated in different ways and are referred to in different jurisdictions as licences, concessions, permits, access entitlements or allocations.
Water trading	The process of buying and selling water entitlements, where entitlements can include water supplied as part of a licence, allocation or other entitlement.

FOR MORE INFORMATION . . .

<i>INTERNET</i>	www.abs.gov.au the ABS web site is the best place to start for access to summary data from our latest publications, information about the ABS, advice about upcoming releases, our catalogue, and Australia Now—a statistical profile.
<i>LIBRARY</i>	A range of ABS publications is available from public and tertiary libraries Australia-wide. Contact your nearest library to determine whether it has the ABS statistics you require, or visit our web site for a list of libraries.
<i>CPI INFOLINE</i>	For current and historical Consumer Price Index data, call 1902 981 074 (call cost 77c per minute).
<i>DIAL-A-STATISTIC</i>	This service now provides only current Consumer Price Index statistics call 1900 986 400 (call cost 77c per minute).

INFORMATION SERVICE

Data already published that can be provided within five minutes will be free of charge. Our information consultants can also help you to access the full range of ABS information—ABS user pays services can be tailored to your needs, time frame and budget. Publications may be purchased. Specialists are on hand to help you with analytical or methodological advice.

<i>PHONE</i>	1300 135 070
<i>EMAIL</i>	client.services@abs.gov.au
<i>FAX</i>	1300 135 211
<i>POST</i>	Client Services, ABS, GPO Box 796, Sydney NSW 2001

WHY NOT SUBSCRIBE?

ABS subscription services provide regular, convenient and prompt deliveries of selected ABS publications and products as they are released. Email delivery of monthly and quarterly publications is available.

<i>PHONE</i>	1300 366 323
<i>EMAIL</i>	subscriptions@abs.gov.au
<i>FAX</i>	(03) 9615 7848
<i>POST</i>	Subscription Services, ABS, GPO Box 2796Y, Melbourne Vic 3001



2461800013023

ISBN 0642479844

Recommended retail price \$29.00
© Commonwealth of Australia 2005
Produced by the
Australian Bureau of Statistics