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Status of the Western Australian Pastoral Rangelands

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STATUS OF THE WESTERN AUSTRALIAN PASTORAL RANGELANDS

This report has been written to provide an overview of the current status of the pastoral rangelands and changes that have been experienced over the last fifteen years. The report is divided into four sections:

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Key observations and trends:

Production

- Stocking rates have been increasing in the Goldfields and Nullarbor; climbing slowly for the Kimberley, Pilbara and East Pilbara; decreasing in the Murchison and decreasing from 2009 in the Gascoyne
- Increasing average age of pastoral business owners
- Increasing ownership of stations by foreign investors
- A decrease in on station work and an increase in off station work during poor profitability in 2011

Financial

- An increase in business profitability since 2011
- Significant increase in the profitability of cattle in the last five years appears to be due largely to increases in sales prices and, to a lesser extent, the total number of animals sold
- There has been a drop in the number of live exports since 2011 although the value of live exports continues to climb
- Global export of beef and veal has increased by 21% since 2011, with little increase in export volumes from Australia
- Seasonal changes within WA and Australia are a significant driver of numbers of animals available and therefore price received
- Profitability fluctuations are experienced more dramatically in the Kimberley than the rest of the pastoral rangelands, and on average the Kimberley is significantly more profitable

Pastoral rangelands condition and drivers of change

- Rainfall has been increasing over the northern and central pastoral rangelands since 2000 leading to an increase in pastoral rangeland condition and consequently actual carrying capacity,
- Reported stocking rate has increased by 40% since 2001 and on average stations are now exceeding actual carrying capacity.

1. PRODUCTION DATA

1.1 Pastoral Stations in WA

There are a total of 435 stations (comprising of 491 pastoral leases) in the Western Australian pastoral rangelands covering over 857,833km². As of May 2018, there were 345 entities operating pastoral stations in Western Australia. The entities comprised of various interests: individuals or families, companies, aboriginal corporations, mining companies, publicly owned and foreign owned.

Table 1 shows the changes in station ownership over a six year period between 2011 and 2017. There has been an increase in foreign owned stations with the biggest growth experienced in the Kimberley. In 2011 Kimberley foreign owned stations were 27% of total foreign owned stations and this increased to 51% in 2017. Mining companies have reduced their ownership from 36 stations in 2011 to 30 in 2017. Individual ownership has contracted from 41% of the total to 33% of the total number of stations between 2011 and 2017. Further, there has been an increase in company owned stations from 36% of the total to 39% of the total, although there has been a decrease in the Kimberley over this time. Private companies are inclusive of any company, including an individual or couple who have decided to form a company to run the business. Some of the change in ownership could be attributable to more individuals or families creating a company structure for the business.

| Ownership Type – Nov 2017 | WA rangelands | | | | Kimberley Only | | | |
|--|---------------|-------------|------------|-------------|----------------|-------------|-----------|-------------|
| | 2017 | | 2011 | | 2017 | | 2011 | |
| Type | No. | % | No. | % | No. | % | No. | % |
| Foreign Owned (Includes Foreign Owned Mining Companies) | 29 | 6.7% | 11 | 2.4% | 15 | 16.3% | 3 | 3.2% |
| Aboriginal Corporation | 55 | 12.6% | 56 | 12.3% | 30 | 32.6% | 31 | 33.0% |
| Public Company | 2 | 0.5% | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% |
| Government Department | 2 | 0.5% | 3 | 0.7% | 1 | 1.1% | 1 | 1.1% |
| Mining Company (Does Not Include Foreign Owned Mining Companies) | 30 | 6.9% | 36 | 7.9% | 0 | 0.0% | 0 | 0.0% |
| Individuals | 145 | 33.3% | 186 | 41.0% | 11 | 12.0% | 19 | 20.2% |
| Private Company | 172 | 39.5% | 162 | 35.7% | 35 | 38.0% | 40 | 42.5% |
| Total | 435 | 100% | 454 | 100% | 92 | 100% | 94 | 100% |

Source: Department of Planning and Heritage, 2018

In 2005: 57 pastoral stations were controlled by, or run on behalf of, aboriginal interests; 44 pastoral stations and one sub-lease were controlled by or run on behalf of mining interests; 5 pastoral stations were purchased by private interests for conservation purposes and the remainder were run by families. This data shows there has been considerable change in pastoral ownership over the last thirteen years.

Since 2004/05 there has been an average of around 23 station transfers per financial year. Table 2 shows few transfers leading up to the 2015 lease renewals. This was because of the difference in values between leases with only a few years until their expiry compared leases that ranged in length between 18 and 50 years subsequent to the lease renewal process.

Table 2: Sales of Western Australian pastoral stations between 2004/05 and 2006/17

| Region | 2004/05 | 2005/06 | 2006/07 | 2007/08 | 2008/09 | 2009/10 | 2010/11 | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 | 2016/17 |
|--------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|----------|-----------|
| Kimberley | 2 | 8 | 2 | 3 | 0 | 1 | 5 | 2 | 4 | 2 | 4 | 0 | 13 |
| Pilbara | 1 | 5 | 2 | 6 | 5 | 1 | 2 | 0 | 2 | 8 | 5 | 1 | 1 |
| Southern | 20 | 30 | 20 | 2 | 13 | 9 | 9 | 14 | 13 | 13 | 28 | 7 | 39 |
| Total | 23 | 43 | 24 | 11 | 18 | 11 | 16 | 16 | 19 | 23 | 37 | 8 | 53 |

Source: Department of Planning Lands and Heritage, 2018

Every operating entity differs in relation to a host of variables including scale, enterprise mix, management capabilities, availability of resources and capital structure. Over time, income received by pastoralists has diversified into areas such as contract servicing to the mining industry or intensive horticultural production. Some stations do not operate as commercial pastoral businesses but may be managed for alternative uses such as conservation, training, cultural or tourism outcomes or pastoral support such as agistment¹.

Table 3 shows that the average lease size of Western Australian pastoral rangelands is 174,966ha, with the largest being 595,322ha and the smallest being 889ha. Table 3 also presents rangeland stock numbers (cattle, sheep and goats) in Cattle Units² (CU). An approximation of the market value of leases is shown in Table 3 estimated on a 'walk in, walk out' basis. These consist of values accorded to stock, plant and equipment, fixed improvements and the price of feed (or the unimproved value of the property) expressed as \$/Cattle Unit, (CU). These leases are traded on a CU basis. Table 3 also presents an approximation of the aggregate market value of leases and indicates that these may have grown by over 300% over the period 2001-17.

This is a broad brush macro view of the industry as detailed data is not collected by any government agency. It should also be noted that there is significant volatility in the data across the period as 2001 represented a low cattle price point and the 2016 a high. For instance, 2014 values and pastoral rents dropped around 70% from 2009 levels, due to a mixture of factors such as price, environmental conditions and live export conditions.

Table 3's approximation begins in row 8 with an estimation of the market value of leases, per CU, in each of the rangeland regions in 2001. These are multiplied by the number of CU recorded for that year (row 9) to arrive at an approximation of the market value of leases, in \$M, for that year (row 10). This process is repeated for the 2016 (rows 11 – 13). Row 14 adjusts these values for the Valuer General's application of a 'stand alone, non-viable' rent applied to leases that are not able to sustain a pastoral business but are rented for access to station infrastructure. Row 15 compares an implied discount or premium

¹ Herbert, A (2010) Financial viability of southern rangeland pastoral businesses 2010, Department of Agriculture, unpublished.

² A CU is a standardised measure based on the amount of energy required to maintain a 400kg steer and is equal to seven Dry Sheep Equivalents (DSE), which in turn is a standardised measure based on the amount of energy required to maintain a 100kg wether.

accorded to the value of these leases based on of the divergence between reported CU and the Present assessed Carrying Capacity of the rangeland in CU. The Present Carrying Capacity is the divergence from the originally assessed Potential Carrying Capacity. This divergence occurs because of either change in land conditions (degradation or improvement) or changes in rainfall or a mixture of both.

Around 10 -15% of the property's value is the unimproved value. Pastoral rents are set at between 2 – 3% of the unimproved value of the property. These may be compared to around 4 – 5% for agricultural land and around 8% for land used for commercial pursuits. This reflects inherent productivity, distance to market and rainfall variability (i.e. the level of climatic risk, relative to the capital intensity of pastoral enterprises). At present (2014 rent review) a rental of 2.8% yields a rental rate of about \$1.75 / CU.

Table 3: An overview of pastoral stations and leases across the different regions of the Western Australian pastoral rangelands

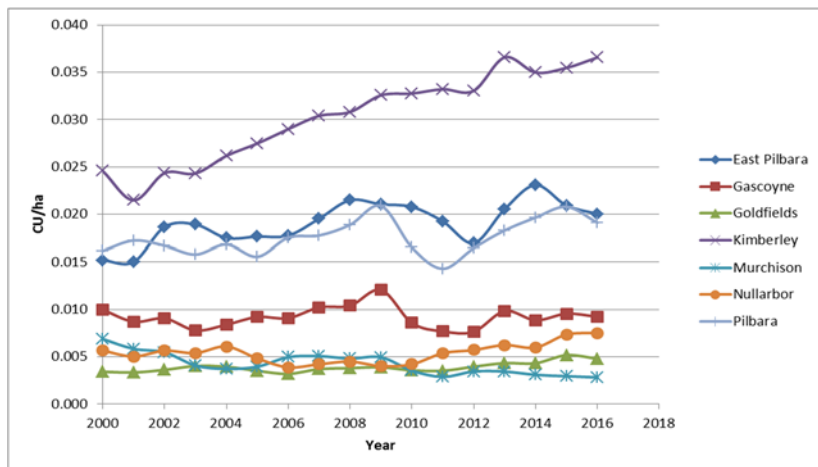
| Region | Kimberley | East Pilbara | Pilbara | Gascoyne | Murchison | Goldfields | Nullarbor | Total |
|--|-------------------|-----------------|----------------|----------------|--------------|----------------|----------------|-------------------|
| 1. Number of stations | 90 | 21 | 46 | 81 | 90 | 88 | 18 | 435 |
| 2. Number of leases | 107 | 25 | 49 | 90 | 96 | 103 | 19 | 491 |
| 3. Total area of leases (ha) | 20,677,581 | 5,411,127 | 9,374,091 | 13,820,469 | 12,873,667 | 17,805,581 | 5,771,060 | 85,733,580 |
| 4. Average lease size (ha) | 193,248 | 216,445 | 191,308 | 151,873 | 134,101 | 172,870 | 303,740 | 174,966 |
| 5. Median lease size (ha) | 178,003 | 202,824 | 192,922 | 131,715 | 116,258 | 154,559 | 314,394 | - |
| 6. Maximum lease size (ha) | 480,859 | 397,303 | 406,489 | 398,389 | 364,905 | 406,813 | 595,322 | |
| 7. Minimum lease size (ha) | 889 | 4493 | 1045 | 2997 | 915 | 1790 | 46,266 | |
| 8. App'x market value of leases, 2001, in \$/CU. (Walk in walk out) | 500 | 400 | 400 | 400 | 400 | 400 | 400 | |
| 9. Recorded livestock carried, 2001, '000 CU | 444 | 80 | 162 | 120 | 75 | 59 | 29 | 970 |
| 10. App'x market value of leases, 2001, \$M if solely traded on value of reported (CU) | 220 | 30 | 65 | 50 | 30 | 25 | 10 | 435 |
| 11. App'x market value of leases, 2016, in \$/CU. (Walk in walk out) | 1,900 | 1,700 | 1,600 | 1,400 | 1,300 | 1,300 | 1,200 | |
| 12. Recorded livestock carried, 2016, '000 CU | 756 | 108 | 179 | 128 | 36 | 85 | 43 | 1335 |
| 13. App'x market value of leases, 2016, \$M if solely traded on value of reported(CU) | 1,440 | 180 | 285 | 180 | 50 | 110 | 50 | 2295 |
| 14. App'x market value of leases, 2016, \$M, (with discount for 'stand alone, non-viable') | 1,440 | 180 | 285 | 90 (50%, LG) | 10 (80%) | 55 (50%) | 50 | 2110 (185) |
| 15. App'x market value of leases, 2016, \$M, with discount (premium) for divergence of Reported CU from Present CU | 1,340 (-7%, -100) | 250 (+40%, +70) | 260 (-8%, -25) | 65 (-26%, -25) | 3 (-70%, -7) | 30 (-42%, -25) | 35 (-28%, -15) | 1985 (125) |

Source: Western Australian Annual Return of Livestock and Improvements, Department of Primary Industries and Regional Development, Western Australia / discussion with Chris Olson, Office of the Valuer General

1.2 Stocking rates

Figure 1 presents the stocking rates for the rangeland regions from 2000 to 2016. The stocking rates for the Kimberley, East Pilbara and Pilbara regions are comparatively high and have experienced an increase over this period. Stocking rates for the Goldfields and Nullarbor regions have varied over the period with a trend towards increasing stocking rates since 2010. The Gascoyne's overall trend appears flat with a slight decrease since 2009 and the stocking rates in the Murchison have decreased over time.

Figure 1: Stocking rates for each region of the pastoral rangelands from 2000 to 2016



Source: Western Australian Annual Return of Livestock and Improvements DPIRD 2018, Western Australia

1.3 Socioeconomic indicators

Table 4 and Figure 2 show there is a trend towards an increase in the average age of the primary decision maker of owner manager pastoral businesses and their spouses. There is no apparent trend in the number of hours worked both on and off-farm over time (Figure 3). However the figures show that the dip in profitability experienced in 2011 (figures 5 and 6) correlates with an increase in off-farm work, particularly for the spouse, and a decrease in on-farm work around this time.

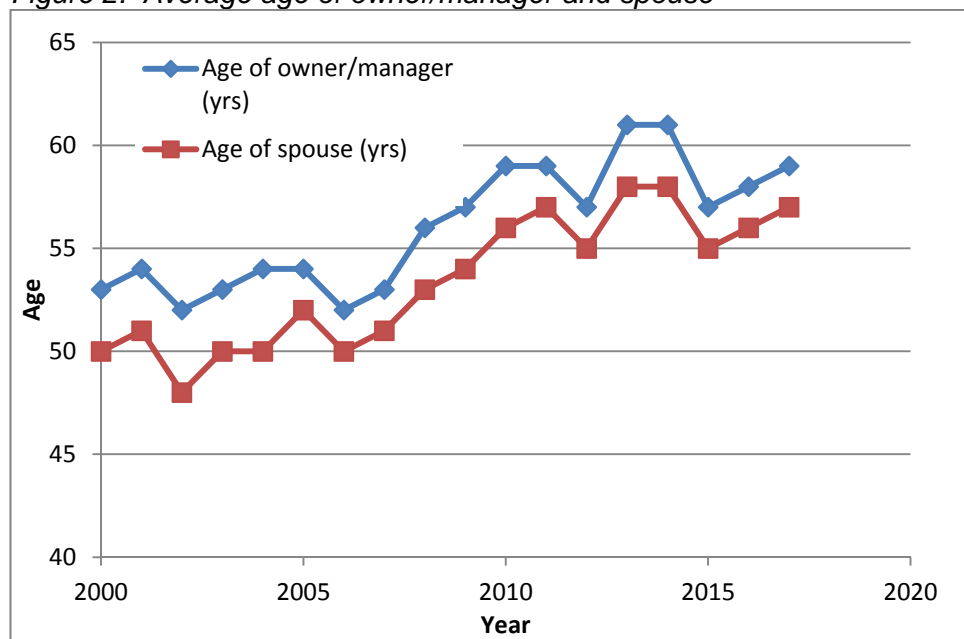
Hours worked off-farm have ranged between one and eight hours per week for the spouse and one and four hours per week for the owner/manager.

Table 4: An overview of socioeconomic indicators for pastoral businesses in WA every five years between 2000 and 2017

| Year | 2000 | 2005 | 2010 | 2015 | 2017 |
|--|------|------|------|------|------|
| Age of owner/manager (yrs) | 53 | 54 | 59 | 57 | 59 |
| Age of spouse (yrs) | 50 | 52 | 56 | 55 | 57 |
| Hours worked on farm by owner manager (hrsperwk) | 46 | 50 | 48 | 49 | 48 |
| Hours worked on farm by spouse (hrsperwk) | 18 | 29 | 26 | 23 | 23 |
| Hours worked on farm - total (hrsperwk) | 111 | 141 | 115 | 109 | 116 |
| Total labor used (weeks) | 148 | 158 | 150 | 141 | 155 |
| Off-farm work for owner manager (hrsperwk) | 3 | 2 | 2 | 1 | 2 |
| Off-farm work for spouse (hrsperwk) | 7 | 1 | 3 | 5 | 4 |

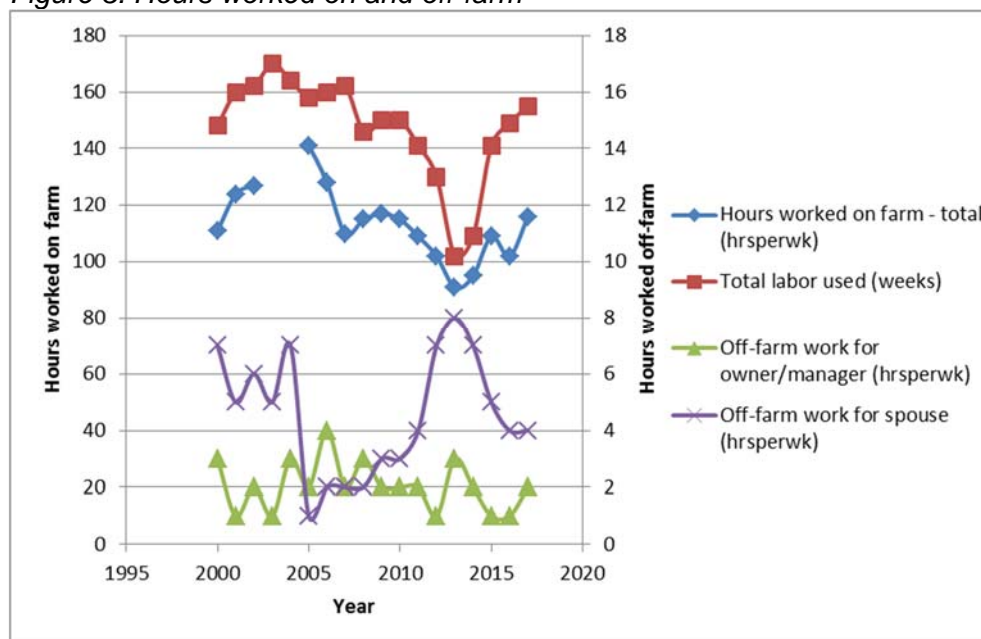
Source: ABARES Agsurf (<http://apps.daff.gov.au/agsurf/agsurf.asp>)

Figure 2: Average age of owner/manager and spouse



Source: ABARES Agsurf (<http://apps.daff.gov.au/agsurf/agsurf.asp>)

Figure 3: Hours worked on and off-farm



Source: ABARES Agsurf (<http://apps.daff.gov.au/agsurf/agsurf.asp>)

2 FINANCIAL DATA

2.1 Business Characteristics

Each year, ABARE (Australian Bureau of Agricultural and Resource Economics) conducts a physical and financial survey of businesses in selected regions, zones and industries across Australia. The survey sample is taken from the business register of ABS (Australian Bureau of Statistics). ABARE endeavours to change up to 25% of the sampled population annually such that any individual business only remains in the sample for 3-4 years.

The Western Australian 'Kimberley' (Region code 511) and 'Pilbara and Central Pastoral' zone (Region code 512) represents the bulk of the Western Australian pastoral rangelands. All values are assumed averages per business in the area based on the data returned from those businesses sampled. Table 5 shows ABARES data giving the averages for pastoral businesses in each region.

Table 5: ABARES sampled population and business characteristics for Western Australian pastoral businesses from 2000 to 2016

| Year | | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|--|-------------------------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Kimberley | No. businesses | 71 | 69 | 55 | 54 | 40 | 50 | 67 | 43 | 41 | 37 | 55 | 56 | 51 | 43 | 44 | 44 | 42 |
| | No. sampled | 8 | 9 | 7 | 6 | 10 | 9 | 12 | 10 | 10 | 12 | 10 | 8 | 8 | 9 | 9 | 10 | 9 |
| | % sampled | 11% | 13% | 13% | 11% | 25% | 18% | 18% | 23% | 24% | 32% | 18% | 14% | 16% | 21% | 20% | 23% | 21% |
| | Number of sheep | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | Number of cattle | 7888 | 7904 | 8628 | 7658 | 9398 | 8069 | 9335 | 11689 | 12846 | 16140 | 12292 | 11283 | 10775 | 12833 | 12175 | 11810 | 12578 |
| | Area operated ('000 ha) | 334 | 267 | 285 | 198 | 321 | 257 | 314 | 328 | 399 | 396 | 326 | 268 | 259 | 285 | 275 | 304 | 319 |
| Pilbara, central and southern rangelands | No. businesses | 346 | 256 | 321 | 290 | 300 | 270 | 250 | 233 | 235 | 230 | 186 | 190 | 172 | 178 | 171 | 171 | 163 |
| | No. sampled | 17 | 15 | 16 | 12 | 17 | 19 | 13 | 11 | 16 | 12 | 11 | 8 | 9 | 9 | 13 | 9 | 9 |
| | % sampled | 5% | 6% | 5% | 4% | 6% | 7% | 5% | 5% | 7% | 5% | 6% | 4% | 5% | 5% | 8% | 5% | 6% |
| | Number of sheep | 5379 | 6204 | 4110 | 2746 | 2920 | 3862 | 2576 | 3206 | 1672 | 1825 | 313 | 0 | 75 | 65 | 908 | 167 | 1519 |
| | Number of cattle | 1090 | 1635 | 1471 | 1369 | 1469 | 1515 | 1478 | 1572 | 2048 | 2179 | 2290 | 1536 | 1808 | 2056 | 2529 | 3959 | 4213 |
| | Area operated ('000 ha) | 151 | 242 | 200 | 212 | 206 | 221 | 108 | 180 | 219 | 243 | 239 | 235 | 253 | 223 | 256 | 363 | 350 |

Source: ABARES Agsurf (<http://apps.daff.gov.au/agsurf/agsurf.asp>)

Trends evident in Table 5 for the average Western Australian pastoral business over the last 15 years include:

- A decrease in the estimated number of pastoral businesses;
- An increase in the area operated by each business (total rangeland area has remained the same, but number of businesses has decreased, resulting in the area operated by each business increasing);
- A significant fall in the number of sheep and then a slow build per business from 2012 in the Pilbara, central and southern rangelands sample region;
- A peak in cattle numbers in 2009, a slump in 2011/12 and then a rebuild in cattle numbers to date, per business.

Table 6: Financial business characteristics for the Western Australian pastoral rangelands every five years from 2000 to 2016

| | Year | 2000 | 2005 | 2010 | 2015 | 2016 |
|-------------------------------------|--|---------|-----------|-----------|-----------|-----------|
| Kimberley | Kimberley Total cash receipts (\$) | 971,272 | 1,914,690 | 2,051,919 | 2,319,872 | 3,861,709 |
| | Kimberley Total cash costs (\$) | 698,708 | 1,185,845 | 1,592,774 | 1,392,338 | 1,697,365 |
| | Kimberley Operating surplus (\$) | 272,564 | 728,845 | 459,145 | 927,534 | 2,164,344 |
| | Kimberley Profit at full equity (\$) | 653,628 | 679,592 | 159,928 | 407,018 | 935,852 |
| Pilbara, central and southern | Pilbara, central and southern total cash receipts (\$) | 402,743 | 528,635 | 379,509 | 1,115,295 | 1,306,096 |
| | Pilbara, central and southern total cash costs (\$) | 330,864 | 391,695 | 399,509 | 634,435 | 550,737 |
| | Pilbara, central and southern operating surplus (\$) | 71,879 | 136,940 | -20,000 | 480,860 | 755,359 |
| | Pilbara, central and southern profit at full equity (\$) | 23,591 | 9,446 | -52,280 | 326,184 | 716,251 |

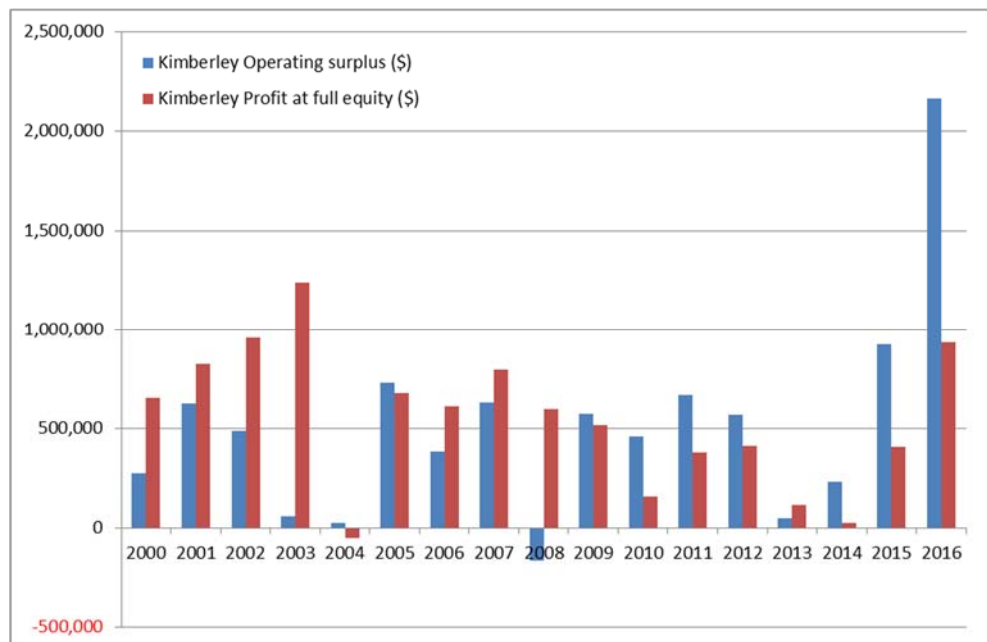
^{3, 4} Source: ABARES Agsurf (<http://apps.daff.gov.au/agsurf/agsurf.asp>)

Table 6 and Figures 4 and 5 show the cyclical nature of profit on pastoral stations. The highs and lows are experienced more dramatically in the Kimberley than the rest of the pastoral rangelands although the Kimberley is significantly more profitable. The Kimberley experienced only one year of loss and no break even years between 2000 and 2016, whereas the rest of the pastoral rangelands experienced five years of loss and two years of break-even over this period. The difference in the y axis for each graph should be noted as the Kimberley is on average generating greater profits and operating surplus than the rest of the pastoral rangelands. This is predominantly due to the higher productivity per hectare in the Kimberley.

³ The operating surplus is derived by taking the total cash costs away from the total cash receipts. It is an approximate measure of the average business's operating cash flow.

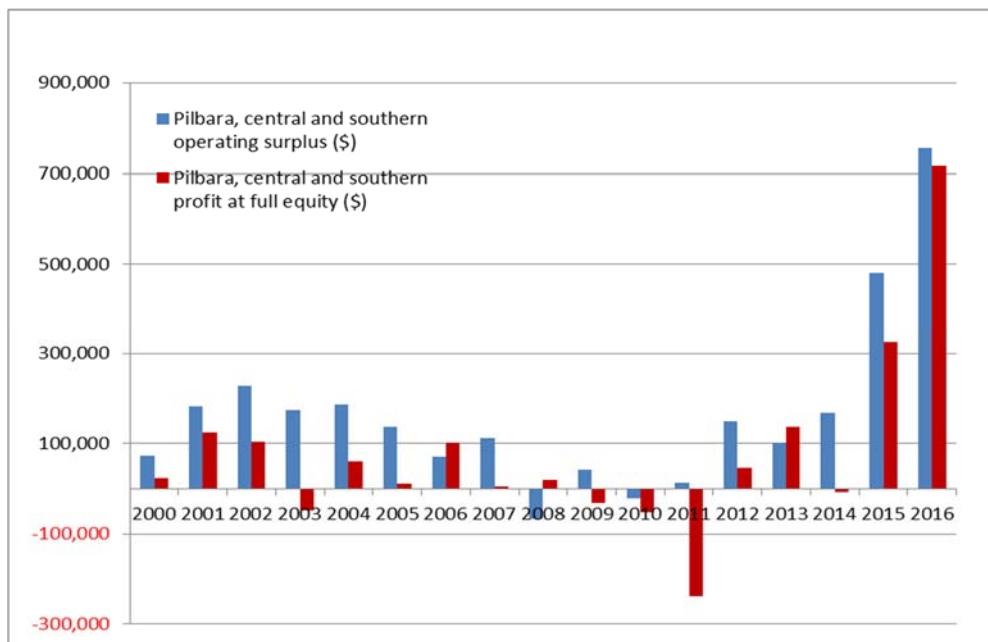
⁴ Profit at full equity equals farm business profit, plus rent, interest and finance lease payments, less depreciation on leased items. It is the return produced by all the resources used in the farm business. It assumes the business is debt free and does not have interest repayments.

Figure 4: Kimberley operating surplus and profit at full equity



Source: ABARES Agsurf (<http://apps.daff.gov.au/agsurf/agsurf.asp>)

Figure 5: Pilbara, central and southern op.surplus & profit at full equity

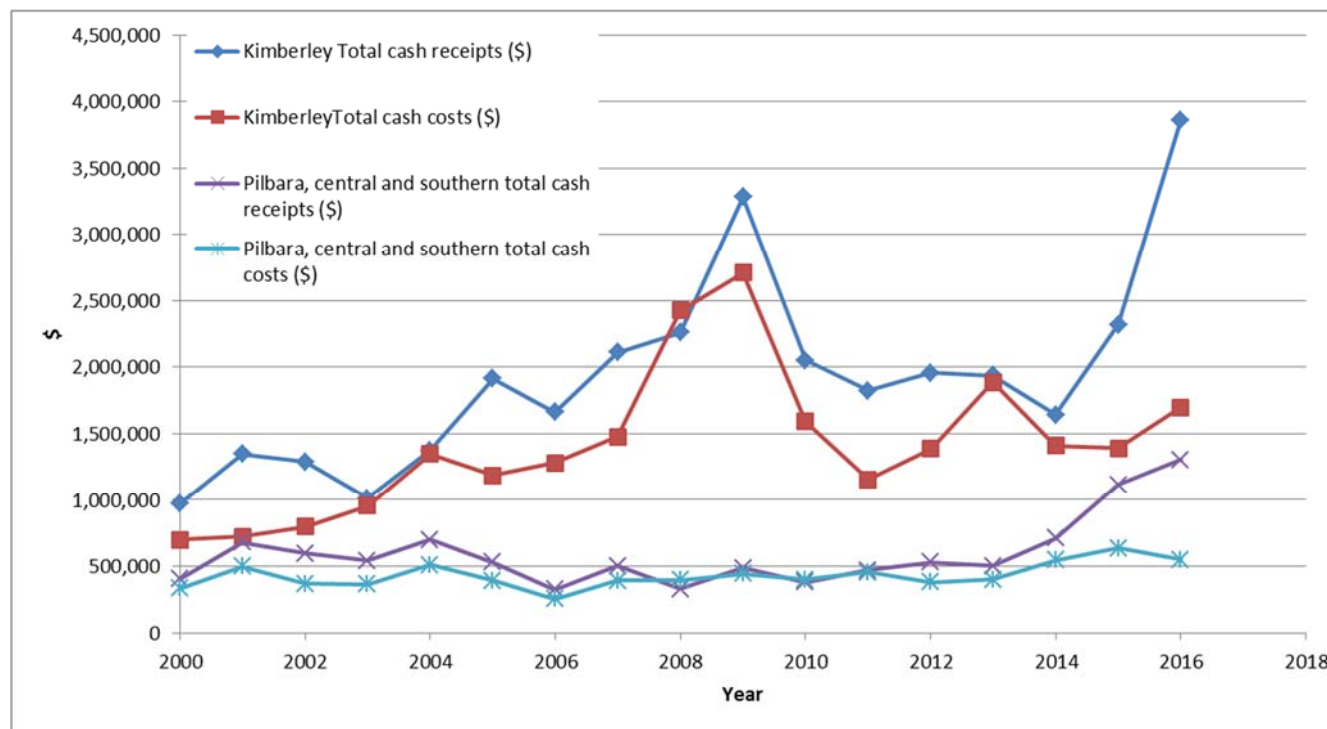


Source: ABARES Agsurf (<http://apps.daff.gov.au/agsurf/agsurf.asp>)

Figure 6 shows total cash costs and total cash receipts have tended to follow each other over time. As stock numbers increase costs follow. However there has been a divergence between total cash costs and total cash receipts since 2014 resulting in the increased profit and operating surplus shown in the figures above. This is primarily because livestock prices have been unusually high.

As noted earlier, Figure 1 shows the stocking rates in the Kimberley, East Pilbara and the Pilbara are higher than the other areas of the pastoral rangelands. The data suggests that higher stocking rates contribute to higher profits. Therefore the figures in Table 6 potentially mask the lower profitability of many station businesses in the Southern Pastoral Rangelands in the Gascoyne, Murchison, Goldfields and Nullarbor.

Figure 6: Cash receipts and cash costs for the Kimberley and the Pilbara, central and southern pastoral rangelands from 2000 to 2016



Source: ABARES Agsurf (<http://apps.daff.gov.au/agsurf/agsurf.asp>)

2.2 Sales data

The data in Table 7 shows revenue from pastoral rangelands cattle has increased 256% and sheep revenue has decreased by 44% from 2001 to 2016.

Table 7: Stock sales revenue for the Western Australian pastoral rangelands from 2001 to 2016

| Rangeland stock sales revenue (GVAP, point of sale), (ABS) | 2001 | 2006 | 2011 | 2016 | % chg 01 - 16 |
|--|-------|-------|-------|------|---------------|
| - Cattle, \$M | 140.2 | 146.2 | 329.4 | 499 | +256% |
| - Sheep, \$M | 14 | 9.9 | 11.2 | 6.2 | -44% |

Source: ABS, Value of Agricultural Commodities Produced (from 5 yearly ABS Agricultural Cenci)

2.3 Value of Meat

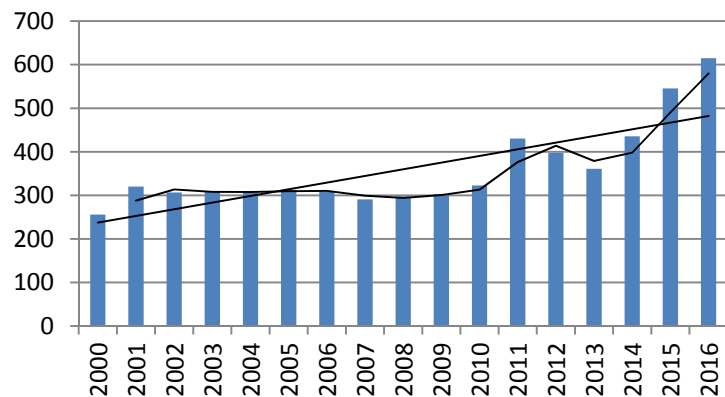
The value of sheep and cattle meat has been increasing gradually over time as shown in Table 8 and Figures 7 and 8. The demand for meat has increased and therefore so has the price, as world cattle numbers have remained steady (see Table 9). There has also been a large scale herd reduction in Queensland due to drought.

Table 8: Livestock values for selected years 2000 to 2016, c/kg cwt

| Year | 2000 | 2004 | 2008 | 2012 | 2016 | % chg 00 - 16 |
|---|------|------|------|------|------|---------------|
| - Cattle, Trade steer 330 – 400kg, saleyard | 256 | 307 | 298 | 397 | 615 | +140% |
| - Sheep, Trade lamb 18 – 22kg, saleyard | 187 | 325 | 326 | 403 | 478 | +156% |

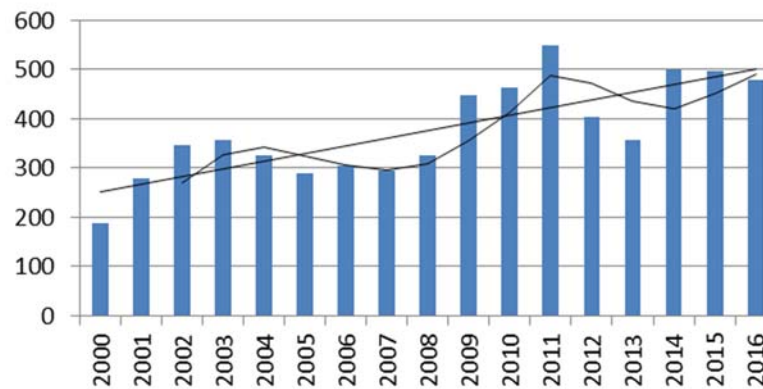
Source: Meat and Livestock Australia

Figure 7: WA Trade Steer c/cwt, 2000-16



Source: Meat and Livestock Australia

Figure 8: WA Trade Lamb 18-22kg c/cwt, 2000-16



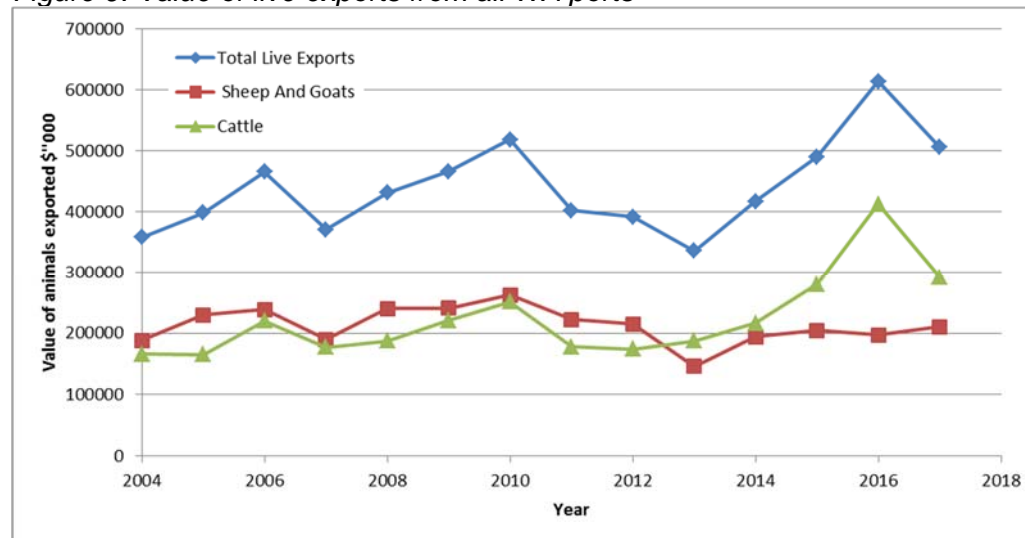
Source: Meat and Livestock Australia

Stable cattle numbers world wide and the decreased herd in Queensland have put pressure on supply and pushed prices higher. In 2015, WA exported around 40% of its cattle turnoff as live exports and around 45% of its total boxed production (about 60% of turnoff); therefore its prices are largely tied to movements in export prices and movements in herd sizes as a result of climatic conditions.

2.4 Markets and Destinations

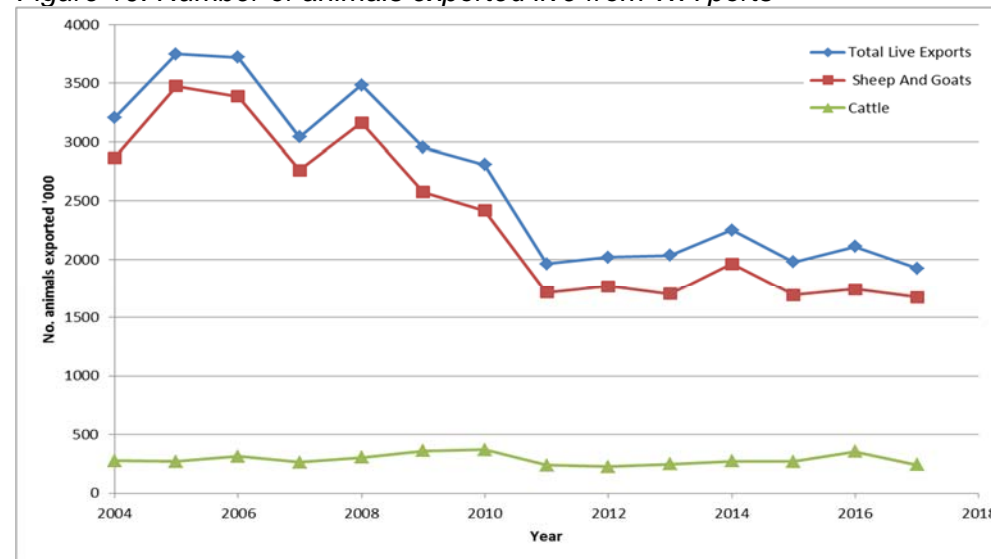
The Global Trade Atlas provides export data from Australian ports. The value and number of live exports from the whole of Western Australia between 2004-2017 is shown in figures 9 and 10.

Figure 9: Value of live exports from all WA ports



Source: Global trade Atlas

Figure 10: Number of animals exported live from WA ports

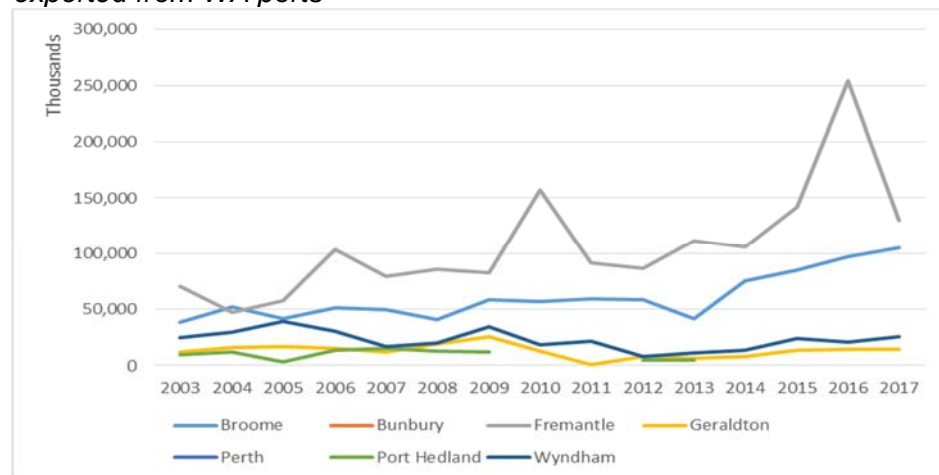


Source: Global trade Atlas

While the number of animals exported live from Western Australia dropped dramatically in 2011 and subsequently stabilised (Figure 10), the value over the same period increased (Figure 9). There was a severe drought in some areas, especially sheep areas, in 2010. Rebuilding of livestock numbers occurred in 2011 so turn-off was very low across the board. Live exports to Indonesia were suspended in 2011. Following the ban the Exporter Supply Chain Assurance System (ESCAS) was introduced in 2012. These events have contributed to the decrease in exports since 2011.

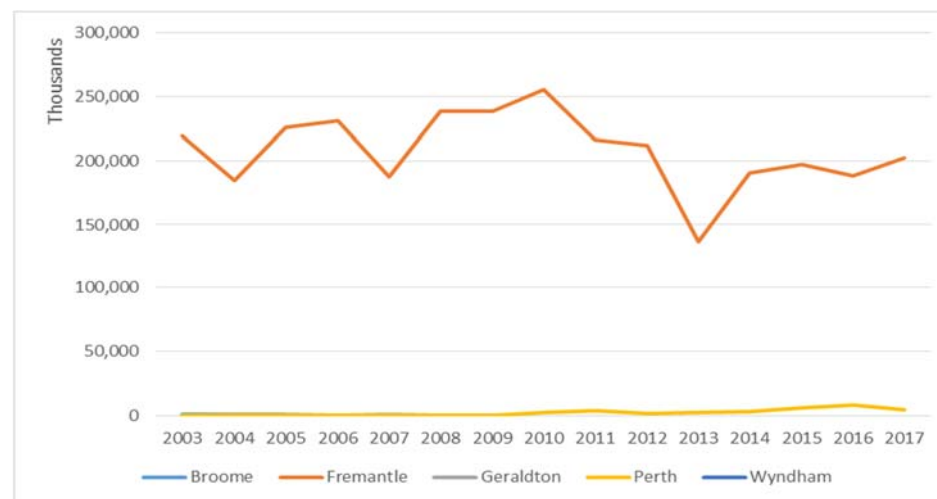
Figures 11 and 12 show the value of exports for cattle and sheep by port. The Kimberley and parts of the Pilbara export out of the northern ports. Whilst the remainder of the pastoral rangelands predominantly export out of Fremantle. Therefore the data is for the whole of the State includes exports from the agricultural areas as well. There have been no live exports from Bunbury.

Figure 11: The value of WA live cattle exports (breeding and slaughter) exported from WA ports



Source: ABS data, DPIRD analysis

Figure 12: The value of WA live sheep exported from WA ports



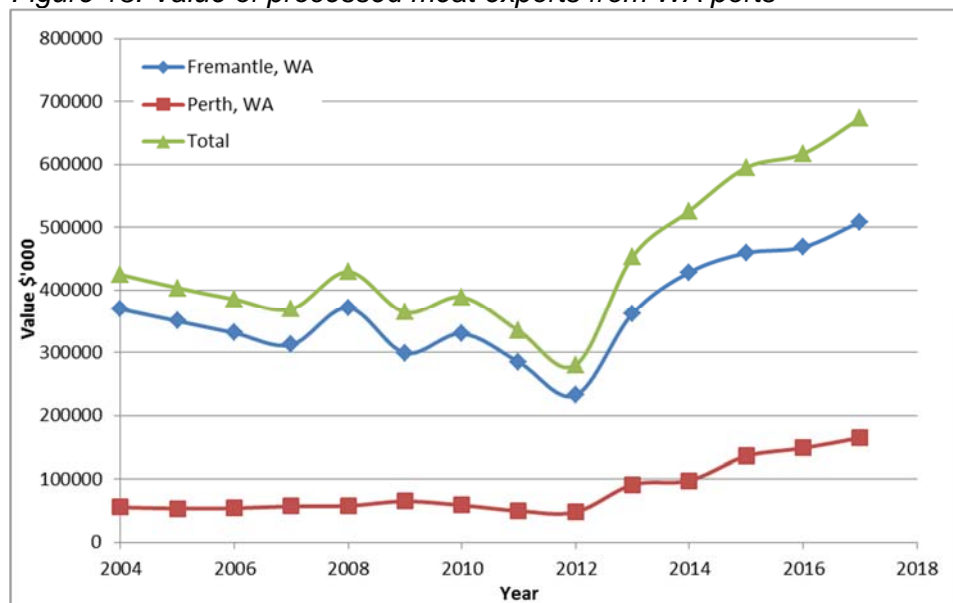
Source: ABS data, DPIRD analysis

Figures 13 and 14 show the value and kilograms of processed meat respectively exported from WA. The data shows there was a dip in both quantity and value of processed meat exported in 2011 and 2012, with a recovery from 2013. The recovery can be attributed to herd and flock rebuilding following the drought in 2010. The value has increased from 2013 consistent with price trends explored in the Section 2.5.

The Kimberley Meat Company abattoir on Yeeda Station near Derby is the only abattoir in the pastoral rangelands. It has a capacity to process 50,000 – 60,000 head per year and opened in September 2016. The bulk of animals for boxed meat are still trucked south for finishing before processing and being exported from Fremantle. Cattle from the Kimberley may also be trucked to the Darwin abattoir, although its owners recently indicated that the facility is likely to be mothballed later in 2018⁵.

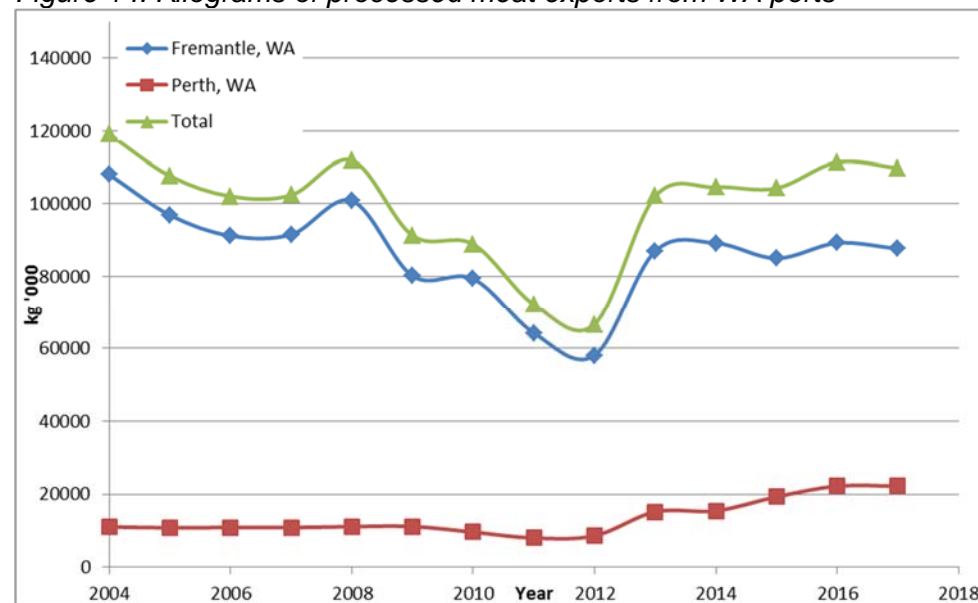
⁵ <http://www.abc.net.au/news/rural/2018-05-23/aaco-closes-livingstone-beef-abattoir-near-darwin/9790454>

Figure 13: Value of processed meat exports from WA ports



Source: Global trade Atlas

Figure 14: Kilograms of processed meat exports from WA ports



Figures 15 and 16 show sheep and cattle disposals for WA producers in 2017. The largest live cattle export destinations by value for northern ports are Indonesia and Vietnam. For southern ports the major destinations are Israel, Vietnam, Indonesia and Turkey. The major live sheep export markets are Kuwait, Qatar, Turkey, Oman and United Arab Emirates.

The top four countries receiving beef exports are the United States of America, Japan, China and Korea. Key destinations for sheep meat are China, Saudi Arabia, United States of America, United Arab Emirates and Malaysia.

Figure 15: Cattle disposals by WA producers in 2017

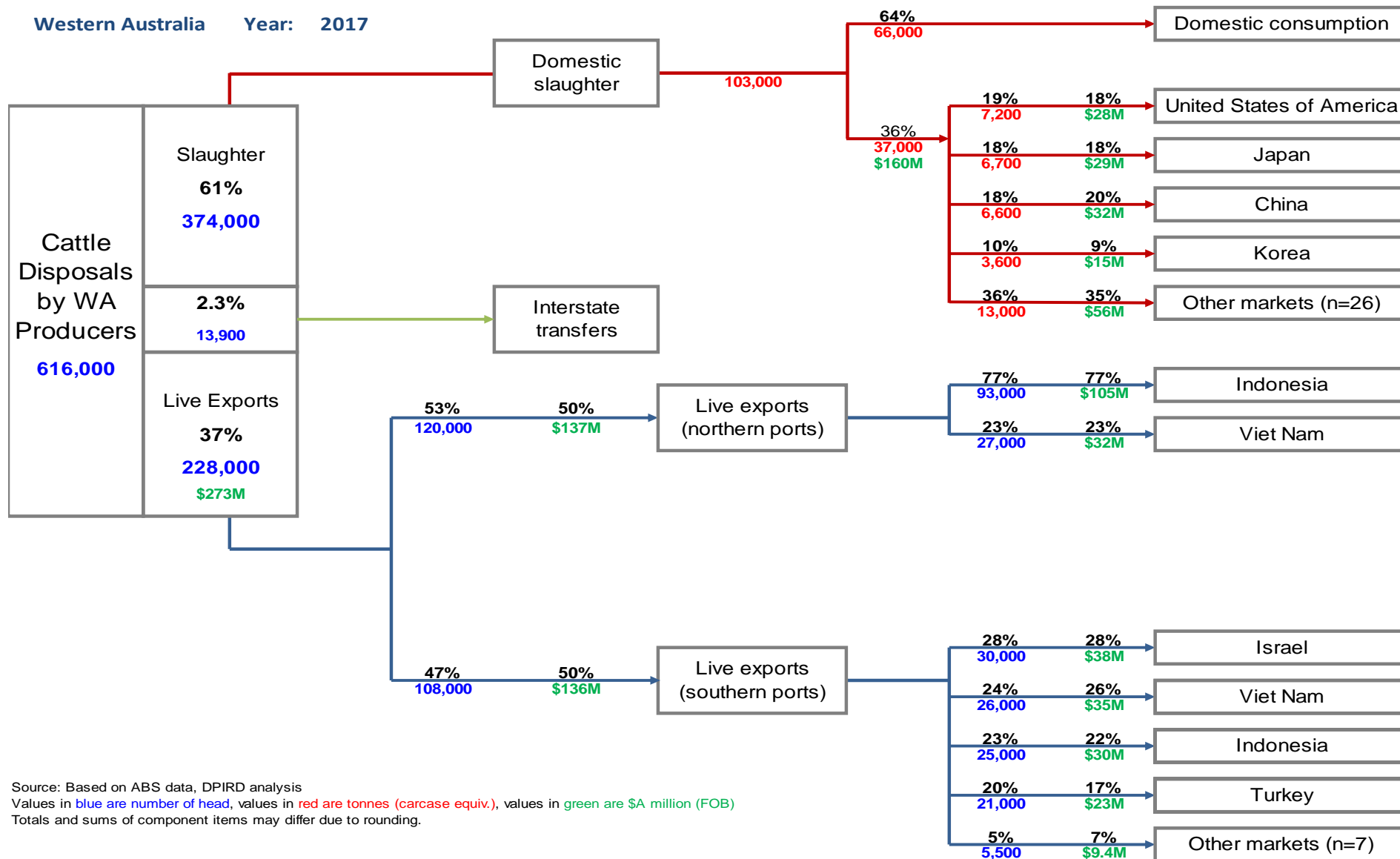
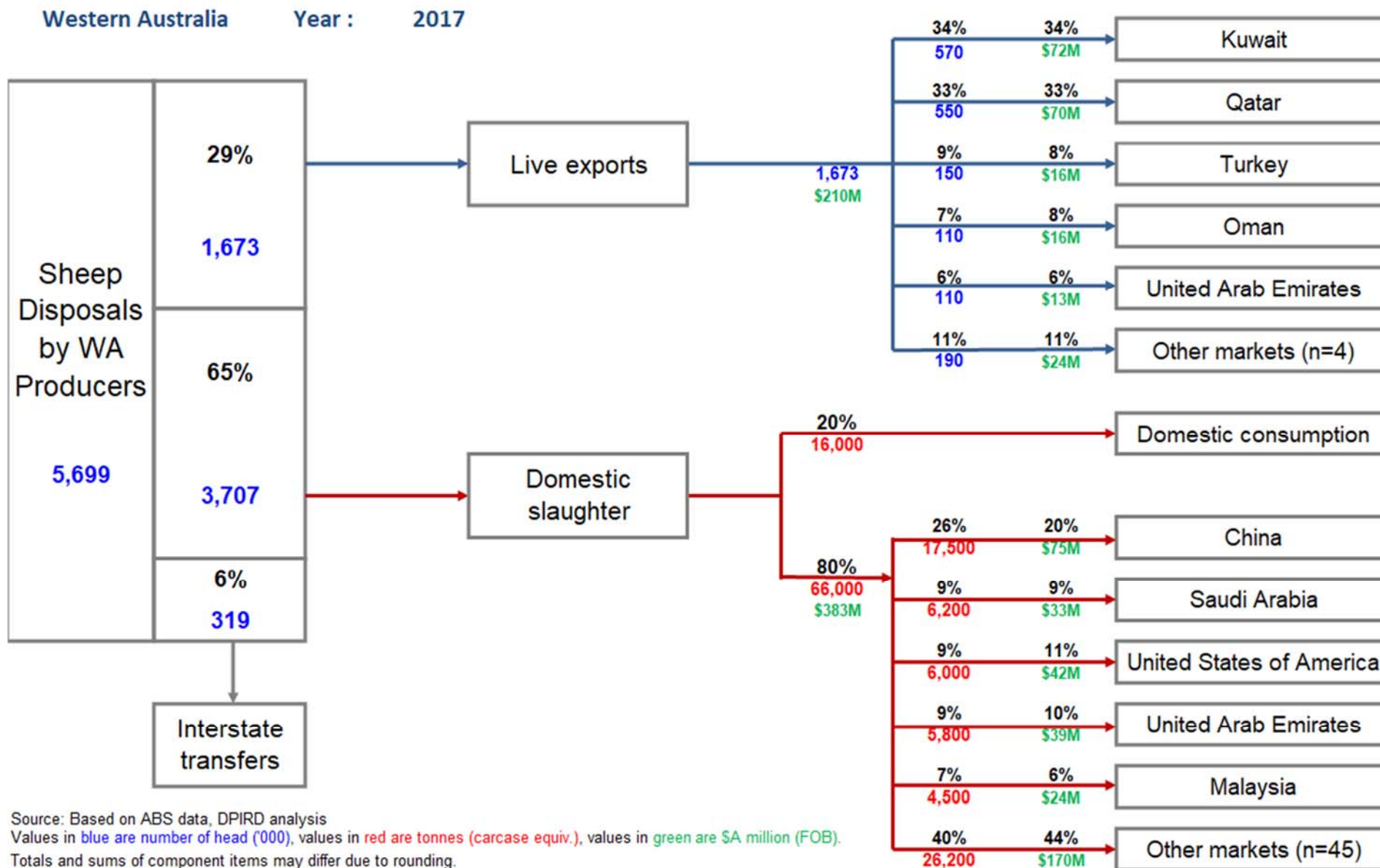


Figure 16: Sheep disposals by WA producers in 2017



2.5 Global and national trade price trends

ABARES also publish an annual series of commodity price statistics. Table 9 indicates that between 2010/11 and 2016/17 the global volume of export in beef and veal has increased by 21%, driven in part by China's 1945% import growth over the period. However, world cattle numbers fell over the period and this is reflected, in part, in the rising \$/kg value of Australian beef exports. The Australian dollar also fell around 25% against the US dollar between 2012 and 2016. Exports accounted for between 69% and 75% of Australia's beef and veal production over the period. As the nation's production capacity is largely fixed due to its resource endowment, Australian export volumes grew by only 0.11% in the period, while the value of Australian exports grew 57%. Note the large variations in export volumes and slaughtering's are due to climatic instability in the key production areas of Queensland and NSW. These states accounted for 42% and 20% of the national total cattle numbers respectively in 2015/16. Movements in these herds can effectively set benchmark prices for the rest of the country.

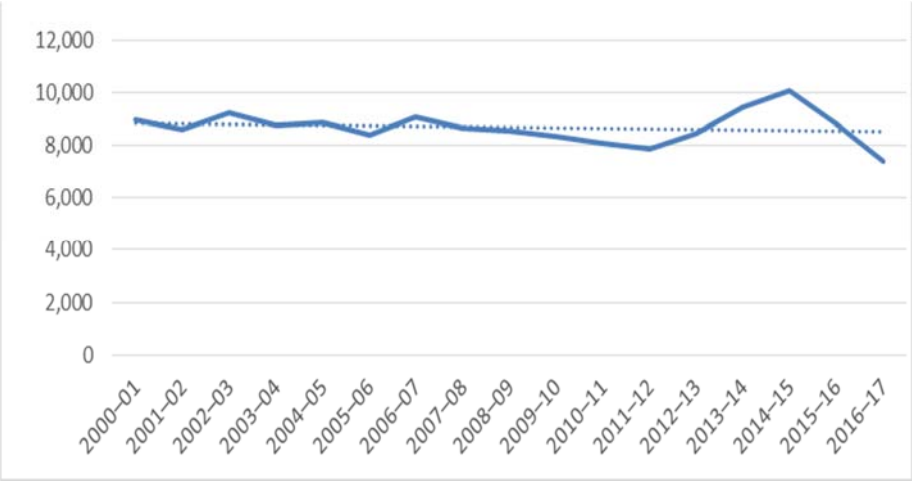
Table 9: Beef and Veal commodity statistics, 2010-17

| | World exports, kt (cwt) | China imports, kt | World cattle numbers (total), million | Australian exports by value, \$/kg (cwt) | Australian exports by volume, kt (cwt) | Australian exports by value, \$M | Australian slaughtering's |
|---------|-------------------------|-------------------|---------------------------------------|--|--|----------------------------------|---------------------------|
| 2010–11 | 7,793 | 40.0 | 1,009 | 3.14 | 1,442 | 4,527 | 8,097 |
| 2011–12 | 8,063 | 29.0 | 1,002 | 3.20 | 1,462 | 4,685 | 7,873 |
| 2012–13 | 8,169 | 95.0 | 1,002 | 3.28 | 1,539 | 5,052 | 8,457 |
| 2013–14 | 9,239 | 412 | 1,005 | 3.63 | 1,769 | 6,422 | 9,473 |
| 2014–15 | 9,997 | 417 | 1,009 | 4.50 | 2,009 | 9,040 | 10,103 |
| 2015–16 | 9,545 | 666 | 980 | 4.86 | 1,749 | 8,495 | 8,796 |
| 2016–17 | 9,422 | 818 | 989 | 4.93 | 1,443 | 7,115 | 7,423 |

Source: ABARES Commodity Statistics

Figure 17 could indicate an emerging pattern of larger episodes of destocking and herd rebuilding as climatic change becomes more evident. This could imply a pattern of higher trend prices as eastern states' herds are unable to rebuild to their full potential before the next destocking episode. If so, WA's apparent pattern of increases in volume and reliability of rainfall over much of the northern and eastern pastoral rangelands could provide additional business opportunities for pastoralists in these areas. This proposition requires testing by using a national herd model.

Figure 17: Australian beef and veal slaughtering's '000 head, 2000-17



Source: ABARES Commodity Statistics

3 PASTORAL RANGELAND CONDITION AND DRIVERS OF CHANGE

3.1 Pastoral rangeland condition

The status of the pastoral rangelands has been described in detail in the *Rangelands Report Card* under the themes of rangeland vegetation cover, plant population change, vegetation cover, soil erosion and soil organic carbon⁶.

Each lease has an estimated livestock carrying capacity⁷ based on assessment of the condition of the lease.

Table 10 presents rangeland vegetation condition scores from the Soil and Land Commissioner's annual reports to the Pastoral Lands Board. Good condition country is in original condition. Fair and poor scores are given to areas where some degradation has occurred.

Table 10: Rangeland condition scores for Western Australian Pastoral Rangelands, 2002-2009

| Condition score of Rangeland Catchments and Regions | | | | |
|---|----------------------|------------------------|---------------------------------|------------------------------|
| Score | Kimberley 2002-09 | Pilbara 2001- 09 | Upper Southern Rangelands | Lower Southern Rangelands |
| Good | 52% | 64% | 32% | 39% |
| Fair | 32% | 24% | 39% | 39% |
| Poor / Very Poor | 16% | 12% | 29% | 22% |

Source: Extracted from Soil and Land Commissioner's Report to the Pastoral Lands Board, 2017

The difference in potential carrying capacity and actual carrying capacity gives an indication of the resource condition. There can be changes in rangeland condition such as an increase in unpalatable species that can have positive benefits for overall rangeland condition as the increase in vegetation cover reduces the risk of erosion or potentially increases soil carbon. However this change would not result in an increase in carrying capacity as the species are unpalatable⁸.

Rangeland condition also changes depending on location. Figures 18 and 19 show the trends for vegetation condition, plant population change in desirable perennials, vegetation cover and soil erosion at a Land Conservation District level for the Western Australian pastoral rangelands

⁶ Report card on sustainable natural resource use in the rangelands (<https://www.agric.wa.gov.au/rangelands/report-card-sustainable-natural-resource-use-rangelands-western-australia>),

⁷ Carrying capacity is estimated based on the rangeland vegetation condition scores and the pastoral values (livestock units per unit of area) of the land systems that make up the lease.

⁸ Report card on sustainable natural resource use in the rangelands (<https://www.agric.wa.gov.au/rangelands/report-card-sustainable-natural-resource-use-rangelands-western-australia>),

Figure 18: Trends in natural resources in the Northern Rangelands. The trend in vegetation cover was based on data in 2006–15 and the trends in rangeland vegetation condition, soil erosion and desirable plant populations are based on the WARMS assessments since the last station inspection.

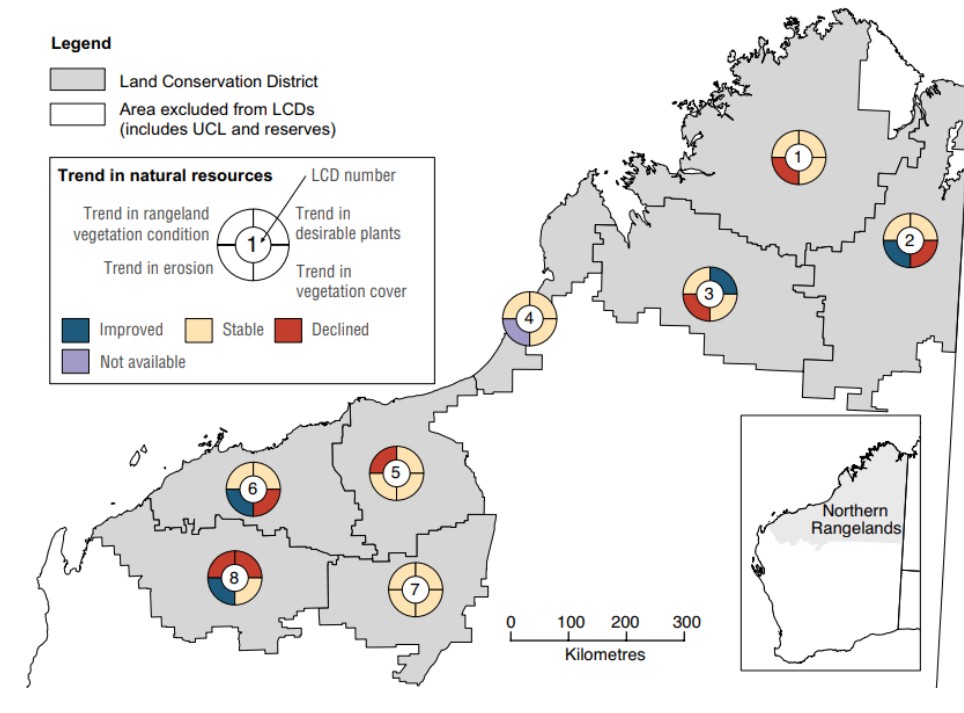
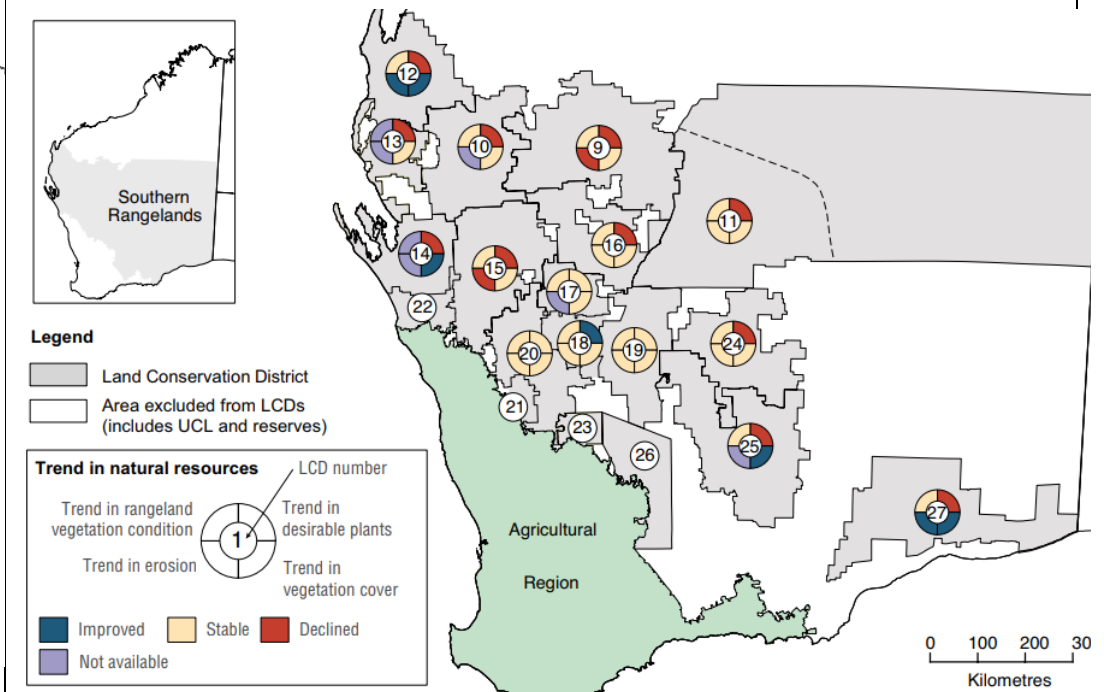


Figure 19: Trends in natural resources in the Southern Rangelands. The trend in vegetation cover was based on data in 2006–15 and the trends in rangeland vegetation condition, soil erosion and desirable plant populations are based on the WARMS assessments since the last station inspection. There are insufficient spatial data for some attributes to confidently determine trends for LCDs 21, 22, 23 and 26.



Source: Report card on sustainable natural resource use in the rangelands (<https://www.agric.wa.gov.au/rangelands/report-card-sustainable-natural-resource-use-rangelands-western-australia>), pages xii, xiii.

WARMS refers to the Western Australian Rangelands Monitoring Sites, and LCD refers to Land Conservation Districts.

3.2 Drivers of change in rangeland condition

There are three drivers of change in the pastoral rangelands; grazing pressure, seasonal quality and fire.

3.2.1 Grazing pressure

Historic overgrazing has reduced the carrying capacity of the pastoral rangelands by varying levels across regions. Grazing pressure can be from managed stock, native herbivores such as kangaroos and from feral animals such as goats, donkeys or camels. The loss of pastoral rangeland condition equates to a loss in potential production. It was estimated in by the Department of Agriculture and Food, Western Australia in 2016, based on a five year average of ABARES receipts and costs, that the loss of profit from pastoral rangelands degradation was \$78m each year.

In terms of asset value, this could translate to a loss of approximately \$238m in cattle units. Table 11 shows there has been an increase in the number of cattle units (CU) carried in total across the pastoral rangelands. The trend in increasing cattle units is shown as an increase in the percent of total carrying capacity. When adjusted for degradation, on average, leases are operating at 117% of assessed carrying capacity, as of 2016. Stocking beyond the present carrying capacity is contributing to further degradation in some areas of the pastoral rangelands. Table 12 suggests that the Kimberley, Pilbara and Nullarbor were, on average, stocking beyond assessed capacity in 2016, reflecting increased rainfall in these areas.

Table 11: Reported versus potential carrying capacity from PLB, selected years 2001 to 2016

| Rangeland reported livestock numbers, CU (=7 DSE) | 2001 | 2006 | 2011 | 2016 | % chg 01 - 16 |
|---|-------------|-------------|-------------|-------------|----------------------|
| - Cattle | 812,993 | 1,038,294 | 1,115,131 | 1,301,364 | +60% |
| - Sheep | 153,318 | 82,644 | 24,897 | 33,488 | -78% |
| - Goats | 3,824 | 7,075 | 3,598 | 939 | -75% |
| - Total | 970,130 | 1,128,014 | 1,161,188 | 1,335,769 | +38% |
| Livestock / carrying capacity ratios | 2001 | 2006 | 2011 | 2016 | % chg 01 - 16 |
| Reported CU / Potential CU, | 66% | 74% | 73% | 84% | +27% |
| Reported CU / Present CU (Potential CU adjusted for degradation) | 90% | 102% | 101% | 117% | +30% |
| Potential CU adjusted for degradation / Potential CU | | | 72% | | |

Source: Western Australian Annual Return of Livestock and Improvements DPIRD, Western Australia, 2017.

Table 12: Stocking rate changes by locations

| | Kimberley | | East Pilbara | | Pilbara | | Gascoyne | | Murchison | | Goldfield s | | Nullarbor | |
|------------------------------|-----------|----------|--------------|----------|----------|----------|----------|----------|-----------|------|----------------|----------|-----------|----------|
| | 20 00 | 2016 | 2000 | 2016 | 2000 | 2016 | 2000 | 2016 | 2000 | 2016 | 20 00 | 20 16 | 2000 | 2016 |
| Reported CU/ Potential CU | 59 % | 93% | 111 % | 140 % | 86% | 92% | 72% | 74% | 61% | 30% | 41 % | 58 % | 52% | 78% |
| Reported CU / Present CU | 85 % | 131 % | 133 % | 167 % | 112 % | 120 % | 100 % | 102 % | 83% | 41% | 59 % | 83 % | 77% | 115 % |

Source: Western Australian Annual Return of Livestock and Improvements, DPIRD, Western Australia, 2017.

3.2.2 Rainfall and seasonal quality

Table 13 shows there has been a general increase in rainfall across the pastoral rangelands over the past 20 years. The increase has been greatest in the Kimberley. Table 13 also shows there has been an increase in summer rainfall and a decrease in winter rainfall for all districts over past 20 years, with the exception of a slight increase in winter rainfall in the Kimberley.

Table 13: Average annual rainfall differences for 1970-1999 and 2000-2017

| | Average annual rainfall | | Average summer rainfall | | Average winter rainfall | |
|---------------------|-------------------------|-----------|-------------------------|-----------|-------------------------|-----------|
| | 1970-1999 | 2000-2017 | 1970-1999 | 2000-2017 | 1970-1999 | 2000-2017 |
| Kimberley | 696 | 851 | 611 | 797 | 47 | 54 |
| East Pilbara | 355 | 409 | 282 | 365 | 68 | 52 |
| Pilbara | 324 | 333 | 226 | 272 | 95 | 66 |
| Gascoyne | 238 | 230 | 100 | 139 | 138 | 90 |
| Murchison | 236 | 251 | 126 | 188 | 109 | 64 |
| Goldfields | 257 | 280 | 132 | 195 | 124 | 87 |
| Nullarbor | 223 | 264 | 105 | 163 | 117 | 100 |

Source: Bureau of Meteorology, DPIRD analysis

The trend of increased rainfall across the northern and eastern pastoral rangelands of Western Australia both annually and during summer, is illustrated in Figures 18 and 19 respectively.

The arrows on the map show where the isohyets were and where they have moved to. The new isohyets are shown in colour.

Climate strongly influences rangeland pastures. Forage production is generally directly related to seasonal quality and length. However, in degraded areas this may not be true if water is not retained in the landscape.

Extended periods of average and above average rainfall can encourage managers to increase livestock numbers. When seasons return to average or below average, these higher livestock numbers are often retained, which can result in overgrazing of preferred pasture plants, resulting in a loss of soil cover and therefore increased potential for degradation and a decline in productivity⁹.

3.2.3 Fire

Fire is a natural part of the rangeland ecosystem. For instance many grasslands in the Kimberley are reliant on fire. Fire is common in the Kimberley and the Pilbara and is much less common in the southern pastoral rangelands¹⁰.

Fire frequency, intensity and timing affect pastoral condition. Frequent fire events that do not provide time for the vegetation to recover can leave soil exposed and prone to water and wind erosion. Also timing of fire is important. Fires occurring late in the dry season can leave soil exposed to heavy rainfall at the start of the wet¹¹.

⁹ Report card on sustainable natural resource use in the rangelands (<https://www.agric.wa.gov.au/rangelands/report-card-sustainable-natural-resource-use-rangelands-western-australia>),

¹⁰ Report card on sustainable natural resource use in the rangelands (<https://www.agric.wa.gov.au/rangelands/report-card-sustainable-natural-resource-use-rangelands-western-australia>),

¹¹ Report card on sustainable natural resource use in the rangelands (<https://www.agric.wa.gov.au/rangelands/report-card-sustainable-natural-resource-use-rangelands-western-australia>),

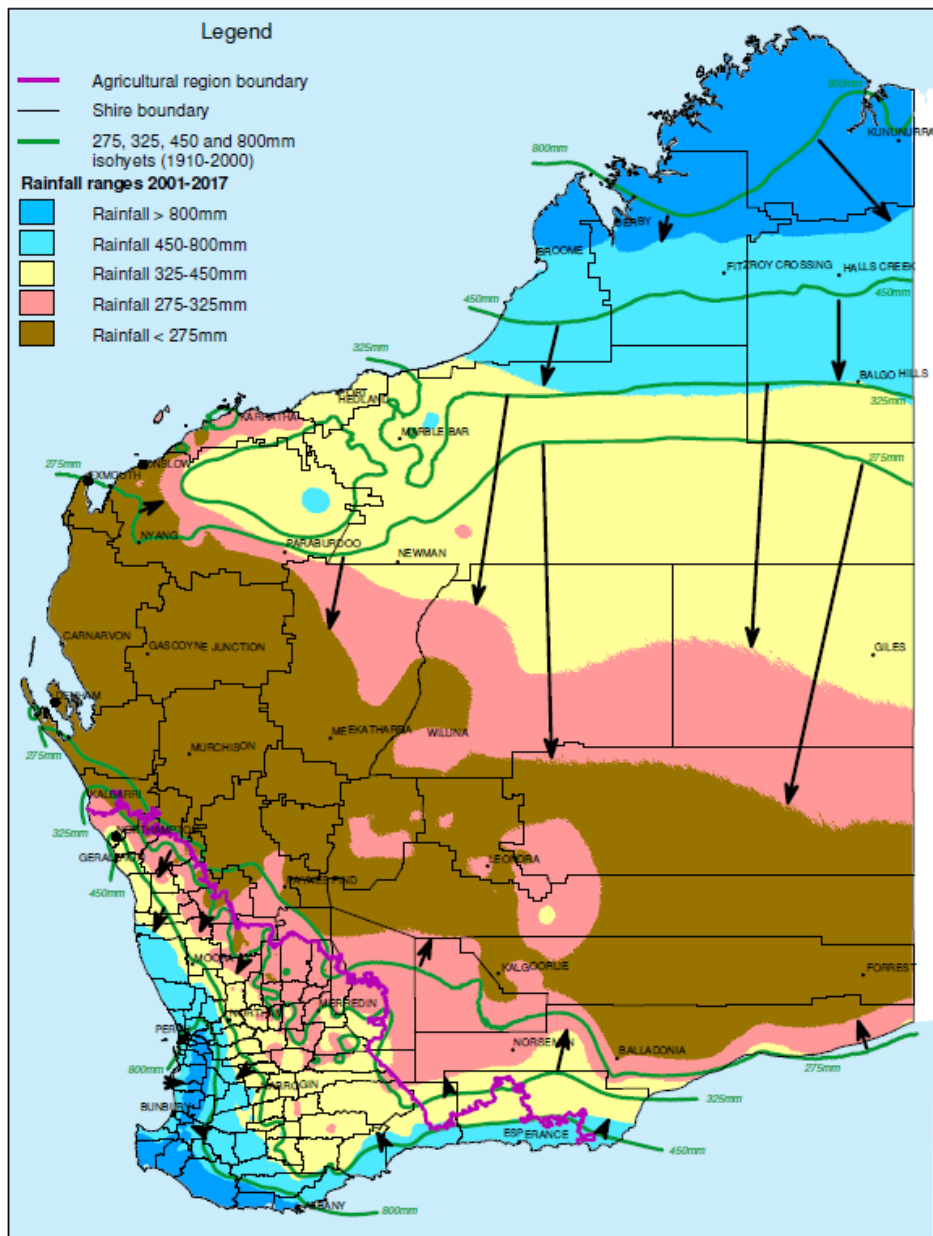


Figure 18: Changes in average annual rainfall zones for the WA pastoral rangelands 2001-2017 compared to 1910-2000

4 POTENTIAL FUTURE TRENDS AND RISKS

4.1 Potential future trends

Market diversification

Western Australia has three predominant cattle markets; live export, domestic retail and boxed cattle export. The market specifications for receiving a good price in Western Australia are narrow. In comparison, there are a greater number of available markets with different specifications in the eastern states. Market options available to WA producers will broaden if and when new market opportunities are created, such as via more northern processing, better timing of deliveries as a consequence of, for instance, irrigated on-feeding and improved genetics. This could increase the production and profitability of the WA cattle production in the pastoral rangelands.

Backgrounding

An example of backgrounding¹² in Western Australia is moving cattle from the pastoral rangelands to properties in the agricultural region to prepare them for live export or for feedlots. In 2013 96,000 cattle moved to the agricultural regions from the pastoral rangelands with 23 percent moving to a property for backgrounding, 13 percent going to an abattoir, 40 percent being delivered to feedlots and 24 percent delivered to saleyards¹³. Backgrounding in WA is not as well developed as it is in the eastern states. Currently, many cattle are not backgrounded and are sold by the breeder direct into live export.

Feedlotting

Grain-finished animals are prepared for market through feedlots. Western Australia's feedlotting industry is underutilised with around 70 percent of capacity used at any one time. Feedlotting is expected to increase across Australia as international demand for grain fed beef increases. The WA industry is growing in scale and throughput, although it remains much smaller than eastern states' industries.

Irrigation

There are approximately 3500 hectares of irrigated pasture in the Pilbara and West Kimberley. Of the 3500 hectares of irrigated pasture land, a large proportion of this is used by pastoralists as 'stand and graze'¹⁴ pasture rather than as a 'cut and carry'¹⁵ fodder enterprise. Significant exceptions to this are two operations by Rio Tinto in the Pilbara totalling around 1800 hectares. These sites use mine dewater surplus to grow dedicated hay crops for use on company owned pastoral properties and for sale to the regional market.

It is likely that recent proving-up of water resources in the north by DPIRD will expand the amount of irrigation in the Kimberley, Pilbara and Gascoyne creating new opportunities for pastoral businesses in animal production and potentially horticultural crops. This could increase stocking rates without causing rangeland degradation if managed appropriately.

¹² Backgrounding refers to the practice of moving cattle from a property that focuses on breeding, to another property to prepare the animals for market.

¹³ NLIS data for 2013, analysed by DPIRD

¹⁴ Stand and graze systems involve livestock grazing on irrigated pasture, usually rotated at regular intervals to optimise pasture and livestock performance.

¹⁵ Cut and carry systems involve the production of a fodder crop that is put through a haymaking or fodder conservation process (i.e.: silage) on a terminal basis with annual species (e.g. Oaten hay) or at set intervals with perennial pasture species (e.g. Rhodes grass or lucerne hay).

Changes in business structures

There has been a slow transition away from individually owned station leases towards a number of leases operating as one pastoral business. There has also been an increased presence of corporate owned pastoral businesses over time, predominantly in higher rainfall areas. It is expected this trend will continue, particularly if stations continue to generate good returns.

Greater production variability implies a greater need for flexible management practices that are more likely to be associated with family structures rather than corporate structures. Increased digitisation may alter this relationship at the margin, and it may permit more corporate finance to flow, in passive forms, to well managed family structures that are able to demonstrate their expertise particularly in variable production areas.

Pastoral reform

The pastoral reform process could potentially have significant benefits for pastoralists allowing lease holders to more easily undertake alternative forms of production on the lease. This could have flow-on benefits in terms of the value of the lease.

Improved management

Many pastoralists have been improving the productivity of livestock through options such as improving watering points, increasing fertility rates and improved pasture management. However, further gains can be made. Also it is likely improved technology will provide further options for extensive stock management in the future. Digital technology developments indicate possibilities for efficiency gains in coming years, particularly labour replacement and livestock and pasture production measurement. For example, these may include drones for pasture measurement and water point operation, equipment surveillance and animal tracking devices.

Tourism

A number of pastoralists already have a tourism component to their business. Opportunities to profit from tourism could increase with increased tourism to WA.

4.2 Potential future risks

Market access

Changes in markets can have a significant effect on pastoral business profitability. For example suspended live exports to Indonesia as previously experienced in June 2011 can have dramatic effects on the profitability of a business. Market access can also be changed due to disease or other contamination issues.

Market preferences

The rising middle class around the world has seen an increase in demand for meat protein, one of the main drivers in increasing the value of meat. Figures presented in this document show recent years have been an extraordinarily good time for meat producers in terms of value for the product. A potential issue is whether rising Asian middle class demand for red meat will dominate any emerging concerns over environmental and health issues regarding red meat production, or if lower price substitutes such as white meats, laboratory produced proteins and plant based proteins will take market share and depress prices.

Increased production in competitor countries

There is the potential that livestock production could increase in other nations at lower prices, reducing the demand for stock reared in the pastoral rangelands.

Climatic changes

The climate data presented show an increase in rainfall across the northern and much of the eastern parts of the WA pastoral rangelands since around 2000. This could have benefits with respect to increasing pasture productivity, however it could also have risks. If the rainfall is delivered through increased cyclonic intensity, then diversification into activities requiring expensive infrastructure could be limited and there could be increased animal welfare and land degradation issues through widespread flooding.

There has been an increase in summer rainfall relative to winter rainfall in many districts over the past 20 years. This may be contributing to the reported overall decline in rangeland condition in the southern pastoral rangelands.

Additionally, an increase in rainfall leading to an increase in pasture growth could lead to pastoralists increasing grazing pressure, potentially beyond environmentally sustainable carrying capacities. Grazing pressure resulting in a decrease in rangeland condition during average to better seasons has been experienced in some areas of the southern pastoral rangelands. Also after periods of favourable seasons it is possible that livestock numbers may not be reduced quickly enough when average to poor seasonal conditions return.

Cultured meats and plant protein meats

The methods for tissue culture have been taken from medical science and are being translated to food production. Recently, there has been an increase in press reports of considerable investment into the development of low cost cultured meats. For instance, Tyson Foods announced in May 2018 that it had invested \$2.2M in an Israeli start-up company 'with a clear roadmap to \$5-10 kg (protein) by 2020'¹⁶. While the company's ability to attain this goal within the stated timeframe is speculative, it is likely the investment dollar flow into alternative protein production is gathering pace. Note, alternative protein covers dairy and seafood substitutes as well as meat, but meat substitute investment comprise almost 50% of the total funding allocated to alternative protein.

Meat alternatives are also being manufactured from plant based proteins. These foods are manufactured to taste, look and feel like meat.

Meat substitutes will be a substitute for meat protein potentially decreasing the demand for meat. Commodity based protein producers may have to find new sources of consumer attributes to extract value from, other than price and meat quality. For instance there could be opportunities for meat producers in Australia to position themselves as clean and green premium quality products.

¹⁶ https://agfundernews.com/tyson-invests-israeli-cultured-meat-startup-future-meat-technologies.html?utm_source=AgFunder+Updates&utm_campaign=923ab9b6a3-Apr26_2017&utm_medium=email&utm_term=0_7b0bb00edf-923ab9b6a3-98388045&mc_cid=923ab9b6a3&mc_eid=77710204aa

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