



feedgrains

regional demand and supply in Australia



abare report to client 2007

shirshore hagi hirad, ahmed hafi, leanne
lawrance, amelia brown and ian shaw

april 2007

abare

abareconomics.com

innovation in economics

abare

© Commonwealth of Australia 2007

This work is copyright. *The Copyright Act 1968* permits fair dealing for study, research, news reporting, criticism or review. Selected passages, tables or diagrams may be reproduced for such purposes provided acknowledgment of the source is included. Major extracts or the entire document may not be reproduced by any process without the written permission of the Executive Director, ABARE.

Hagi Hirad, S., Hafi, A., Lawrance, L., Brown, A., and Shaw, I.

Australian Bureau of Agricultural and Resource Economics
GPO Box 1563 Canberra 2601

Telephone +61 2 6272 2000 Facsimile +61 2 6272 2001
Internet www.abareconomics.com

ABARE is a professionally independent government economic research agency.

ABARE project 2859

acknowledgments

The authors gratefully acknowledge the comments on various drafts of this report from Terry Sheales and Don Gunasekera. The authors also benefited from comments from the Meat, Wool and Dairy branch of the Australian Government Department of Agriculture, Fisheries and Forestry.

contents

key findings	1
1 introduction	2
2 crop production estimates	4
3 grain stocks	5
grain and fodder stocks held on farm	6
4 availability and demand for feedgrains	8
5 sensitivity analysis	20
appendix	
A ABARE's regional feed demand and allocation model	22
references	25

figures

A	total crop production in Australia	4
B	winter crop production, by state	4

maps

1	supply regions	23
2	demand regions	23

tables

1	major grains held in storage in Australia	5
2	stocks of grain and fodder held on farm, by state - 31 December 2002	7
3	stocks of grain and fodder held on farm, by state - 31 December 2006	7
4	availability of main feed ingredients, by supply region, 2005-06	9
5	availability of main feed ingredients, by supply region, 2006-07	10
6	livestock numbers, by demand region, 2005-06	11
7	livestock numbers, by demand region, 2006-07	11
8	feed use, by state, 2005-06	13
9	feed use, by state, 2006-07	13
10	use of main feed ingredients, by industry, 2005-06	14
11	use of main feed ingredients, by industry, 2006-07	14
12	main feed ingredient transfers from supply to demand regions, 2005-06	15
13	main feed ingredient transfers from supply to demand regions, 2006-07	16
14	main feed ingredient transfers between states, 2005-06	17
15	main feed ingredient transfers between states, 2006-07	17
16	transfers of main feed ingredients from Western Australia to eastern states, 2005-06	18
17	transfers of main feed ingredients from Western Australia to eastern states, 2006-07	18
18	main feed ingredient transfers from supply to demand regions (reduced sorghum crop), 2006-07	21
19	types of livestock and feed rates in Australia	24
20	supply and demand regions and points	24

key findings

- » As at 31 December 2006, Australia's total grain stocks were around 21.1 million tonnes, of which around 16.3 million tonnes (77 per cent) were held by bulk handlers. The stocks held by the bulk handlers were boosted by carryover stocks from the previous season. The remaining stocks, 4.8 million tonnes, were held on broadacre and dairy farms.
- » Also as at 31 December 2006, total fodder stocks (hay, silage and straw) held on farm were around 6.6 million tonnes, 68 per cent of which was hay – 4.5 million tonnes.
- » Based on ABARE's estimates of winter and summer crop production in 2006-07 (released on 20 February 2007), together with grains held in stock, it appears that the estimated domestic requirements for feedgrains in Australia in 2006-07 of around 11.5 million tonnes can be met almost entirely from domestic supplies.
 - Typically Australia imports high protein oilseed meals, particularly soybean meal. In 2006-07, imports of oilseed meals are forecast to increase from 330 000 tonnes to around 500 000 tonnes to replace the fall in production of domestic protein feeds, particularly Western Australian lupins.
- » Although feed needs have increased as a result of an expansion in the intensive livestock industries and reduced pasture availability caused by drought, the combination of carryover stocks from the 2005-06 harvest and drought affected production in 2006-07 is expected to be large enough to meet this demand and allow for some grain exports.
- » However, modelling results indicate that prior to the commencement of the 2007-08 winter harvest, up to 413 000 tonnes of feedgrains could be imported (if they satisfy quarantine protocols), with most going to Queensland and Victoria. This level of imports represents less than 4 per cent of estimated total feed use in 2006-07.

introduction

In recent years, continued expansion of the feedlot, pig and poultry industries as well as increased supplementary feeding in dairying has steadily increased the use of feedgrains in Australia. As the intensive livestock industries, particularly feedlot cattle and poultry, are projected to continue to expand, the reliability of feed supplies at competitive prices is becoming increasingly important.

The recent severe drought in most parts of the country has highlighted the importance of security of feedgrain supply to the livestock industries. The drought sharply curtailed winter grains production in 2006-07 and has had severe adverse effects on Australian summer grain crops. In the case of the principal crops, compared with 2005-06, production of wheat and barley in 2006-07 fell by more than 60 per cent, while grain sorghum production is forecast to fall by 50 per cent. The drought also had significant negative impacts on pasture growth, which has placed pressure on stocks of both grain and fodder.

As a result of the uncertainties surrounding the availability of feed stocks the Australian Government Department of Agriculture, Fisheries and Forestry (DAFF), with the support of Meat and Livestock Australia (MLA), Australian Pork Limited (APL), Australian Dairy Farmers Limited (ADF), Australian Wool Innovation Limited (AWI), and the Grains Research and Development Corporation (GRDC), commissioned ABARE to investigate the quantity of grain and fodder stocks held on farms.

ABARE conducted a survey in January 2007 to estimate the quantity of feed and fodder stocks held on farms. The survey was conducted within the framework of ABARE's Australian agricultural and grazing industries survey, which covers grain, sheep and beef producers, and ABARE's dairy industry survey.

DAFF, MLA, APL, ADF, AWI and GRDC also commissioned the Australian Bureau of Statistics (ABS) to estimate the amount of grains held by grain handlers and marketers. At this stage the ABS has been contracted to collect and report these data each month from October 2006 to May 2007. A continuation of this collection on a quarterly ongoing basis would provide a useful database for further analysis of feedgrain supply and demand in Australia.

The ABS collection involved a mailout to all the major grain storage operators asking for details of grain on hand, by type, quality and location. Data collected by the ABS from grain handlers and marketers is subject to the confidentiality provisions in the Census and Statistics Act. This need for confidentiality will restrict the availability of data on regional areas or states where storage is dominated by a small number of operators.

Data collected from ABARE's survey of Australian agricultural and grazing industries complement information collected by the ABS on grain stocks held by the major grain bulk handlers.

DAFF also commissioned ABARE to investigate the potential impact of the drought on regional feedgrains demand and interregional movements of grain. To assess these impacts, ABARE conducted a modelling study using its regional feed demand and allocation model (see appendix A for model details).

2

crop production estimates

Severe ongoing drought conditions experienced throughout the major cropping areas of Australia in 2006-07 have significantly reduced crop production compared with 2005-06.

Total Australian winter crop production in 2006-07 is estimated to have fallen by 61 per cent from the previous season to around 15.7 million tonnes, the smallest winter crop since 1994-95 (figure A).

The drought has affected production of winter crops in all states (figure B). Of the major winter grains, wheat production is estimated to have fallen by around 61 per cent to 9.8 million tonnes and barley production by 62 per cent to an estimated 3.7 million tonnes. Production of lupins is estimated to have fallen by around 85 per cent.

Summer crop production in 2006-07 has also been severely affected by the ongoing drought conditions with total summer crop production forecast to fall by 59 per cent to around 1.9 million tonnes, the smallest in over twenty years (figure A). Grain sorghum production is forecast to fall by 51 per cent to around 996 000 tonnes. Production of other summer crops used for feed are also forecast to fall significantly.

The substantial decline in both winter and summer crop production combined with the negative impacts of the drought on pasture growth mean that stocks of grain and fodder have been depleted.

fig A total crop production in Australia

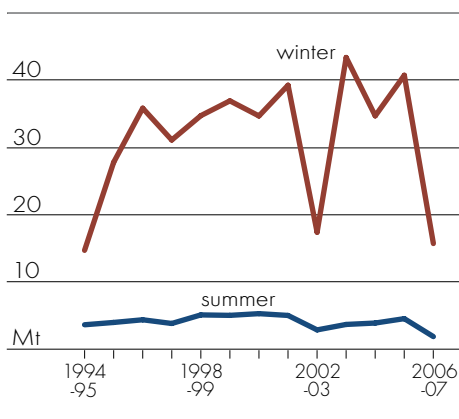
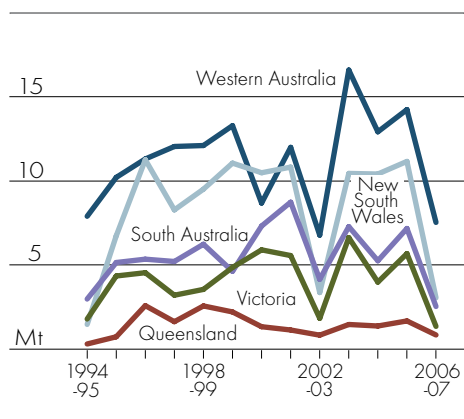


fig B winter crop production, by state



3

grain stocks

Details of the major grains held in storage, by grain type are given in table 1. As at 31 December 2006, total grain held was around 21.1 million tonnes. Bulk handlers held around 16.3 million tonnes, representing about 77 per cent of all grain held both on and off farm. In comparison, in December 2002, bulk handlers held around 82 per cent of the 21 million tonnes in storage at the time.

As at 31 December 2006, wheat was the major grain held in storage, accounting for around 62 per cent of all grain held. In December 2002 around 64 per cent

table 1 **major grains held in storage in Australia**

	December 2002 kt	January 2003 kt	October 2006 kt	December 2006 kt	January 2007 kt
wheat					
in storage and handling					
- milling	9 634	9 061	6 459	8 949	8 015
- feed	2 555	2 373	1 185	2 454	2 192
on farm	1 241	na	na	1 617	na
total wheat	13 430	11 434	7 644	13 020	10 207
barley					
in storage and handling					
- malting	1 838	1 683	1 161	1 566	1 427
- feed	1 633	1 488	560	1 795	1 689
on farm	772	na	na	1 482	na
total barley	4 242	3 170	1 721	4 843	3 116
oat					
in storage and handling	128	137	17	58	57
on farm	993	na	na	899	na
triticale					
in storage and handling	46	48	37	31	28
on farm	168	na	na	227	na
all grains					
in storage and handling	17 297	16 214	10 469	16 297	14 787
on farm	3 731	na	na	4 852	na
total all grains	21 028	16 214	10 469	21 149	14 787

of grain held was wheat. Of the wheat held by the bulk handlers in December 2006, around 78 per cent was classified as milling quality. However, as has occurred in previous droughts, milling wheat can be used for feeding purposes.

Barley made up around 20 per cent of stocks held by the major bulk handlers, the same percentage as held in 2002. Around 47 per cent of stocks held were classified as malting quality, compared with around 53 per cent in 2002.

grain and fodder stocks held on farm

ABARE's survey of on-farm grain and fodder stocks was undertaken in January 2007. The survey was conducted within the framework of ABARE's Australian agricultural and grazing industries survey, which covers grain, sheep and beef producers, and ABARE's dairy industry survey.

It is estimated that grain stocks held on Australian broadacre and dairy farms as at 31 December 2006 were around 4.85 million tonnes, compared with 3.73 million tonnes in December 2002 (tables 2-3). Wheat stocks held on farm were 1.62 million tonnes (just over 1 million tonnes of this was considered suitable for seed), compared with around 1.24 million tonnes held in December 2002. Barley stocks held on farm were around 1.48 million tonnes, almost double the amount held in 2002.

As at 31 December 2006, New South Wales had the most grain held on farm at almost 1.8 million tonnes, mostly barley and wheat. Western Australia had the second largest amount of grain held on farm, at around 1.1 million tonnes, the majority of which was wheat, followed by oats.

As at 31 December 2006, total fodder stocks (hay, silage and straw) held on farm were around 6.6 million tonnes, 68 per cent of which was hay (4.5 million tonnes). Victoria had the highest fodder stocks at around 2.2 million tonnes, followed by Western Australia. Queensland had the lowest stocks of fodder.

table 2 **stocks of grain and fodder held on farm, by state -
31 December 2002**

	NSW	VIC	Qld	SA	WA	TAS	Australia
	kt	kt	kt	kt	kt	kt	kt
wheat	494	269	72	173	230	2	1 240
barley	199	179	71	193	127	4	773
oats	418	132	8	59	364	11	992
sorghum	8	0	15	0	0	0	23
triticale	48	54	4	42	19	1	168
other	92	70	6	69	296	0	533
total	1 260	705	176	536	1 036	18	3 730
hay	672	2 002	114	558	702	150	4 198
silage	534	1 025	167	55	240	194	2 215
straw	131	98	14	41	23	1	308
total	1 337	3 125	295	654	965	345	6 721

Note: Columns may not add due to rounding.

table 3 **stocks of grain and fodder held on farm, by state -
31 December 2006**

	NSW	VIC	Qld	SA	WA	TAS	Australia
	kt	kt	kt	kt	kt	kt	kt
wheat	530	321	67	346	351	3	1 617
barley	626	343	32	383	95	4	1 482
oats	463	96	8	69	258	5	899
sorghum	13	0	39	0	3	0	55
triticale	37	70	0	27	94	0	227
other	86	107	14	107	255	3	571
total	1 754	937	160	931	1 056	14	4 852
hay	831	1 561	56	642	1 247	184	4 521
silage	307	500	194	27	212	226	1 466
straw	171	144	19	158	121	3	616
total	1 309	2 206	268	828	1 580	414	6 603

Note: Columns may not add due to rounding.

4

availability and demand for feedgrains

Although crop production in 2006-07 has been severely affected by the drought, the availability of feedgrains, particularly wheat and barley, has been boosted by carryover stocks from the previous year. The amount of wheat and barley available for feeding in 2006-07 is estimated to be around 14 million tonnes and 4.8 million tonnes respectively, which is considerably less than what was available in 2005-06 (tables 4-5).

Overall demand for feed is expected to be higher in 2006-07 as a result of expansion in some intensive livestock industries and increased feed requirements in others because of the negative impacts of the drought on pasture growth.

Animal numbers in some livestock industries are forecast to expand, while others are forecast to fall in 2006-07 (tables 6-7). Poultry and feedlot cattle numbers are forecast to increase by 3 per cent and 6 per cent respectively, while pig numbers are forecast to fall by 3 per cent. Although dairy cattle numbers are expected to remain largely unchanged, feed requirements in 2006-07 are estimated to increase by about 20 per cent owing to the drought. Sheep destined for live export are forecast to decline by 11 per cent compared with 2005-06 as a result of supply constraints and increased competition in export markets.

impacts of the drought on the demand for and interregional movements of feedgrains

The estimates of regional grain demand and interregional movements generated from ABARE's regional feed demand and allocation model represent an optimal outcome given assumptions about feed availability, prices, livestock numbers, transport costs and feedgrain imports. Changes to any of these assumptions can be expected to result in different estimated outcomes.

It is important to recognise that actual outcomes will be the result of a multiplicity of individual day to day decisions made by growers, traders and feed users in response to expectations about future feed and livestock prices, freight costs, and

table 4 availability of main feed ingredients, by supply region, 2005-06

	Qld		NSW		NSW		NSW		NSW		Vic		Vic SW		SA		WA		total
	coast	central	south	north	central	west	south	south	west	east	north	west	north	east	west	south	north	total	
	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt
wheat	516	869	1 061	3 306	284	3 270	419	2 020	266	524	1 981	2 783	5 747	23 046	1 981	2 783	5 747	23 046	
barley	18	237	444	661	5	1 085	180	1 636	184	682	1 969	1 810	760	9 669	1 969	1 810	760	9 669	
oats	1	3	37	206	33	143	56	81	84	41	68	349	94	1 195	68	349	94	1 195	
maize	54	61	40	15	0	60	4	1	0	0	0	4	0	239	0	4	0	239	
sorghum	472	640	714	80	0	4	1	2	1	0	0	2	2	1 918	0	2	2	1 918	
triticale	0	1	4	36	28	211	150	38	26	85	40	15	17	651	40	15	17	651	
lupins	0	0	0	4	1	9	6	10	4	25	24	158	767	1 009	24	158	767	1 009	
peas	0	0	2	16	1	55	7	80	1	38	162	45	37	445	162	45	37	445	
faba bean	0	0	2	15	1	51	6	68	1	33	139	4	4	322	139	4	4	322	
cotton seed	52	167	290	136	0	30	0	0	0	0	0	0	0	674	0	0	0	674	
canola meal	0	0	19	10	1	0	15	25	0	10	16	67	8	171	16	67	8	171	
soy meal	0	15	37	2	1	0	1	0	0	0	0	0	0	55	0	0	0	55	
colton meal	0	56	115	6	4	0	0	0	0	0	0	0	0	181	0	0	0	181	
sunflower meal	0	2	41	2	1	0	0	0	0	0	0	0	0	46	0	0	0	46	
mill mix	58	19	54	54	80	54	62	13	14	31	12	12	19	482	12	12	19	482	
rice pollard	0	0	0	0	0	35	35	0	35	0	0	0	0	105	0	0	0	105	
total	1 170	2 071	2 859	4 550	441	5 007	941	3 974	616	1 469	4 409	5 249	7 455	40 209	4 409	5 249	7 455	40 209	

table 5 availability of main feed ingredients, by supply region, 2006-07

	Qld		NSW		NSW		NSW		Vic		Vic SW		SA		WA		total
	coast	central	north	central	west	east	north	east	north	west	east	& lower SE of SA	west	east	south	north	
wheat ^a	160	37	1 494	2 400	199	2 019	38	183	24	451	1 704	3 325	1 961	14 026			
barley ^a	55	1	453	254	2	221	80	725	81	289	836	1 457	275	4 766			
oats	1	54	36	56	5	70	24	34	36	13	21	268	30	529			
maize	54	264	46	18	0	70	3	1	0	0	0	4	0	255			
sorghum	0	0	333	37	0	2	0	1	0	0	0	1	1	996			
triticale	0	0	43	50	6	25	66	17	12	38	18	9	6	289			
lupins	0	0	1	3	0	1	1	2	1	9	9	81	44	151			
peas	0	0	1	3	0	4	1	8	0	14	60	30	16	139			
faba bean	0	0	8	22	1	24	1	9	0	7	28	2	1	102			
cotton seed	17	56	179	84	0	18	0	0	0	0	0	0	0	354			
canola meal	0	0	1	1	0	0	2	4	0	3	5	32	2	50			
soy meal	0	12	23	1	1	0	1	0	0	0	0	0	0	38			
cotton meal	0	33	67	4	2	0	0	0	0	0	0	0	0	106			
sunflower meal	0	17	15	1	0	0	0	0	0	0	0	0	0	33			
mill mix	58	19	54	54	81	54	62	14	14	32	12	12	20	487			
rice pollard	0	0	0	0	0	4	4	0	4	0	0	0	0	13			
total	591	680	2 754	2 987	297	2 447	283	996	172	856	2 694	5 220	2 355	22 333			

^a Includes carry-over stocks from 2005-06 held by grain-bulk handlers as of October 2006.

table 6 livestock numbers, by demand region, 2005-06

	broilers	layers	pig weaners	pig growers	pig breeders	dairy	beef cattle on feed	sheep for live export	grazing ruminants
	'000	'000	'000	'000	'000	'000	'000	'000	'000
Qld central	54	163	481	469	26	39	358	0	7 805
Qld south	76 004	3 540	983	957	53	68	1 136	0	2 539
NSW Sydney									
southern	87 118	2 687	197	192	11	59	6	0	621
NSW Hunter	27 860	705	4	4	0	36	10	0	1 639
NSW									
northern	35 808	727	504	491	27	75	368	0	2 589
NSW									
south west	46 537	120	957	932	51	59	311	0	1 198
Vic north &									
upper west	26 204	1 165	1 049	1 021	56	429	195	0	1 186
Vic east	106 270	1 782	55	53	3	413	2	0	685
Vic SW & lower									
SE of SA	22 144	835	86	84	5	417	15	680	1 078
SA	42 524	1 140	762	742	41	89	60	680	1 032
WA	59 978	1 185	605	589	32	60	126	2 889	2 358
total	530 501	14 049	5 683	5 533	305	1 743	2 588	4 248	22 730

table 7 livestock numbers, by demand region, 2006-07

	broilers	layers	pig weaners	pig growers	pig breeders	dairy	beef cattle on feed	sheep for live export	grazing ruminants
	'000	'000	'000	'000	'000	'000	'000	'000	'000
Qld central	56	165	466	454	25	39	381	0	9 366
Qld south	78 338	3 578	952	927	51	68	1 207	0	3 047
NSW Sydney									
southern	89 794	2 716	191	186	10	59	7	0	746
NSW Hunter	28 715	713	4	4	0	36	11	0	1 967
NSW northern	36 908	735	488	476	26	75	391	0	3 106
NSW									
south west	47 966	122	927	902	50	59	331	0	1 438
Vic north &									
upper west	27 008	1 178	1 015	989	55	430	207	0	1 423
Vic east	109 534	1 802	53	52	3	414	2	0	822
Vic SW & lower									
SE of SA	22 824	844	83	81	4	418	16	608	1 294
SA	43 830	1 153	738	718	40	89	64	608	1 238
WA	61 820	1 198	586	570	32	60	134	2 584	2 830
total	546 794	14 204	5 503	5 358	296	1 746	2 750	3 800	27 276

likelihood of a return to more normal seasonal conditions. Although these factors cannot be modeled, the estimated results, nevertheless, should provide a broad indication of likely regional grain demand and interregional flows, given the information currently available.

Feedgrain use in Australia is estimated to increase from 10.7 million tonnes in 2005-06 to 11.5 million tonnes in 2006-07 (tables 8-9). The largest increase in feedgrain requirements is expected to occur in Victoria and Queensland. The increase mainly reflects higher supplementary feeding requirements for the dairy industry and grazing ruminants brought about by the drought. Feedgrain use in both of these industries is forecast to increase by around 20 per cent when compared with 2005-06 (tables 10-11).

- » Feedgrain demand by the cattle feedlot and poultry industries is forecast to increase in line with increasing animal numbers in these sectors, while consumption by the pig and live sheep export industries is forecast to fall by 2 per cent and 11 per cent respectively.

The increase in feedgrain requirements and lower feedgrain availability in eastern Australia are likely to result in greater interregional feedgrain movement (tables 12-13) and interstate grain movement (tables 14-15), particularly into Queensland and Victoria.

- » In 2005-06, Queensland supplied an estimated 79 per cent of its feedgrain requirements, while in 2006-07 only 36 per cent of its feed requirements are estimated to be met from in-state production. The remaining feed requirements (2.2 million tonnes) in Queensland will be met largely by increased transfers of grain, mainly wheat and barley, from New South Wales and Western Australia.
- » In 2006-07, Victoria is estimated to supply 39 per cent of its own feedgrain needs, compared with 71 per cent in 2005-06. The additional grain, mainly wheat, (2.1 million tonnes) is expected to be sourced primarily from New South Wales and South Australia.
- » Model results also suggest the possibility of a significant increase in transfers of barley and oats from Western Australia to Queensland and Victoria (tables 16-17).

table 8 feed use, by state, 2005-06

	Qld	NSW	Vic	SA	WA	total
	kt	kt	kt	kt	kt	kt
wheat	1 009	463	685	174	269	2 600
barley	625	536	770	120	150	2 200
oats	104	268	418	82	128	1 000
maize	115	75	42	3	4	239
sorghum	1 094	678	139	3	4	1 918
triticale	2	279	214	124	32	651
lupins	45	66	343	49	98	600
peas	10	64	88	60	82	305
faba bean	4	65	74	4	8	155
cotton seed	0	0	0	0	0	0
canola meal	5	25	73	10	57	171
soy meal	97	149	124	11	7	388
cotton meal	56	94	0	0	0	150
sunflower meal	0	0	0	0	0	0
mill mix	78	133	106	37	0	354
others	1	1	1	0	0	0
total	3 246	2 897	3 077	676	838	10 734

table 9 feed use, by state, 2006-07

	Qld	NSW	Vic	SA	WA	total
	kt	kt	kt	kt	kt	kt
wheat	1 264	1 136	1 332	324	305	4 361
barley	1 003	696	950	188	310	3 148
oats	25	46	358	34	66	529
maize	114	79	57	1	4	255
sorghum	621	344	29	0	2	996
triticale	1	124	95	55	14	289
lupins	19	22	36	6	69	151
peas	10	23	83	5	17	139
faba bean	4	6	88	1	3	102
cotton seed	120	192	42	0	0	354
canola meal	1	1	42	0	7	50
soy meal	93	190	153	50	50	536
cotton meal	42	45	18	0	0	106
sunflower meal	0	0	0	0	0	0
mill mix	119	153	146	43	26	487
others	1	1	10	0	0	0
total	3 437	3 058	3 439	708	873	11 516

table 10 use of main feed ingredients by industry, 2005-06

feed ingredient	broilers	layers	pigs	beef	dairy	sheep for	grazing	others	total
	kt	kt	kt	feedlot	kt	live export	ruminants	kt	kt
wheat	470	50	424	1 175	365	10	46	60	2 600
barley	0	0	247	1 137	699	28	89	1	2 200
oats	163	38	160	0	479	23	136	0	1 000
maize	98	18	97	9	0	0	0	16	239
sorghum	517	92	249	872	97	0	91	0	1 918
triticale	233	10	180	227	0	1	0	0	651
lupins	0	4	108	12	388	19	9	60	600
peas	253	42	10	0	0	0	0	0	305
faba bean	74	4	19	0	40	0	0	18	155
cotton seed	0	0	0	0	0	0	0	0	0
canola meal	21	1	4	17	123	0	0	4	171
soy meal	338	50	0	0	0	0	0	0	388
cotton meal	0	7	11	93	38	0	0	0	150
sunflower meal	0	0	0	0	0	0	0	0	0
mill mix	188	87	78	0	0	0	0	0	354
others	0	0	0	0	0	0	0	4	0
total	2 357	404	1 587	3 542	2 228	82	371	162	10 734

table 11 use of main feed ingredients by industry, 2006-07

feed ingredient	broilers	layers	pigs	beef	dairy	sheep for	grazing	others	total
	kt	kt	kt	feedlot	kt	live export	ruminants	kt	kt
wheat	823	124	600	1 538	1 008	15	182	70	4 361
barley	172	27	517	1 297	943	25	164	4	3 148
oats	16	1	10	0	425	18	59	0	529
maize	108	75	68	0	0	0	0	4	255
sorghum	361	5	71	529	3	0	27	0	996
triticale	76	2	129	67	15	0	0	0	289
lupins	0	3	20	10	44	14	0	60	151
peas	129	10	0	0	0	0	0	0	139
faba bean	87	0	0	2	0	0	0	14	102
cotton seed	0	0	0	256	86	0	12	0	354
canola meal	41	0	0	5	2	0	0	2	50
soy meal	357	51	36	0	92	0	0	0	536
cotton meal	66	23	5	0	13	0	0	0	106
sunflower meal	0	0	0	0	0	0	0	0	0
mill mix	194	88	99	59	39	1	2	4	487
others	0	0	0	0	9	0	0	4	0
total	2 430	408	1 555	3 764	2 678	73	446	162	11 516

table 12 main feed ingredient transfers from supply to demand regions, 2005-06

	demand regions														total
	Qld central	Qld south	NSW northern	NSW Hunter	NSW Sydney southern	NSW south west	Vic north & upper	Vic west	Vic east	Vic SW & lower SE of SA	SA	WA	domestic transfers	available for export	
	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt
supply regions															
Qld coast															
central	596	176	0	0	0	18	0	0	0	0	0	0	791	379	1 170
Qld south	1	1 802	0	0	0	0	0	0	0	0	0	0	1 804	267	2 071
NSW north	0	401	838	107	189	50	73	0	0	0	0	0	1 658	1 201	2 859
NSW															
central west	65	13	169	96	238	34	4	65	0	0	0	0	684	3 866	4 550
NSW south	0	0	0	0	71	42	0	0	0	0	0	0	113	327	441
NSW south west	0	1	1	0	16	854	135	34	0	0	0	0	1 040	3 966	5 007
Vic north east	0	0	0	0	0	0	356	531	11	3	0	0	900	41	941
Vic north west	0	0	0	0	0	0	591	44	70	128	0	0	834	3 140	3 974
Vic SW & lower															
SE of SA	0	0	0	0	0	0	0	102	476	0	0	0	578	38	616
SA east	0	0	0	0	0	0	0	0	28	380	0	0	408	1 060	1 469
SA west	0	0	0	0	0	0	0	16	0	154	0	0	170	4 240	4 409
WA south	25	0	0	0	0	0	0	10	0	0	0	772	807	4 441	5 249
WA north	57	24	17	11	25	13	81	196	132	0	59	0	615	6 840	7 455
imports	1	82	0	28	81	0	1	112	10	11	7	0	0	0	332
total	747	2 500	1 024	242	621	1 010	1 240	1 110	727	676	838	10 734	29 807	40 541	

table 13 main feed ingredient transfers from supply to demand regions, 2006-07

	demand regions												total	
	Qld central	Qld south	NSW northern	NSW Hunter	NSW Sydney southern	NSW south west	Vic north & upper	Vic east	Vic SW & lower SE of SA	SA	WA	domestic transfers		avail-able for export
	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt
supply regions														
Qld coast														
central	381	210	0	0	0	0	0	0	0	0	0	0	0	591
Qld south	0	663	0	0	0	0	0	0	0	0	0	0	17	680
NSW north	145	1 251	848	138	202	0	19	22	0	0	0	2 625	129	2 754
NSW central west	0	0	179	54	310	137	97	27	7	0	0	811	2 176	2 987
NSW south	0	0	0	0	40	55	0	3	0	0	0	98	199	297
NSW south west	0	1	1	0	0	668	537	329	5	0	0	1 542	905	2 447
Vic north east	0	0	0	0	0	0	79	177	27	0	0	283	0	283
Vic north west	0	0	0	0	0	94	514	291	96	1	0	996	0	996
Vic SW & lower SE of SA	0	0	0	0	0	0	0	4	168	0	0	173	0	173
SA east	0	0	0	0	0	0	0	14	378	463	0	856	0	856
SA west	0	0	0	0	0	0	0	101	0	108	0	209	2 485	2 694
WA south	89	220	9	13	5	0	0	152	73	0	802	1 363	3 858	5 220
WA north	178	133	0	2	12	0	21	28	0	0	21	394	1 961	2 355
imports	9	156	52	55	82	102	99	88	84	136	50	0	0	912
total	803	2 634	1 089	262	650	1 057	1 366	1 235	839	708	873	11 516	11 730	23 245

table 14 main feed ingredient transfers between states, 2005-06

	demand state					total domestic		total
	Qld	NSW	VIC	SA	WA	transfers	overseas	
supply state	kt	kt	kt	kt	kt	kt	kt	kt
Queensland	2 577	18	0	0	0	2 594	646	3 241
New South Wales	481	2 704	310	0	0	3 495	9 361	12 856
Victoria	0	0	2 180	131	0	2 312	3 219	5 530
South Australia	0	0	44	534	0	578	5 300	5 878
Western Australia	106	66	419	0	832	1 422	11 281	12 703
imports	83	109	123	11	7		0	332
total	3 246	2 897	3 077	676	838	10 402	29 807	40 541
proportion of feed requirement met from								
in-state production	79%	93%	71%	79%	99%			

table 15 main feed ingredient transfers between states 2006-07

	demand state					total domestic		total
	Qld	NSW	VIC	SA	WA	transfers	overseas	
supply state	kt	kt	kt	kt	kt	kt	kt	kt
Queensland	1 254	0	0	0	0	1 254	17	1 271
New South Wales	1 398	2 633	1 045	0	0	5 076	3 409	8 485
Victoria	0	94	1 356	1	0	1 452	0	1 452
South Australia	0	0	493	571	0	1 065	2 485	3 549
Western Australia	620	40	274	0	823	1 757	5 819	7 575
imports	165	291	271	136	50	0	0	912
total	3 437	3 058	3 439	708	873	10 604	11 730	23 245
proportion of feed requirement met from								
in-state production	36%	86%	39%	81%	94%			
reduced sorghum crop								
Queensland	921	0	0	0	0	921	6	927
New South Wales	1 482	2 392	921	0	0	4 795	3 403	8 198
Victoria	0	152	1 299	0	0	1 451	0	1 451
South Australia	0	25	637	572	0	1 235	2 315	3 549
Western Australia	824	31	221	0	823	1 898	5 676	7 574
imports	211	458	361	136	50	0	0	1 216
total	3 437	3 058	3 439	708	873	10 300	11 400	22 916
proportion of feed requirement met from								
in-state production	27%	78%	38%	81%	94%			

The decline in lupin production in Western Australia is likely to result in increased imports of high protein soybean meal, in every state.

- » Lupins are a high protein feed ingredient and in a 'normal' year lupins are transported from Western Australia into the eastern states (particularly Victoria and southern Queensland).

table 16 **transfers of main feed ingredients from Western Australia to eastern states, 2005-06**

	Qld kt	NSW kt	VIC kt	SA kt	total kt
barley	0	0	0	0	0
oats	61	0	59	0	119
lupins	45	66	343	0	454
others	0	0	17	0	18
total	106	66	419	0	591

table 17 **transfers of main feed ingredients from Western Australia to eastern states, 2006-07**

	Qld kt	NSW kt	VIC kt	SA kt	total kt
barley	584	0	0	0	584
oats	6	9	216	0	231
lupins	19	17	20	0	56
others	6	0	39	0	45
total	620	40	274	0	934
reduced sorghum crop					
barley	724	0	0	0	724
oats	70	0	167	0	238
lupins	19	16	15	0	51
others	11	0	36	0	47
total	824	31	221	0	1 075

- » In 2006-07 lupin production in Western Australia, which on average accounts for around 80 per cent of Australian production, is estimated to have declined by 85 per cent.

With a significant proportion of the grain sorghum remaining to be harvested as of mid-March, the ultimate size of this crop will be critical to the overall availability of feedgrains for the livestock industries. Conditions in the main grain sorghum growing regions of northern New South Wales and Queensland have, for the most part, remained very dry.

- » Grain sorghum production is forecast to be just under 1 million tonnes, down from 2 million tonnes in 2005-06. The smaller grain sorghum crop will reduce the availability of feedgrains for use by livestock industries.
- » It is estimated that use of grain sorghum for feed in Queensland and New South Wales will be around 620 000 tonnes and 345 000 tonnes respectively in 2006-07.

5

sensitivity analysis

Given the continuing dry conditions throughout the summer in sorghum growing regions of northern New South Wales and Queensland, it is conceivable that the 2006-07 grain sorghum crop could be significantly less than the current forecast of just under 1 million tonnes.

If the grain sorghum crop turns out to be significantly less than 1 million tonnes, larger quantities of other feedgrains will need to be transferred from other states or imported from overseas.

Keeping in mind the probability of a decline in this year's grain sorghum crop, a sensitivity analysis was conducted. The sensitivity analysis involved the estimation of the potential effects on feedgrain movements of a substantially lower grain sorghum crop of 500 000 tonnes in 2006-07. In effect this represents a worst case scenario for the grain sorghum crop in 2006-07.

Results from the sensitivity analysis using ABARE's regional feed demand and allocation model indicate that a significantly lower grain sorghum crop will lead to increased interstate and interregional feedgrain movements and increased imports from overseas (tables 15 and 18).

Queensland and New South Wales which produce and rely heavily on grain sorghum, mainly for their feedlot industries, will be the two states that will be most affected by reduced availability of the grain.

- » In Queensland, it is estimated that only 27 per cent of feedgrain requirements would be met by in-state production in the event of 500 000 tonnes sorghum crop (table 15). The remaining feed requirements will be met from overseas imports of grains, increased barley transfers from Western Australia (table 17) and wheat transfers from New South Wales.
- » In New South Wales, the use of wheat and barley increases as a result of reduced sorghum usage.

table 18 main feed ingredient transfers from supply to demand regions (reduced sorghum crop), 2006-07

	demand regions											total	avail- able for export	total		
	Qld central	Qld south	NSW northern	NSW Hunter	NSW Sydney southern	NSW south west	Vic north & upper west	Vic east	Vic & lower SE of SA	SA	WA				total domestic transfers	
	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt
supply regions																
Qld coast																
central	316	215	0	0	0	0	0	0	0	0	0	0	0	0	0	531
Qld south	0	390	0	0	0	0	0	0	0	0	0	0	0	0	6	396
NSW north	146	1 331	781	91	43	0	0	14	0	0	0	0	0	0	122	2 528
NSW central																
west	0	4	198	78	349	76	62	5	0	0	0	0	0	0	2 177	2 949
NSW south	0	0	0	3	58	37	0	1	0	0	0	0	0	0	200	298
NSW south west	0	1	1	0	13	664	517	322	0	0	0	0	0	0	904	2 423
Vic north east	0	0	0	0	0	0	107	176	0	0	0	0	0	0	0	283
Vic north west	0	0	0	0	0	152	533	246	65	0	0	0	0	0	0	996
Vic SW and lower																
SE of SA	0	0	0	0	0	0	2	4	166	0	0	0	0	0	0	172
SA east	0	0	0	0	0	8	0	13	457	377	0	0	0	0	856	0
SA west	0	0	0	0	0	18	0	167	0	194	0	0	0	0	2 315	2 694
WA south	195	311	0	3	0	0	46	84	62	0	804	1 504	0	0	3 716	5 220
WA north	91	227	9	4	15	0	0	24	4	0	20	394	0	0	1 961	2 355
imports	55	156	100	84	172	102	99	178	84	136	50	0	0	0	0	1 216
total	803	2 634	1 089	262	650	1 057	1 366	1 235	839	708	873	11 516	11 400	0	11 400	22 916

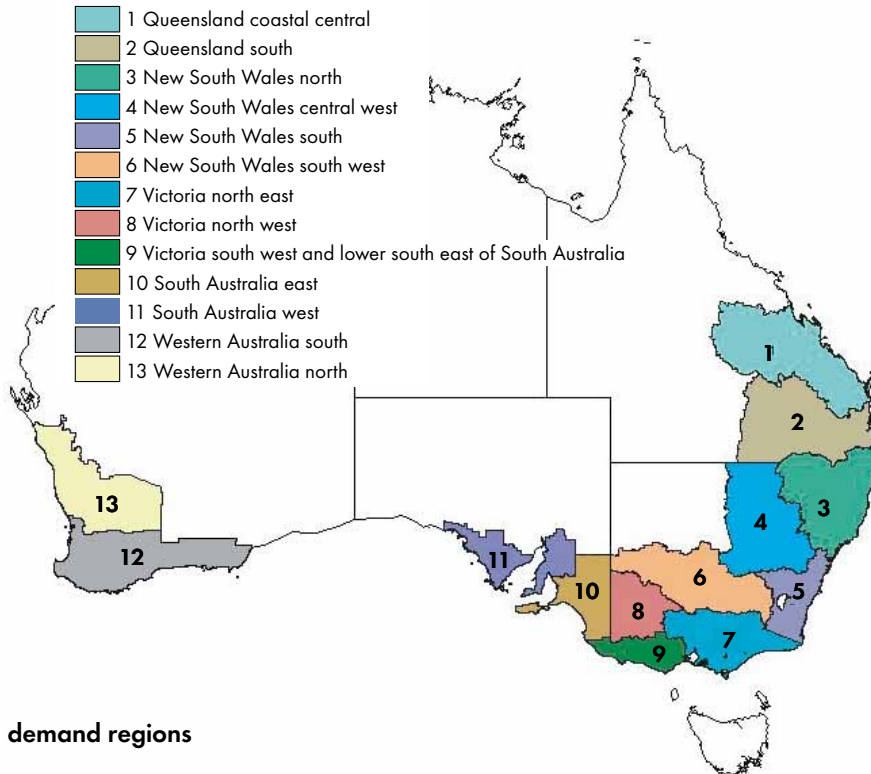
ABARE's regional feed demand and allocation model

ABARE's regional feed demand and allocation model provides unique opportunities to explore the complex livestock and grain industrywide impacts of changes in the factors influencing feed supply and demand. The original model developed by Hafi and Andrews (1997) was refined in 2000 for a study that looked into the impact on the livestock industry of a number of scenarios affecting regional supply and demand balances (Hafi and Rodriguez 2000). The scenarios simulated in that study included a drought, increased availability of feed wheat and a higher growth in the number of cattle in feedlots. After consultation with industry, further refinements to the model have been introduced, to improve its usefulness in analysing and projecting regional grains use and allocation within Australia.

The model has thirteen supply regions (map 1) and eleven demand regions (map 2), which are linked together. For each demand region, the model has a feed mixing component, which contains thirty different feed ingredients including grains, roughages, animal based products, such as skim milk powder and tallow, and synthetic products. However, for simplicity, each supply region in the model contains only the sixteen most important feed ingredients – six grains (wheat, barley, maize, sorghum, oats and triticale), three pulses (lupins, peas and faba beans), four oilseed meals (soybean meal, sunflower meal, canola meal and cottonseed meal), one oilseed (cottonseed) and two grain byproducts (mill mix and rice pollard). The overall model has a feed allocation component in which the availabilities of sixteen main feed ingredients in the supply regions are matched with demands in regional demand centres, with any regional demand deficits also being able to be supplied from imported sources, while any surplus in regional availabilities can be exported.

The model estimates demand for all feed ingredients, and transfers from supply to demand regions, and exports and imports of the sixteen main feed ingredients. In any given supply region, excess supplies not required on the domestic market are available for export. The fourteen feedstuffs not included in the allocation component of the model are assumed to be available at the assumed prices in each demand region when required.

map 1 **supply regions**



map 2 **demand regions**

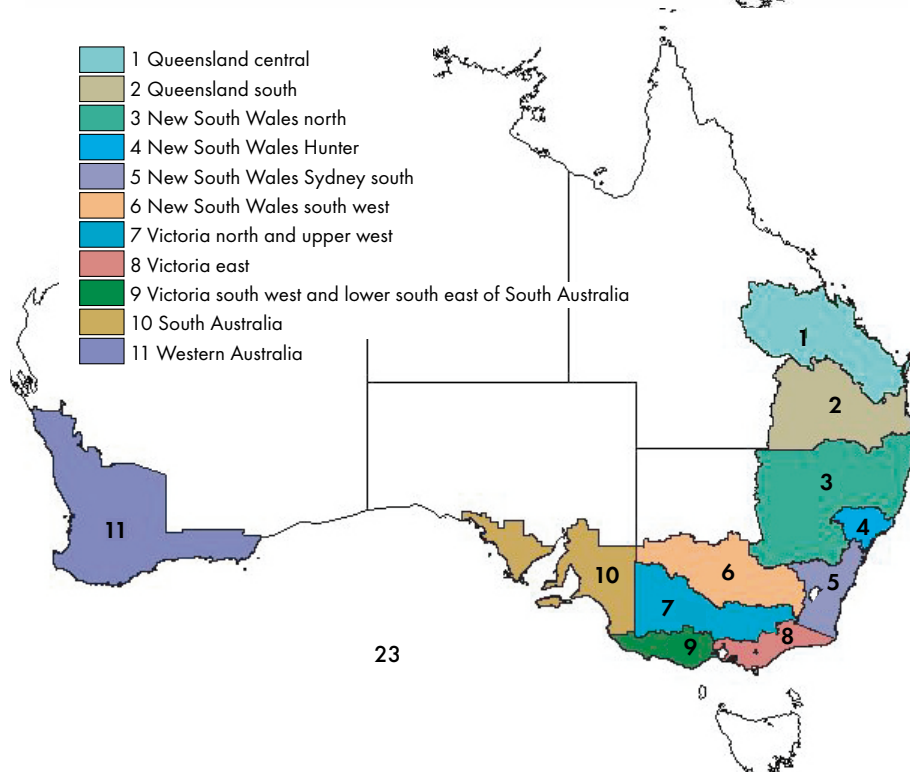


table 19 **types of livestock and feed rates in Australia**

livestock type	feed rate kg/hd/yr
broilers	5
layers	34
pigs - weaner	70
pigs - grower	242
pig - breeder	1 387
dairy a	1 500
feedlot cattle	1 547
live sheep	22
grazing ruminants b	20
others c	2 000

a Reflecting the drought, feed rate increased by 20 per cent in 2006-07. **b** Includes breeding cows and breeding ewes only. **c** Includes horses and aquaculture industries

The feed mixing component of the model determines the mix of feed ingredients that, in each region and for each type of livestock, meets nutrient requirements at minimum cost. In this process, the complex substitution and complementary relationships that exist between feed ingredients are taken into account. For each demand region and each type of livestock, the total feed use is estimated as the product of the predetermined feed rate per head and projected number of animals (table 19). For each demand region and each livestock type the least cost feed mix is then formulated for given feed prices (including transport costs and port charges if the feeds are imported).

The allocation of the given production of the sixteen main feed ingredients available in the supply regions to meet demands in regions and overseas (and, if necessary, accounting for imports of feed ingredients) is achieved at minimum cost.

table 20 **supply and demand regions and points**

supply regions	supply point	demand region	demand point
Qld coastal central	Emerald	Qld central	Rockhampton
Qld south	Dalby	Qld south	Toowoomba
NSW north	Narrabri	NSW northern	Tamworth
NSW central west	Parkes	NSW Hunter	Hexham
NSW south	Yass	NSW Sydney southern	Enfield
NSW south west	Junee	NSW south west	Wagga Wagga
Vic north east	Boort	Vic north and upper west	Shepparton
Vic north west	Ouyen	Vic east	Pakenham
Vic south west and lower south east of SA	Ararat	Cobden	
SA east	Tailem Bend	lower south east of SA	
SA west	Kimba	South Australia	Murray Bridge
WA south	Kondinin	Western Australia	Welshpool
WA north	Merredin		

In the feedgrain supply and demand regions in the model presented in maps 1 and 2, some of the supply and demand regions coincide, as in Queensland; but in South Australia and Western Australia, there are two supply regions and only a single demand region. In order to estimate grain transport costs between a supply region and a demand region, a representative town was chosen for each region. These supply / demand points are given in table 20.

references

- Hafi , A. and Andrews, N. 1997, *Regional Feed Markets in Australia*, ABARE report to the Grains Research and Development Corporation, Canberra.
- Hafi , A. and Rodriguez, A. 2000, *Projection of Regional Feed Demand and Supply in Australia*, ABARE Report for the Grains Research and Development Corporation, Canberra, May.

RESEARCH FUNDING ABARE relies on financial support from external organisations to complete its research program. As at the date of this publication, the following organisations had provided financial support for ABARE's research program in 2005-06 and 2006-07. We gratefully acknowledge this assistance.

02.07

Agricultural Production Systems Research Unit	Independent Pricing and Regulatory Tribunal
Asia Pacific Economic Cooperation Secretariat	International Food Policy Research Institute
AusAid	Land and Water Australia
Australian Centre for International Agricultural Research	Meat and Livestock Australia
Australian Greenhouse Office	Minerals Council of Australia
Australian Government Department of the Environment and Water Resources	Ministry for the Environment, New Zealand
Australian Government Department of Industry, Tourism and Resources	National Australia Bank
Australian Government Department of Prime Minister and Cabinet	Newcastle Port Corporation
Australian Government Department of Transport and Regional Services	NSW Sugar
Australian Wool Innovation Limited	Rio Tinto
CRC - Plant Biosecurity	Rural Industries Research and Development Corporation
CSIRO (Commonwealth Scientific and Industrial Research Organisation)	Snowy Mountains Engineering Corporation
Dairy Australia	University of Queensland
Department of Business, Economic and Regional Development, Northern Territory	US Environmental Protection Agency
Department of Premier and Cabinet, Western Australia	Wheat Export Authority
Department of Primary Industries, New South Wales	Woolmark Company
Department of Primary Industries, Victoria	
East Gippsland Horticultural Group	
Fisheries Research and Development Corporation	
Fisheries Resources Research Fund	
Forest and Wood Products Research and Development Corporation	
Grains Research and Development Corporation	
Grape and Wine Research and Development Corporation	
GHD Services	