Final report

BeefLinks: Understanding feedlot performance and eating quality of beef cattle sourced from rangelands through the WA Supply chain

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Abstract
The research aims to collect data on feedlot cattle from rangeland and backgrounding operations in Western Australia to identify cattle suitable for southern finishing systems and assess their eating quality using the MSA index. A variety of research and stakeholder engagement methods were used to identify feedlot and backgrounding market specifications, the range of rangeland animals in finishing systems, current and future on-farm husbandry management and the value of EBV selection to market decisions. The project demonstrates a process for collecting valuable data on rangeland cattle from feedlot, backgrounding and processing systems in Western Australia. However significant data gaps, notably animal age and weaning weight limited the ability to identify opportunities to improve breeding, management, and supply chain efficiency. Statistical analysis enhanced understanding of the range of animals on feed and with desirable meat quality traits. Feedback pathway between producers, feedlotters, and processors was identified to assist producers with marketing decisions. Benefit cost analysis demonstrates returns from investment from genetic testing to chase high market price. Industry will benefit from the data gap analysis and willingness of producers to collect data and conduct on-station experiments, which was a key outcome for the project. The research project supported on-farm practice change by improving producer awareness and access to better data to select cattle suited for finishing systems.

Executive summary

Background

This research aims to collect data on feedlot cattle from rangeland and backgrounding operations in Western Australia (WA), including key factors such as breed, weight, and growth. The primary goal is to identify cattle suitable for southern finishing systems and assess their eating quality using the MSA index. The research targets WA beef producers, particularly those in northern rangelands, to improve breeding, management, and performance for domestic supply chains. Results will support optimized cattle growth, better bull purchasing decisions, improved husbandry practices, and increased market access, ultimately reducing reliance on live export markets.

Objectives

The project's objectives were to improve feedlot performance and meat quality of cattle sourced from northern Western Australia. The project focused on beef businesses in rangeland regions like Murchison, Gascoyne, Pilbara, and Kimberley, as well as backgrounding properties in the Agricultural Zone. It aimed to establish a feedback pathway from feedlotters and abattoirs to producers, engage core producers in discussions, and support on-farm practice changes.

Key activities included collecting data on feedlot cattle entering from rangelands or backgrounding operations, such as breed, weight, sex, and growth metrics, to identify cattle suited for southern finishing systems. The project also aimed to assess animals' eating quality using the MSA index and explored opportunities for improving breeding programs through economic analysis of EBVs tailored to the north-south supply chain. Further, the project obtained data on current on-farm management practices, including breeding, nutrition, and handling practices with a view to identifying areas for optimizing cattle growth for domestic supply chains.

Expected outcomes included improved understanding of feedlot performance, better-informed bull purchasing decisions, optimized management practices, enhanced advisory capacity, increased market access, and reduced reliance on live export markets, thus reducing associated risks.

Methodology

Semi-structured interviews were used to identify the key specifications feedlot and backgrounders use when selecting rangeland cattle. Visits to 12 stations and 6 breeding properties were conducted to improve understanding of the breeding, management, and data collection practices used in various production systems. The observations, semi-structured interviews and discussions informed development of case studies and best practice guidelines.

Statistical analysis methods were used to summarise data collected on individual cattle at each point across the supply chain.

A benefit cost analysis was conducted to investigate how adopting EBVs and integrating genetic testing, such as parentage verification, could optimise breeding decisions to improve productivity and profitability.

Results/key findings

The project successfully collected valuable data on rangeland cattle from feedlot, backgrounding and processing systems in Western Australia, laying the groundwork for further investment.

- Majority of cattle entered the backgrounding property in September/October, aligning with the typical muster period, whereas the majority of cattle entered the feedlot property in February.
- Although overall weight gain was similar between backgrounding and feedlot properties, the average induction and exit weights were lower at backgrounding compared to feedlot. Backgrounded cattle typically had longer days on feed and often a lower ADG.
- Differences between backgrounding and feedlot (e.g. weights, performance metrics, season of intake etc) are expected due to the different roles each system plays and the feed types offered to cattle.
- Several cattle moved from backgrounding to a feedlot once entry weight was reached, however some animals went direct to processor (pasture-fed) or to live export.
- On-station data for individual animals is often not recorded (age and weaning weight), although "bulk weight" prior to transport was recorded by some stations.
- Producers are using several on-farm management practices to improve cattle suitability to Southern finishing systems.
- Producers seek to improve their management and breeding practices to best prepare cattle for southern systems, but often struggle with where to focus given the limited feedback they receive.
- Meat quality was, for a small proportion of backgrounded rangeland cattle, comparable to the WA average.
- Use of genetic technologies such as parentage testing may be an option to improve estimation of individual animal performance, however should be used with caution due to the marginal to negative return on investment at current testing prices.
- Producers had highly variable understanding and application of genetic techniques (e.g. EBVs), although majority of producers had limited confidence in using EBVs prior to a genetics workshop.
- Significant engagement from producers in genetics management practices and data collection.

Benefits to industry

Industry will benefit from the data gap analysis and willingness of producers to collect data and conduct on-station experiments. Clear guidance on the type of data required to support future investigations has been gathered.

The research project supported on-farm practice change by improving producer awareness and access to better data to select cattle suited for finishing systems. The advisory capacity available to rangeland cattle producers increased as staff were trained in research extension.

Future research and recommendations

The extension activities delivered by the project team has generated substantial interest in data collection, analysis and feedback from a wider range of producers than what were directly engaged in the project. The recommendation is to capitalise on goodwill and motivation to use data to improve decision-making by further investment in ways to improve data access and integration into business decisions. A benchmarking activity was suggested to enable producers to understand where their cattle performance currently sits for finishing and processing to enable them to identify areas of focus for breeding and management. Further engagement with producers in the Kimberley region regarding international buyer specifications is also warranted. Additionally, enhancing data analysis and exploring innovations like AI and parentage testing can further optimize breeding and feed management strategies for greater efficiency.

Table of contents

1. Background

The northern regions of Western Australia, including the Kimberley, Pilbara, Gascoyne, Goldfields and Murchison, are important to Australia's beef production and land management. These regions are characterized by vast, often harsh landscapes, where cattle enterprises operate on large tracts of land. The beef industry in most of these areas has traditionally been heavily reliant on the live export market, with significant portions of cattle being exported to international markets, particularly in Asia and the Middle East. However, since 2011, the live export industry has been increasingly vulnerable to external factors such as political shifts, changing trade policies, and fluctuations in global demand. This has created a pressing need for northern WA beef producers to diversify their market options.

The cattle enterprises in northern WA face several unique challenges due to the region's environmental conditions. Unreliable seasonal rainfall and nutrient-deficient soils can limit beef production. This makes it difficult to manage and sustain healthy cattle herds across vast areas. Additionally, cattle are often managed in extensive grazing systems, where producers are considering feedbase availability, genetic selection, markets and targeted nutritional practices. The result is a wide variation in herd genetics, growth rates, and overall performance, which makes it challenging to identify and select the best-performing animals for finishing in feedlots.

One of the key challenges faced by producers in this region is the lack of accurate herd records. While cattle enterprises are extensive, the recording of important data such as progeny identification, pedigree, and performance records is not common practice. Without this data, it becomes difficult to track which animals have the potential for high feedlot performance. Moreover, identifying animals that are best suited for the finishing phase is often based on anecdotal evidence, rather than data-driven decisions. The lack of detailed record-keeping limits the ability to select optimal cattle for the southern finishing systems that dominate Australia's beef supply chains.

This project aims to empower northern WA beef producers to select cattle that are not only suited for the domestic market but can also perform well in live export supply chains. By improving herd genetics and management practices through better data collection and analysis, producers can enhance the quality and consistency of their cattle, increasing market access and reducing reliance on live exports. In doing so, the project contributes to the long-term sustainability and profitability of the beef industry in northern WA, helping producers navigate the challenges of an increasingly volatile global market. By enabling more informed decision-making and integrating feedback from the feedlot sector, the project supports the development of more resilient and efficient beef production systems.

2. Project objectives

- To collate data on feedlot cattle entering from rangeland WA or backgrounding WA (including but not limited to breed, initial weight, sex, days on feed, season of entry, liveweight, average daily gain). Data will support identification rangeland cattle suited to southern finishing systems in Western Australia
- Use the MSA eating quality index to assess the range of animals on feed
- Identify areas for improved on-farm breeding program through a desktop economic analysis of selecting for EBVs suited to the north south supply chain
- Capture current on-farm husbandry and management including management practises of breeding, weaning, transport and growing out of cattle in the relevant production system.

- Identify areas for improved on-farm optimisation of growth path to prepare animals for performance in domestic supply chains. Focus is on rangeland (Murchison, Gascoyne, Pilbara, Kimberly) beef businesses supplying cattle to either backgrounding operation or direct to feedlots but group may include 1-2 backgrounding properties in the Agricultural Zone of WA.
- Create an effective feedback pathway from feedlotter/abattoir to the producer, the 'breeder of origin'.
- Engage minimum 5 core producers in a facilitated discussion group process
- Support on-farm practice change through group and individual processes

The participant will deliver outcomes that result in:

- Improved knowledge of feedlot performance and meat quality from animals sourced in WA northern herds
- Improved knowledge of how feedlot performance data can inform bull purchasing decisions to increase performance of northern herd
- Captured existing beef husbandry management practice on-farm and through the supply chain
- Development of recommendations and support activities to optimise on-farm management in the northern regions to access an alternate (to live export) market.
- Increased advisory capacity in WA supply chain
- Improved market access to domestic markets.
- Reduced risk through reduced exposure to live export market.

Promotion of this project and the BeefLinks program should be consistent with the BeefLinks communications plan. Public collateral and media coverage should be discussed with MLA for sign off prior to distribution.

3. Methodology

This project proposes to achieve the objectives by:

a) identifying existing on-farm practices;

b) collecting data on feed efficient rangeland cattle at the feedlot, and;

c) developing feedback loops to backgrounding/breeding operations.

The project aims to provide a basis to drive improvement in on-farm management for optimal growth path performance. The feedback pathway creates a catalyst to increase awareness, knowledge and management changes that increase accessibility of alternative markets for rangeland WA producers. Performance feedback to the producer-of-origin aims to drive changes to bull purchasing strategies and nutritional management programs.

There are few robust data sets detailing cattle flow through WA's North-South supply chain through to feedlots. Baseline data on existing practices, cattle specifications, carcass data, optimal targets for liveweight and nutritional management across the "rangeland-backgrounding-feedlot" continuum are needed to identify knowledge gaps. This project aims to work with end users (producers, feedlotters, processors) to compile information on current practices, collect existing data (on-farm through to carcass), develop case studies and initiate producer groups.

Stakeholder engagement and resource development/ extension will support on-farm adoption activities supporting producers drive on-farm management changes for increased market access. This will enable more producers to seek market diversification, improving productivity and profitability of the Northern WA beef herd.

The initial phase has two main stages.

1) Review of WA feedlot intake of cattle, supply chain dynamics (source to feedlot models – direct from rangelands, rangelands to backgrounding, southern systems to feedlot), transport protocols (including any evidence of shrinkage), stakeholder discussion group.
2) Alignment of cattle flow models to feedlots with existing DPIRD and BEEFLINKS models to quantify pastoral cattle through southern finishing systems and record carcass traits.

Economic models and feedlot data will provide quantitative decision-making feedback for on-farm management changes. Stakeholder groups will provide two way feedback. Adoption activities will ensure capacity building on farm to inform practice change (e.g. understanding of and use of EBVs).

This 18 -month pilot project will support the scope building phase of a larger WADPIRD feed efficiency project at new northern beef facility (CRCNA WAARC collaboration) and collaborate with current Northern Beef Genetics review. The project is a capstone project for three key BeefLinks supply chain projects (P.PSH.2136, P.PSH.1233 and P.PSH.2100) and will unify messaging emerging from the broader BeefLinks program.

4. Results

4.1 To collate data on feedlot cattle entering from rangeland WA or backgrounding WA (including but not limited to breed, initial weight, sex, days on feed, season of entry, liveweight, average daily gain). Data will support identification rangeland cattle suited to southern finishing systems in Western Australia

4.1.1 Data collection, description and challenges

The north to south supply chain for WA pastoral cattle is summarised in Figure 1. This summary is based on previous BeefLinks findings, literature reviews, and discussions and interviews with supply chain stakeholders and industry experts. Cattle moving through the domestic market from north to south typically go via a finishing property – either a backgrounding property, a feedlot, or both (backgrounding then feedlot) (Ausvet, 2006). The finishing process enables cattle to gain weight and fat to meet market specifications as well as improve their meat quality. Additionally, the higher quality feed helps keep cattle on a rising plain of nutrition and enables target weights to be achieved in a reduced time frame (Malau-Aduli et al., 2022).

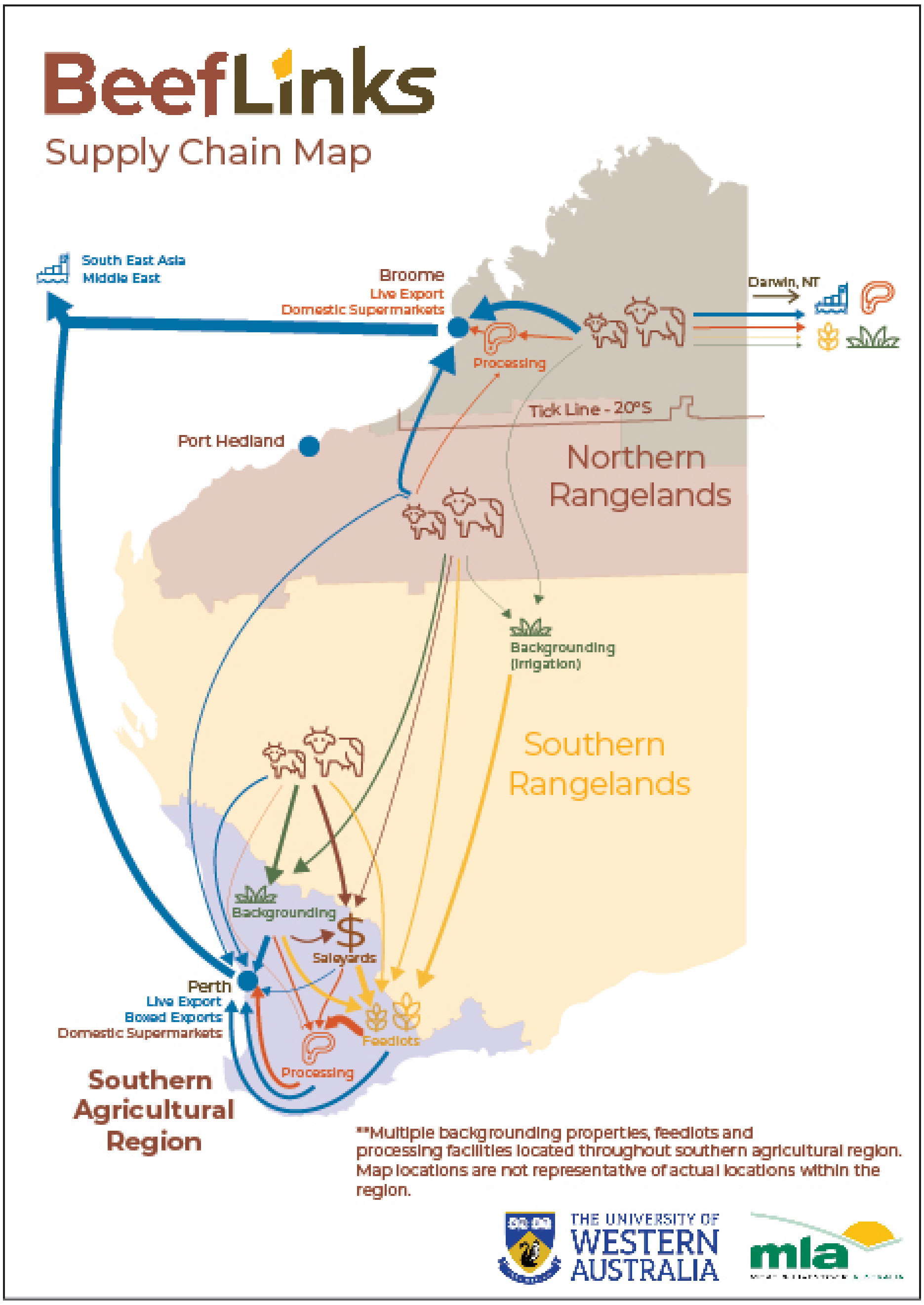

Figure 1. Map of Western Australia showing the main supply chain pathways utilised by rangeland producers. Thickness of arrows gives an indication of approximate prevalence of each pathway.

Data was collected from each stage of the supply chain (breeder, finisher, processor) with the goal of tracking individual animals throughout the entire supply chain. The collection process is detailed in the Guidelines for optimising feedlot performance (Appendix A).

There are few publicly described databases of rangeland cattle that include individual animal data from breeder to processor. Wiedemann et al (2022) collected livestock performance data from station gate to processor for a partially vertically integrated beef company, Harvest Road, operates across Northern and Southern productions systems in WA.

Teese et al (2024) collected data across the supply chain for a vertically integrated cattle production company in Northern Australia, finding that data integration provides opportunities for detailed analytics on lifetime average daily gains and link value attributes such as marbling score to genetics, management practices and feeding systems.

The data collected from each control point in the supply chain is detailed in Table 1. Some datasets were merged using RFID to link data for individual animals. Figure 2 shows the data collected from each point in the supply chain and where there was overlap between the records. Unfortunately, no cattle were able to be tracked from the breeding property (station of origin) to the processor. There were 5 stations that did not collect individual animal data, the reasons cited were: time and labour required to weigh animals individually and perceived value of the data in decision-making. However, four of the six stations expressed interest in collecting station data to use in decision-making.

Wiedemann et al (2022) also note dysfunction in supply chain data collection, suggesting data collection systems will need to be implemented to enable transfer of information around the carbon credentials of livestock and beef throughout the supply chain.

Table 1: Datasets collected from each point in the supply chain detailing the number of individual animals with recorded performance information, origin of the animals, owner of the data and the performance measures.

Dataset	Cattle Origin Region(s)	Number of animals	Data owner(s)	Performance measure(s)
Station (Breeder)	Gascoyne	450	Breeder	Reproductive rate, weight gain
Backgrounding	Gascoyne, Goldfields, Pilbara, Mid-West	19,082	Backgrounder	Induction Weight, Exit Weight, Overall Gain, ADG, DOF
Feedlot	Gascoyne, Pilbara	4,134	Feedlot	Induction Weight, Exit Weight, Overall Gain, ADG, DOF
MSA Data (Processing)	Gascoyne, Goldfields, Pilbara, Mid-West	1,262	Backgrounder, Processor	HSCW, rib fat, dressing percentage, pH, MSA Index
Non-MSA Data (Processing)	Gascoyne	60	Consigner (Breeder or Backgrounder), Processor	HSCW, rib fat, dressing percentage

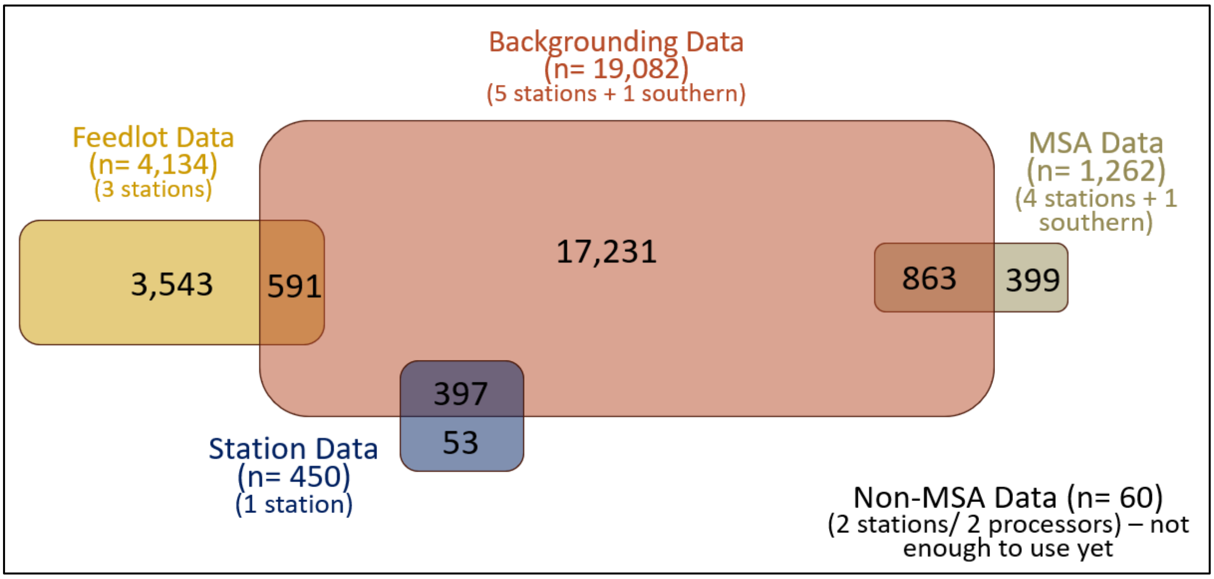

Figure 2: Map of data collected from each stage of supply chain and areas of overlap. Numbers indicate the number of individual animals that have data from that point(s) of the supply chain.

4.1.2 Station (breeder) Data Summary

Data from one station was collected for 450 sale animals. The data included: liveweight, data of scanning and on-station ADG if the animal had been scanned previously (few animals, no initial weight or date information). There was no lifetime performance data available for the animals outside of their time in the yard's pre-sale. The data the producer collected did not provide insights into reproductive rate as this was not one of his data collection/analysis goals.

4.1.3 Backgrounding Data Summary

Data from a backgrounding property in the Mid-West was collected for animals arriving from six properties spanning the Gascoyne (3), West Pilbara (1), Goldfields (1) and Mid-West (1). Cattle data from 19,082 animals cleaned to exclude non-rangeland-bred cattle and outliers beyond these parameters: days on feed 20-1,000 days and ADG -4 and +4kg/day. The data cleaning resulted in 16,520 animal records for analysis. Data were from 2012 – 2024 and included 7,580 males and 8,940 females. Table 2 summarises the key performance metrics.

Induction weight average is 259kg and exit weight average is 323kg. The interquartile range is 97kg and 124kg for induction and exit weight respectively, highlighting the large variability. ADG was also variable, with an average of 0.57, which is the same as found in P.PSH.1233. ADG is likely to be influenced by days on feed, transition practices used and feed type, as reported on in P.PSH.1233. The findings from P.PSH.1233 indicated that inclusion of pellets in the diet improved overall ADG and consistency of ADG compared to pasture only system.

Table 2: Summary of key performance metrics in backgrounding data (n= 16,520).

Metric	Mean	Min.	Max.	25% Quartile	75% Quartile
Induction Weight (kg)	259	101	852	213	310
Exit Weight (kg)	353	104	1,020	285	409
Overall Gain (kg)	83	-226	449	28	123
ADG (kg/day)	0.57	-3.11	3.70	0.38	0.69

Days on Feed (days)	220	20	992	85	349

Breed summary:

The breed of choice varied between station, with some stations experimenting with different breeds or changing breeds over the years. Table 3 summarises breeds entering the backgrounding property between 2012-2024. Droughtmasters were the most popular breed (51%), followed by Santa Gertrudis (21%), which supports conversations with both stations and finishing systems on common breed choice for these regions. Both Droughtmaster and Santa Gertrudis are adapted to the rangelands environment but have flatter backs (lower tropical breed content) enabling flexibility of sales into both the domestic and live export markets.

Table 3. Cattle breeds entering the backgrounding property from the six stations between 2012-2024.

Breed	**Number**	**Percent (%)**
Braford	7	0
Brahman	868	5
Charolais	193	1
Droughtmaster	8413	51
Santa Gertrudis	3421	21
Shorthorn	1808	11
Unknown	1810	11

Year of Entry Summary:

There has been a steady stream of cattle entering backgrounding over the last 13 years with 2018 and 2019 achieving the highest intake, and 2015, 2021 and 2024 significantly lower than other years (Table 4). The backgrounder suggested that years with lower sales may be due to producers holding more cattle to restock in a good season following a period of drought where destocking occurred (higher numbers sold). This suggestion requires further investigation with the addition of climate data from each property and interviews with producers on their sale decisions.

Table 4. Number of cattle entering the backgrounding property each year from the six stations between 2012-2024 (% are rounded)

Year	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Number	407	1268	1540	566	1413	1226	2311	2142	1401	810	1528	1726	179
Percent (%)	2	8	9	3	9	7	14	13	8	5	9	10	1

Season of Entry Summary:

Most cattle entered backgrounding between June and November, with the 27% arriving in September, and 20% in October (Table 5). This is expected as the arrivals align with the typical muster timing and the increased feed base at the backgrounding property following winter rains.

Table 5. Number of cattle entering the backgrounding property from the six stations each month between 2012-2024

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Number	282	296	141	305	328	1461	1891	1881	4460	3363	1346	766
Percent (%)	2	2	1	2	2	9	11	11	27	20	8	5

Proportion of weight class:

The number of cattle in each 50kg weight class at induction to backgrounding are provided in Table 6. In our backgrounding dataset, a very small proportion of the sample (4.4%) fall below 150kg. There could be several reasons, for example the breeder and backgrounder perceive there to be some commercial value in inducting animals under150kg live weight, especially in poorer seasons. The majority of animals are spread across the 150kg to 350kg weight class.

Table 6. Backgrounding animal weight class and proportion in sample (Total >100kg induction weight = 17,017).

Weight range (kg)	100-150	150-200	200-250	250-300	300-350	350-400	400-450	450-500	500-550	550+
# animals	765	2441	4268	4384	2481	1138	580	286	142	183
% sample	4.4	14.3	25.1	25.8	14.6	6.7	3.4	1.7	0.8	1.1

Average Daily Gain Summary:

Some variation in ADG across the month of entry and year, although difficult to ascertain trend with inconsistent intake. The major outcomes of PPSH 1233 included a mean ADG for pasture-based backgrounding tended to be closer to 0.5 kg/day but could vary significantly throughout the year and with different feed types and transition scores.

Table 7. Number of animals entering backgrounding properties (head) in each month for the period 2020 to 2022, and ADG (kg/day).

Year		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2020	Head				58	38	638	810	282	2425	2645	453	277
	ADG				0.35	0.47	0.08	0.4	0.46	0.89	0.69	0.78	0.53
2021	Head	461	542	275	57	375	341		1069	686	383	197	204
	ADG	0.63	0.65	0.74	0.99	0.52	0.35		0.58	1.14	0.68	0.48	0
2022	Head		203			188		521			814	105	
	ADG		0.35			0.43		0.26			0.76	0.37	

4.1.4 Feedlot Data Summary

Data from a feedlot in the Wheatbelt was collected for animals arriving from three properties spanning the Gascoyne (2) and West Pilbara (1). Cattle data from 4,134 individuals were cleaned to only include animals on feed from 20 - 210 days (n=3,136). Data were from 2012, 2013 and 2016 and included 1,797 males and 1,339 females. Table 6 summarises the key performance metrics.

Table 8: Summary of key performance metrics in feedlot data (n= 3,136).

Metric	Mean	Min.	Max.	25% Quartile	75% Quartile
Induction Weight (kg)	371.8	244	620	338	400
Exit Weight (kg)	477.7	298	738	438	510
Overall Gain (kg)	105.9	-138	268	80	132
ADG (kg/day)	1.71	-2.26	4.25	1.34	2.07
Days on Feed (days)	66	21	246	46	81

Breed summary:

Most cattle were Brahman (57%), followed by Droughtmaster (29%), which is representative of the primary breeds on the origin stations (i.e. most cattle came from a station breeding Brahmans). Table 9 summarises the number of cattle of each breed entering the feedlot from the three stations.

Table 9: Cattle breeds entering the feedlot property from the three stations in 2012, 2013 and 2016.

Breed	Number	Percent (%)
Brahman	1793	57
Droughtmaster	909	29
Droughtmaster Cross	15	0
Santa Gertrudis	101	3
Shorthorn	303	10
Other	15	0

Month of Entry:

February entry to the backgrounding property accounted for 40% of the rangelands cattle inductions (Table 10). Personal communications with a backgrounder suggest this may be due to cattle arriving at the feedlot following a period of backgrounding, as this timing aligns with the period that backgrounding properties are likely to experience a greater feed gap and is outside the typical station muster period. Data from more properties across multiple years and further discussions with relevant stakeholders is required to better understand factors influencing season of intake into the feedlot.

Table 10: Total number of cattle entering the feedlot from the three stations each month during 2012, 2013 and 2016

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Number	306	1269	108	47	4	303	134	129	325	143	283	85

Percent (%)	10	40	3	1	0	10	4	4	10	5	9	3

Proportion of weight class:

Table 11 shows that 37.5% of the feedlot animals are above 400kg at induction weight and very few are below 300kg induction weight. Further analysis will be conducted to determine the performance of these animals at later stages of the supply chain i.e. meat quality. The majority of animals (60.1%) are within the 300-400kg weight range, supporting the findings from the feedlot interviews (Appendix B).

Table 11. Feedlot animal weight class and proportion in sample (Total >100kg induction weight = 5871).

Weight range (kg)	100-300	300-350	350-400	400-450	450-500	500-550	550-600	600-650	650-700	750+
# animals	230	1329	1591	641	181	62	144	294	349	530
% sample	3.9	23.0	27.1	10.9	3.1	1.1	2.5	5	5.9	9

4.2 Use the MSA eating quality index to assess the range of animals on feed

4.2.1 MSA Data

Data was extracted from the MSA database for cattle moving through the backgrounding property from four stations: Gascoyne (2), Goldfields (1), West Pilbara (1). Data is recorded from 2017 to 2020 and included 965 females and 238 males. All cattle were HGP free and grass-fed (Pasturefed Cattle Assurance System certified). Table 12 shows the summary performance metrics from the MSA data with comparison to the WA state average for grass-fed, HGP-free females from 2019-2021 (MLA 2021). The rangelands cattle are comparable for most metrics, however, fall below the state 25% quartile for carcass weight and fat depth. These are important metrics for profitability and access to abattoir specifications. These results suggest that rangelands cattle have potential to meet MSA specifications and have comparable performance to southern cattle. However, there is large diversity in the cattle originating from the rangelands, with many animals performing below the state average. This diversity presents opportunity to identify and select for the higher performing cattle in the current herds to enable gradual improvement to overall herd performance. Further identification of the management, environmental and genetic factors separating the higher and poorer performing cattle is required to help inform management and breeding decisions to maximise performance.

Table 12: Summary of key performance metrics in MSA data (n= 1,262) with comparison to the WA state average for grass-fed, HGP-free females from 2019-2021.

Metric	**Data Average (965 females, 238 males)**			**WA Average (females only)**		
	Mean	**25% Quartile**	**75% Quartile**	**Mean**	**25% Quartile**	**75% Quartile**

MSA Index	57.5	55.8	59.23	60.05	58.59	61.68
Carcass Weight (HSCW) (kg)	218.8	196.8	241.8	253.9	243.5	257.8
Rib Fat (mm)	5	3	6	8	7	9
MSA Marbling	303.3	270	330	340	300	390
Hump Height (mm)	57.7	50	65	55	55	55
Ossification Score	163.9	150	170	160	150	180
Eye Muscle Area (EMA) (cm2)	66.7	61	71	N/A	N/A	N/A
Dressing Percentage (%)	49.4	47.8	51.1	N/A	N/A	N/A

4.2.2 What drives performance?

The potential for regression analysis with the current dataset is limited as some of the variables in the cattle data are highly correlated. If we include those highly correlated variables as independent variables in our statistical models, then we could have issues of multicollinearity. This can lead to unstable and unreliable coefficient estimates and inflated standard errors, potentially leading to a distortion of the interpretation of relationships in the models.

One potential solution is removing some of the highly correlated independent variables, which we have done in our preliminary statistical analyses. Additionally, we do not have station information (e.g. weaning weight, age) and the entry date for backgrounding induction, which further limits the ability to develop statistical models.

4.3 Identify areas for improved on-farm breeding program through a desktop economic analysis of selecting for EBVs suited to the north south supply chain

The feedlot interviews data (Appendix B) indicated that feedlots seek cattle with "good genetics", i.e. those cattle that are able to meet domestic market specifications. Improving herd genetic merit is possible by Estimated Breeding Values (EBVs) and selection indexes in bull purchasing decisions. Selection indexes combine multiple EBVs into a single value, helping breeders select animals based on their overall genetic potential for specific production goals, such as fertility, growth, and carcass quality. Each index on the BREEDPLAN website (https://breedplan.une.edu.au/products/breedobject/) includes an explanation of the target production system and weightings for each trait to enable producers to select the index most suitable to their system and breed. An example for Santa Gertrudis moving from stations to southern production systems is the Fertility Plus Index. Additional indexes specific to the WA rangelands production systems are currently being developed and tested by AGBU and DPIRD (*pers. comm*).

Once potential bulls have been shortlisted using selection indexes, individual EBVs should be considered to ensure specific EBVs of importance are moving in the desired direction. This step is recommended as selection indexes provide a guide on the overall economic impact for a given system, however because it's an index the underlying EBV values can be quite different to achieve the same index value. Additionally, considerations of specific EBV enable the indexes to be tailored quickly to a specific production system – these are a guide to assist incorporation of genetics (likely otherwise hidden) in decision making. As an example, if a breeding target is to increase fat depth and a producer is deciding between two bulls with similar indexes, then the fat depth EBV should be considered and the bull with higher fat depth EBVs selected (assuming this isn't at detriment of other very important traits). This provides an opportunity for data feedback from the feedlot/abattoir to be used in breeding decisions. For example, if fat depth is often low within the herd, priority could be placed on bulls with greater fat depth EBVs within the group of bulls shortlisted by selection index economic merit. Other information on bulls such as fertility assessment, temperament and structural soundness are also important to consider prior to purchase.

As BREEDPLAN Selection indexes already provide an estimate of the economic impact a bull will have on his progeny compared to average, we conducted an economic analysis (Appendix C) on integrating genetic testing into a breeding program as described in a case study (Appendix D, Case Study 2: East Pilbara). The case study explored how a producer who has already adopted EBVs could integrate genetic testing into their herd management, such as parentage verification, alongside performance data analysis to optimise breeding decisions. Appendix C details the Benefit Cost Analysis on using genetic testing to improve breeding decisions and market price, with a summary provided below.

4.3.1 Current production system, East Pilbara

The producer currently runs approximately 4,500 Santa Gertrudis x Droughtmaster (2,200 breeders) cattle in the East Pilbara. The target market is the domestic 100-day feedlot where approximately 50% of steers are sold at average weight of 380kg. The remainder are sold to alternative markets based on price and suitability. The producer is aiming to increase the percentage of steers that meet the performance criteria for the feedlot market.

The current selection approach used by the producer and feedlot relies on visual assessment of the herd, leading to variability in performance and limiting opportunities for premiums. The feedlot manager indicates price premiums are available for top performing cattle if they could be genetically identified prior to sale.

Aims:

- increase the percentage of steers meeting feedlot performance criteria;
- identify top performing steers prior to sale; and
- increase percentage of top performing steers.

4.3.2 Scenario 1: Parentage verification with premiums for high and very high performing cattle

The following assumptions were used when designing the Benefit: Cost Analysis scenario:

- 50% of steers are sold to the feedlot each year;
- Entire herd is tested for parentage verification to improve steer performance certainty;
- Only cattle sent to the feedlot receive performance premiums; and
- Parentage verification is used to select the top 50% of steers for feedlot suitability.
- 10% of steers receive a $1.50/kg premium for very high performance.

    - 25% of steers receive a $1.00/kg premium for high performance.
    - 65% of steers receive no premium (average performance).
    - Poorer performing steers are sold to alternative markets (e.g., live export, domestic abattoirs).
    - No discounts are applied to lower-performing steers, as they are sold to alternative markets.

The results of the analysis are:

    - Net Present Value of $5,031 and BCR of 1.02, indicating a marginal positive return on investment;
    - NPV and BCR highly affected by cost of parentage analysis, percentage of high/very high performers and value of performance premium
        - Reducing cost of genetic testing or increasing the number or premium received for higher performing steers could lead to a positive return
    - Additional benefits expected after three years from improved herd composition due to better culling and heifer selection (not included in BCR).
    - Potential for long-term genetic improvements in growth and reproduction.

4.3.4 Scenario 2: Parentage verification with premiums for high and very high performing cattle and discounts for lower performing cattle

The following assumptions were used when designing the Benefit: Cost Analysis scenario:

    - 50% of steers are sold to the feedlot each year.
    - The entire herd is tested for parentage verification to improve steer performance certainty.
    - Parentage verification is combined with existing selection practices to select the top 50% of steers for the feedlot.

- **Premium and Discount Structure**:
    - 10% of steers receive a $1.50/kg premium for very high performance.
    - 25% of steers receive a $1.00/kg premium for high performance.
    - 25% of steers receive a $0.30/kg discount for lower performance.
    - 40% of steers receive no premium or discount (average performance).
    - Poor-performing steers are discounted, but are still more profitable than being sold to alternative markets.
    - No backfilling of low-performing steers with higher performers.
- **Results**:
    - NPV of -$50,078 and BCR of 0.85, indicating a negative return on investment when considering only premiums and discounts.
    - NPV and BCR highly affected by cost of parentage analysis, percentage of low/high/very high performers and value of performance premium/discount.
        - Reducing cost of genetic testing, or increasing the number or premium received for higher performing steers could lead to a positive return.

- Potential for long-term benefits from improved culling practices, herd composition, and genetic selection.
- Improved reproductive and growth rates expected over time, contributing to long-term profitability.

4.3.4 Non-Market Benefits

There are some non-market benefits that could not be included in the BCA due to a lack of credible estimates for the analysis. These are:

- Improved herd composition through enhanced selection processes; and
- Increased rate of genetic improvement through improved selection/culling processes; and
- Potential for higher reproduction rates and turnoff weights due to genetic improvements.

4.3.5 Future research directions

The study highlights the potential for parentage verification to enhance herd performance and profitability but underscores the need for strategic implementation and further research to optimise its value in extensive production systems.

- Exploration of the impact of genetic testing on herd composition, market opportunities, and profitability through data analysis to estimate non-market benefits; and
- Comparative analysis of varying levels of genetic testing (e.g. parentage verification vs 50K) and data integration to guide decision-making for producers.

4.4 Capture current on-farm husbandry and management including management practises of breeding, weaning, transport and growing out of cattle in the relevant production system.

Table 13 lists the management practices that are being used in various Western Australian production systems covering both the northern and southern rangelands, as well as one backgrounding property in the southern agricultural zone.

Section 4.8.3 details which practices are being used by seven beef businesses. The case studies (Appendix D) also provide further detail on how some practices have been integrated into the production systems.

Table 13. On-farm husbandry and management practices currently used in the northern production system.

Breeding	Nutrition (weaning and growing out)	Handling (including transport)	Data Collection
• Home-bred bulls • Controlled mating • Preg testing (foetal aging) • Foetal age based segregation • Cull barren females • Spaying cull heifers	• Weaner supplementation in yards • Producing own hay to feed out • Testing for nutritional deficiencies • Supplementation to address a deficiency	• Reduced stress handling • Weaner education • Destressing in yards pre-/post-transport • Supplementation pre-/post-transport	• Remote weight monitoring • Remote pasture monitoring • Remote water/ weather monitoring • Lifetime performance recording (NLIS all animals)

• Artificial insemination (AI) • Embryo transfer (ET) • Supplementing 1st calf heifers • First mating of heifers as yearlings • Crossbreeding/use of Bos taurus breeds	• Herd reduction to safe carrying capacity • Grazing management strategies • Land regeneration strategies • Earlier turnoff / early weaning • Sending animals via a finishing system • Pivot irrigation • Align muster with southern feedbase • Targeting grass fed markets	• Movement using attractants • Disease management (vax program) • Out-of-season sales to attract premium • Integrated supply chain • Trap yards • Twice yearly muster	• Portable weigh system • Data analysis to inform land management • Weigh for sales decisions • Weigh for management • Whole of supply chain data analysis

4.5 Identify areas for improved on-farm optimisation of growth path to prepare animals for performance in domestic supply chains. Focus is on rangeland (Murchison, Gascoyne, Pilbara, Kimberly) beef businesses supplying cattle to either backgrounding operation or direct to feedlots but group may include 1-2 backgrounding properties in the Agricultural Zone of WA.

A comprehensive data of existing on-farm practices, including breeding, weaning, transport, and growing-out systems in the northern regions of WA is summarised in Table 13. The integration of this knowledge with feedlot performance metrics has provided a clearer understanding of the optimal growth path for cattle transitioning from rangeland to finishing systems. This has helped to highlight areas where improvements in breeding strategies, nutritional management, and overall herd management could be made to enhance cattle performance. Insights generated from By focusing on economic models and incorporating the MSA eating quality index, producers have gained insights into how to select cattle better suited to the southern finishing systems, ultimately improving profitability.

Interviews with feedlots and backgrounders were conducted to improve understanding of what these systems look for when selecting cattle (Appendix B). Of greatest importance was the ability for finished cattle to meet specifications for the market/s the feedlot supplies to. These specifications can include, but are not limited to carcass weight, fat depth, dentition, intermuscular fat (marbling), hump height/tropical breed content, breed, feeding practices (e.g. pasture-fed only, minimum 70days on grain). ADG is also a key performance metric, especially when targeting markets with maximum dentition specifications. Feed efficiency is of value as this directly impacts the input costs to production, however not at the expense of a good ADG (i.e. feedlots want feed efficient animals with higher ADG). Temperament and handling practices were also commonly mentioned, as cattle with better temperament tend to have better production (e.g. getting onto feed quicker) and create a safer work environment for both staff and animals.

"Good genetics" were very important to most feedlots, describing the genetic ability of the animal to achieve the performance metrics above. Data collection on these metrics varies greatly between feedlots, however feedback to producers was generally low. Although some feedlots provide written or verbal feedback, many feedlots view repeat sales as a mode of feedback to indicate they are happy with cattle quality. Improving feedback on individual traits and areas for potential improvement could assist both producers and feedlots to produce higher quality cattle better suited to the domestic market.

Investment by producers in these areas could assist in preparing cattle for increased selection and improved performance in the domestic market.

4.6 Create an effective feedback pathway from feedlotter/abattoir to the producer, the 'breeder of origin'.

In a series of interviews with feedlot managers we identified multiple measures of cattle performance (Appendix A). These are:

- Growth, both average daily gain (ADG) and overall gain;
- Feed efficiency, higher growth rates for lower input;
- Health, as sick animals risk failing market specifications within the feeding timeframe; and
- Ability to meet market specifications, such as carcass weight, fat depth and dentition.

The ability of the feedlot and processor to collect and analyse data from individual animals faces a number of challenges: interpreting the data in a meaningful way; administrative load in formatting, interpretation and distribution; operation not designed for individual animal feed information; time commitment required; data ownership and reluctance to share data (Appendix B).

As such, the opportunity to feedback data to a range of producers is limited. Instead, many feedlots use stock agents to relay visual observation on animal performance and repeat sales are an indicator on suitability of the cattle to the feedlotter. Table 14 illustrates the complexity in data ownership, type and format in the WA cattle supply chain obtained through this project.

Table 14. A summary of data collection storage, sharing and ownership identified in the datasets collected in this project.

Collection point (number surveyed)	Data collected?	Type of data	Format of data	Data ownership and sharing	Relevance of data
Station (4)	Minimal Not collected for all individuals.	Live weights (to obtain an average)	Not stored, written and/or Gallagher TSI/APS	Producer owned Not shared	Not used other than for an indication of weights leaving the property
Backgrounding property (3)	Yes Individual animals against Electronic ID. Throughout the time cattle are at property, regardless of ownership	Live weights Health Breed Station of Origin Average daily gain (calculated) Sex Docility (some)	Stored in Gallagher APS Can be extracted as .csv (Excel file format) Most often provided verbally	Owned by backgrounder Informally shared	Used for selling/holding decisions Used for business decisions and planning Feedback to producers
Feedlot (3)	Yes, varies with feedlot Data is collected against Electronic ID throughout	Live weights Health Breed Station of origin Average daily gain (calculated) Sex	Downloaded from StockaID and stored on own server Collated with other data using AxisStream	Owned by feedlot Arrival information shared Performance information informally shared	Used for selling/holding decisions Used for business decisions and planning
Holding yard/ preparation yard (1)	Limited Duration of stay is often short, to break up transport route and/or give animals time to recover/be treated for sale (e.g. dehorned).	Arrival weight	Verbally	Owned by yard Provided informally to producer	Used for selling/holding decisions
Processor (MSA & other)	Yes	Carcase feedback	Storage by processor not known Supplied in pdf format to vendor (kill sheet)	Owned by processor & vendor* Shared via stock agent. **The vendor may not be the producer*	Significant – affects total value received by vendor Commercial value to the processor

Expanding a central repository, such as the MyMLA and NLIS platform, to include multiple data sources would significantly reduce the administrative burden for feedlots and processors in data feedback. Fee-for-service data management, for example PairTree, Blackbox, and AxisTech, are another way to consolidate data in one platform.

One of the feedlot's interviewed is passionate about improving data feedback and has been working to improve their data feedback processes. DPIRD are also coordinating a data feedback program for sheep producer, which has been successful in facilitating individualised data from processor to producer.

One example of how a feedback loop could be established is provided below.

1. Data for all animals is collected and stored electronically, uploaded onto a Cloud-based platform after each session. Handwritten notes are minimal and are converted digitally as soon as practicable.
2. A dedicated administration staff member cleans and compiles induction data into an arrival report (including arrival weights, class and draft report).
3. Arrival report is communicated to producer via email.
4. A dedicated administration staff member cleans and compiles exit data into a performance report (including ADG, overall gain, exit weight).
5. Performance report is communicated to producer via email.
6. Carcass data is compiled from processor and sent to producer via email.

An alternative to email reports is to provide producers with a login to track cattle data and track the progress/performance (note that this would need to be negotiated with the cattle owner). Automating the collation of data and providing producers a login reduces the administrative load of consistently providing detailed feedback manually, as the process is very resource intensive.

Critical with any choice of data feedback is training and support for both feedlot, processor and producer. Training for breeders on how to interpret the data and implement changes based on feedback is recommended to ensure they understand the benefits and can take action effectively.

4.7 Engage minimum 5 core producers in a facilitated discussion group process

4.7.1 Stakeholder engagement process

We initiated a raft of stakeholder engagement activities to better understand the existing networks and interested businesses relevant to this project (see Table 15). We had online meetings with Kari-Lee Falconer (DPIRD Southern Rangelands Program Manager), Annie Bone (DPIRD Northern Beef) and Margi Wier (Southern Rangelands Pastoral Association) to connect us with pastoralists who might be interested to participate in the project.

David Johnson and Matthew Walcott (DPIRD) were engaged on potential synergies and collaboration with programs, particularly the Genevtixs Review Program and other northern feedlot projects. We had in-person meetings with Bron Christensen (Kimberley Pilbara Cattleman Association), Clare Engelke (DPIRD Southern Rangelands Program) and Clinton Revell (DPIRD Northern Feedlot Project) to connect us with pastoralists as well as to collaborate on projects.

Members of the project team attended the Kimberley Pilbara Cattleman Association annual conference on 11th October 2023 in Broome and the Gascoyne Catchment Group annual forum on

9th November 2023 in Coral Bay successfully building rapport with several producers and some feedlotters at these events, which included in-person meetings with Krystie Bremer (Gascoyne Catchments).

We also contacted feedlotters and producers by phone and online to build rapport and interest in the project. We continued general engagements with these potential participants at the GCG training course facilitated by Inside Outside Management, which was based at UWA between 21 – 24th November, 2023.

Table 15. Organisations contacted as part of initial stakeholder engagement.

	Organisations
1	Executive Officer, Southern Rangelands Pastoral Association (Bullseye 2 project)
2	Bullseye 2 Project Manager, Southern Rangelands Pastoral Association
3	Development Officer, Northern Beef Development, DPIRD.
4	Producer
5	Innovation Manager, Pilbara Innovation Partnership, DPIRD.
6	KPCA Conference (multiple stakeholders)
7	AUSVET
8	Gascoyne Catchment Group
9	Grazing Innovation
10	Rangelands NRM
11	Inside Outside Management (training course)
12	Enoch Bergmann
13	Imperial Bovine Breeding Services
14	HG3 Rural
15	Project Manager, Southern Rangelands Project, DPIRD.
16	Northern Feedlot Project, University of New England.
17	Northern Feedlot Project, DPIRD.
18	Kimberley Pilbara Cattleman Association
19	Data Analyst, Harvest Road.
20	Producer

4.7.2 Expression of Interest and stakeholder group

An Expression of Interest (EOI) was sent out to our new connections during November 2023 to seek formal interest in participating in P.PSH1468. The EOI was only sent to a select number of producers to ensure a manageable number of people in the initial workshop.

The project stakeholder group was invited to an online workshop on 8th December 2023 to welcome the group and commence planning phase for data collection activities. Note, following advice from industry experts and feedback from commercial businesses we decided to restrict the project stakeholder group to producers, feedlotters and industry representatives only, to facilitate more honest views on the supply chain and manage conflicting views (Table 16). We formally engaged processors through semi-structured interviews and site visits. There may be opportunities to pull the full stakeholder group together in the future to discuss the results.

Table 16: Project Stakeholder Group by location and business type

	Location	Business Type
1	Mount Magnet	Producer
2	Gasgoyne Junction	Producer
3	Meekatharra	Producer
4	Gasgoyne Junction	Producer
5	Gasgoyne Junction	Producer
6	Gasgoyne Junction	Producer
7	Kimberley	Producer
8	Pilbara	Producer
9	Kimberley	Producer
10	Kimberley	Producer
11	Pilbara	Producer
12	Pilbara	Producer
13	Northampton	Feedlot
14	Toodyay	Feedlot
15	Borden	Feedlot
16	Geraldton	Feedlot
17	Hyden	Feedlot

4.7.3 Stakeholder group discussions

The project stakeholder group convened over the project to discuss topical issues.

Table 17: Key Stakeholder group discussions

Date	Location	Type	Key Topics
8 Dec 2023	Online	Research co-design with stakeholders	Development of research questions and data collection priorities
21 May 2024	Murchison	Research co-design with stakeholders	Market insights, data collection progress and priorities for supply chain analysis
11 Sep 2024	Gascoyne Junction/ Online	Research co-design with stakeholders	Preliminary data analysis results for feedback and priorities for further analysis

An online stakeholder workshop with four producers and two industry representatives (Bullseye 2 project) was conducted on Friday 8th December from 1pm to 2pm. Following an overview of the project and introductions, discussions were focused on:

1. Challenges associated with sending rangelands cattle to feedlots
2. Knowledge gaps in cattle performance at feedlots
3. Ideas for on-station workshops, demonstrations, speakers, etc.
4. Producer-Feedlot data feedback loop – what is possible and needed?

These discussions lead to the development of the following research questions:

- What type of data is collected at the feedlot and processing facilities?
- How can producers access cattle data that is collected at feedlots and processor?

- Can researchers help feedlot and processor to establish systems or better data collection to enable feedback to producers?
- What are the options for tracking animals and feedback of performance information from throughout the supply chain?
- Which animals perform best for market requirement?
- What does the scientific evidence indicate on the breed differences in daily weight gain?
- Is there scientific evidence and anecdotal feedback (from feedlots) on the impact of temperament and handling techniques on cattle performance (weight gain, health, eating quality) at the feedlot?
- What is the variation in shrinkage during transportation?
- How can shrinkage be minimised and estimated on station?
- Does effective management of mineral deficiencies before and after entry to the feedlot impact cattle performance?
- Are there positive aspects of rangelands grown beef that could be used to improve marketing? (e.g. nutritional density, chemical free, reduced methane emissions)
- What are the consumer/ supermarket preferences for meat products?

A feedback session was conducted on 21st May 2024, at a station in the Murchison to discuss results from the feedlot interviews and revisit and expand upon the above research questions. Progress on data collection was also presented to guide data analysis priorities.

The final stakeholder discussion workshop occurred on 11th September 2024 in Gascoyne Junction with an online option available. The original stakeholder group and other project participants were invited, and the workshop was also opened to those attending the SRPA field day. Six producers (from three stations), one backgrounder and one industry representative attended the workshop. Topics discussed included research question progress (from first two workshops), data collection and preliminary results, revision of research questions to answer with available data, feedback on draft guidelines for optimising feedlot performance.

4.7.2 Group workshops and training

Group workshops and training were conducted to support research co-design and implementation of on-farm practices. The “Breeding for Profit” Workshops co-organised with AGBU were conceptualised during the initial stakeholder workshop, following discussion around a lack of understanding of EBVs and how they can be used to breed toward specific markets. The workshop program is provided in Appendix E.

Additional training and support were provided to stations following identification of their areas of interest in data collection/collation/analysis and breeder management (e.g. pregnancy testing, parentage verification, artificial insemination). The workshops and trainings are detailed in Table 18. The Monitoring, Evaluation and Reporting (MER) data is provided in section 4.8.

Table 18: Details of completed workshops and individual training.

Date	Location	Type	Key Topics
21 May 2024	Murchison	Group workshop – “Breeding for Profit”	Reading and understanding EBVs and selection indexes
24 May 2024	Pilbara (part of Pilbara BeefUps)	Group workshop	Bull selection – EBVs and physical inspection to meet market specs

5-12 July 2024	Goldfields	Individual training	Selection indexes and breeder management options
10 Sep 2024	Gascoyne	Individual training	Best practice data collection and analysis
11 Sep 2024	Gascoyne	Individual training	Best practice data collection and analysis
4 Nov 2024	Pilbara	Individual training – "Breeding for Profit"	Custom selection indexes for unique production systems
6 Nov 2024	Gascoyne	Individual training – "Breeding for Profit"	Reading and understanding EBVs and selection indexes
8 Nov 2024	Gascoyne	Individual training	Best practice data collection and analysis
12 Nov 2024	Pilbara	Support implementation	BCA for parentage testing to assist management decisions
18 Nov 2024	Mid-west	Individual training	Collating and interpreting cattle weigh data

4.7.3 Other Communications and engagement Activities

Table 19 lists other communication and engagement activities conducted with the stakeholders by various research team members.

Table 19: Other stakeholder communication and engagements

Date	**Organisation**	**Engagement Type**
16 Feb 2024	University of Western Australia	Undergraduate lecture
17 Sept 2024	Gascogne Catchments Group	Pastoralist engagement
4 Oct 2024	KPCA, Pilbara Innovation Partnership, UNE (AGBU)	Pastoralist engagement
31 Oct 2024	Meat and Livestock Australia	Progress update and feedback
31 Oct – 13 Nov 2024	Pilbara Innovation Partnership, UNE (AGBU)	Pastoralist engagement
31st Oct – 1st Nov 2024	Kimberley Pilbara Cattlemen Association	Annual pastoralists and industry forum
7th Nov 2024	Gascoyne Catchments Groups	Annual pastoralists and industry forum
19 Nov 2024	Southern and Northern Adoption Team, Meat and Livestock Australia	Extension outputs

The research team contributed to two media articles:

1. "The steaks are high for future of WA beef", UWA Media release, 20 November 2023; and
2. "Rangeland cattle supply chain under investigation by researchers", Farm Weekly, 7 October 2024.

An article in the Institute of Agriculture 2023 Annual Report.

There are 5 Blog posts on the Centre for Agricultural Economics and Development webpage:

1. Breeding for Profit: the BeefLinks team visit the Rangelands to deliver a workshop for producers, 12 August 2024;
2. BeefLinks researcher joins in mustering activities to get a better feel for the on-ground practices, 29 August 2024;
3. Beefing up our engagement and knowledge of WA Feedlots, 7 March 2024;
4. Making an impact for the WA beef industry, 4 December 2023; and
5. Cattle farm in Dandaragan warmly welcomes BeefLinks' researchers, 24 July 2023.

4.8 Support on-farm practice change through group and individual processes

4.8.1 On-farm practice change (property visits)

Over the duration of the project the team visited 12 stations and 6 finishing properties (Table 20) accounting for over 46,000 cattle across 7.2 million hectares in pastoral WA and over 66,500 head capacity in finishing systems (backgrounding and feedlots). These visits provided opportunities to improve the research team's understanding of the production systems, conduct training/workshops, conduct interviews and case studies (Appendix D), collect data and provide feedback on data analysis results.

Table 20. Summary details of completed and planned property visits. Activities additional to improving understanding of the production system are included in the 'additional activities' column.

Date Visited	Region	Property Type	Cattle Number/ Capacity	Hectares Managed (Pastoral)	Activities
21 Feb 2024 and 18 Nov 2024	Mid-West	Backgrounding/ Feedlot	3,000	N/A	Interview and training (data collection)
22 Feb 2024	Mid-West	Feedlot	1,000-2,000	N/A	Interview
27 Feb 2024	South-West	Backgrounding/ Feedlot	1,000 – 5,000	1,600,000	Interview
1 May 2024	Wheatbelt	Feedlot	5,000 (15,000/yr)	N/A	Interview
21 May 2024	Murchison	Station	600	149,000	Workshop
24 May 2024	Pilbara	Station	N/A	396,000	Workshop
5 -12 Jul 2024	Goldfields	Station	10,000	1,600,000	Training (genetics), workshop
23 Jul 2024	Southern Agricultural Zone	Feedlot	40,000	2,700,000	Experimental design
29 Aug 2024	Southern Agricultural Zone	Backgrounding/ Feedlot	14,000	N/A	Interview

10 Sep 2024	Gascoyne	Station	4000	248,000	Data feedback
10 Sep 2024	Gascoyne	Station	1500	145,000	N/A
3-5 Nov 2024	Pilbara	Station	17,000	950,000	Training (genetics), data feedback
5-6 Nov 2024	Gascoyne	Station	7,000	158,000	Training (genetics)
8 Nov 2024	Gascoyne	Station	N/A	272,000	Training (data collection)
9 Nov 2024	West Pilbara	Station	N/A	125,000	Training (genetics)
9-10 Nov 2024	West Pilbara	Station	N/A	189,000	Training (genetics)
11-13 Nov 2024	East Pilbara	Station	4,500	193,000	Data collection
15-18 Nov 2024	Murchison	Station	1,200	92,000	Training (data collection)

4.8.2 Summary of businesses engaged

Seven key businesses were considered in detail throughout the project representing various production systems and regions in both the northern and southern rangelands, as well as one backgrounding property in the southern agricultural zone (Table 21). Three of these businesses were involved as Case Studies (Appendix D) and six were visited to gain a better understanding of the on-station practices used. Two of the businesses were involved in the data collation and analysis process, with two more getting set up for further involvement. Five additional stations were involved in the data analysis, however have not got a detailed explanation of their practices used on farm. The Kimberley is poorly represented as very few producers send animals through a domestic supply chain, and those who do typically go East to avoid the tick line. This made involvement in the project difficult. We have been speaking with one business who send cattle from the Kimberley to Southern feedlots and are currently discussing further engagement with them for data analysis purposes.

Table 21. Summary details of businesses engagement in the project. BG = Backgrounding, FL = Feedlot, CF = custom fed, PI = Pivot Irrigated. Breed Code: DR = Droughtmaster, SG = Santa Gertrudis, RA = Red Angus, x = crossed

	1	**2**	**3**	**4**	**5**	**6**	**7**
Region	Pilbara	Pilbara	Goldfields	Murchison	Gascoyne	Gascoyne	Mid-West
Size (ha)	600,000	190,000	1,100,000	150,000	250,000	180,000	4,500
Cattle	30,000	4,500	10,000	600	4,000	1,500	3,000
Breed/s	DR	SG x DR	RA x DR	SG x	DR x RA	DR	Mixed
Finishing Type	BG (own - PI)	FL (sold)	BG (own - PI), FL (own)	FL (CF)	BG (own), FL (CF)	FL (sold)	BG (own)
Induction Weight (kg)	150-250	320-400	120 + (BG); 300-350 (FL)	Highly Variable	200-300 (BG), 300-400 (FL)	300-400	200-300
ADG (kg/day)	0.8-1	N/A	1.5-2	1.2-1.3	0.6-1 (BG), 1.45-1.9 (FL)	N/A	0.6-1

DOF	120	100	70-100	Highly Variable	365 (BG), 70 (FL)	N/A	365
End Weight (kg)	350-400	N/A	400-450	350-400	350-450 (BG) 450-500 (FL)	N/A	280-420

4.8.3 Genetic management practices MER

The overall understanding and utilisation of genetics among the producers differed greatly (Table 22). All producers had clear goals for their breeder selection, targeting selection toward the domestic market to give them flexibility to sell into multiple markets. Producers described these desirable traits as "polled, flat backed, red, with minimal tropical breed characteristics". Fertility, mothering ability and temperament were also very highly prioritised, with most producers stating the ability to consistently raise a calf in harsh conditions was the most important thing for their business. Growth rate and meat quality were also important, especially to meet domestic market specifications and receive a premium for their product.

The methods used to reach these breeding goals varied between producers. Visual inspection was used by all producers to select replacement heifers. Most (5/6) used on-the-day crush side data collection (e.g. weight) for selection, with a lack of infrastructure being the key limiting factor for the 6th producer. Analysis and use of historical crush-side data was less commonly used, predominantly due to data collection and analysis capability. These capability limitations included not all cattle having NLIS tags, enterprise size (i.e. larger enterprises = increased labour/cost to collect data), infrastructure limitations, and data analysis capabilities. Two of the businesses using historical crush side data thought that improving analysis of historical data could improve their selection.

Most producers had a basic understanding of EBVs, with those businesses producing their own herd bulls on a southern breeding property generally having a better understanding than those who typically purchased bulls. Some producers self-identified a shortfall in their understanding of EBVs, welcoming a training workshop facilitated by UWA and AGBU. Producer 3 used EBVs when buying stud bulls, focusing on specific EBVs (low birthweight, 400/600 day weight) but were unaware of selection indexes. Producer 3 noted that selection using EBVs is difficult as there are typically few animals to select from within their price range following a visual screening process. Additionally, not all studs/sales provide EBV information.

There was interest in genomic testing to identify herd bull EBVs, with cost being the main prohibiting factor. Information was provided to these producers, with Producer 5 planning to send DNA samples for genomic analysis in November 2024. Producer 5 is also using DNA sampling for parentage identification, to inform selection. Producer 2 uses dam information to inform selection (manually recorded following mothering up in yards), tracking desirable/undesirable traits through lineages, which is possible due to their low cattle numbers. Producer 3 was interested in parentage testing for breeding herd bulls and was provided information to support this.

Breeder management practices were typically limited by infrastructure such as fencing and yards. Cost of infrastructure was the main limitation, however land management practices and destruction from camels were other preventative factors. This also limited many producers ability for controlled mating or artificial insemination (AI). AI was of interest to many producers to "set up" heifers for future breeding success and improve their herd genetics with reduced cost. High fertility rates were prioritised through culling barren females, with pregnancy testing a common tool to assist this.

Udder fill, visual inspection and historical calving analysis were other methods used to determine productivity of cows.

Table 22. Summary of Genetic Practices Used across the seven main businesses assessed. Legend: Y = Business using, N = Business Not Using, I = Business Interested in Using, N/A = Unsure

Management Practice	**Businesses Using**						
Business Number	***1***	***2***	***3***	***4***	***5***	***6***	***7***
Breeder Selection Methods Used	Y	Y	Y	Y	Y	Y	N/A
Visual Inspection	Y	Y	Y	Y	Y	Y	N/A
On-the-day Crush-side data	Y	Y	N	Y	Y	Y	N/A
Historical Crush-side data	N/A	Y	N	Y	N	Y	N/A
EBVs/Selection Indexes (Bulls)	Y	Y	Y	Y	Y	N	N/A
Genomic Analysis	N/A	I	I	I	N	N	N/A
Parentage Identification	N	Y	I	Y	N	N	N/A
Breeder Management Practices Used							
Home-Bred Bulls	Y	Y	Y	Y	Y	Y	N/A
Controlled Mating	Y	N	N	N	N	N	N/A
Preg testing (Foetal Aging)	Y	Y	N	N	N/A	Y	N/A
Foetal Age Based Segregation	N/A	N	N	N	N	N	N/A
Cull Barren Females	Y	Y	Y	Y	Y	Y	N/A
Spaying Cull Heifers	N/A	N/A	N	N	N/A	N/A	N/A
Artificial Insemination (AI)	Y	I	I	I	N/A	I	N/A
Embryo Transfer (ET)	N	N	N	N	N	N	Y
Supplementing 1st calf heifers	N/A	N/A	N	N	N/	N	N/A
First mating of heifers as yearlings	N/A	Y	Y	N	N/A	N	N/A
Crossbreeding/Use of Bos Taurus breeds	Y	N	Y	N	Y	N	N/A
Breeding Priorities	**Estimated Rank**						
Fertility/Mothering Ability	1	1	1	2	1	1	6
Growth Rate/ Weight Gain potential	3	2	4	4	3	4	1
Meat Quality	5	3	5	6	5	5	3
Temperament	6	5	3	3	4	3	2
Suitability to Domestic Market	2	4	2	1	2	2	4
Suitability to Multiple Markets	4	6	6	5	6	6	5

To address the shortfall in EBV/Selection Index knowledge identified by producers and the stakeholder group, an on-station training workshop was facilitated by UWA and AGBU which was attended by eight stations from the Southern Rangelands. Participants were asked to fill out a pre- and post- workshop questionnaire to assess any changes in attitude, knowledge and intent regarding use of EBVs resulting from the workshop. The workshop had a positive impact on all aspects assessed, as detailed in Table 23.

Table 23. Average questionnaire responses pre- and post- workshop, where 1= strongly disagree, 2= somewhat disagree, 3= neither agree nor disagree, 4= somewhat agree, 5= strongly agree.

AKASA Question	**Pre-Workshop Average (/5)**	**Post-Workshop Average (/5)**
I am aware of EBVs and how they predict genetic merit for traits of interest	3.2	4.9
I understand how EBVs can positively impact bull selection decisions to improve animal production	3.0	4.9
I believe that using EBVs could improve production in my system	3.5	4.7
I have the skills/knowledge/capability to use EBVs in my breeding program	2.9	4.3
I intend to use EBVs to select bulls that align with my breeding objectives and production goals	3.2	4.6

4.8.4 Nutrition management MER

All producers were cognisant of land condition and potential nutritional deficiencies in their cattle, putting measures in place to maximise herd health and nutrition within their station's context (Table 24). Techniques such as adaptive stocking rates (i.e. herd reduction to safe stocking rates), land regeneration strategies (e.g. exclusion zones, slowing water flow using sandbags/excavation), and managing cattle movement through use of attractants (e.g. mineral supplements, water point control, molasses). Some stations used aerial mapping and pasture height monitors to assist their monitoring and decision making around grazing management.

All producers weaned early where possible to reduce strain on the cows and maintain safe stocking rates, providing weaners with supplementation in the yards. Earlier weaning and supplementation also improved domestic market access, with young cattle more likely to meet target weight prior to exceeding dentition requirements. To further aid this, weaners were often sent via a finishing system prior to sale, to improve condition and growth rates to attract a premium. Four businesses owned a backgrounding property, with two utilising pivot irrigation to maximise year-round grazing as well as produce hay for use on-station. Businesses with southern properties tried to align their muster with their southern feedbase to ensure cattle were on a rising plane of nutrition.

All six station properties tested for nutritional deficiencies and supplemented cattle as appropriate. These supplements were often used to manage grazing/herd movement. Producer 6 reported marked improvements to growth and fertility following identification and supplementation for a Phosphorus deficiency.

Table 24: Summary of Nutrition Practices Used across the seven main businesses assessed. Legend: Y = Business using, N = Business Not Using, I = Business Interested in Using, N/A = Unsure.

Management Practice	**Businesses Using**						
Business Number	***1***	***2***	***3***	***4***	***5***	***6***	***7***
Weaner Supplementation in Yards	Y	Y	Y	Y	Y	Y	Y
Producing Own Hay to Feed Out	Y	N	Y	N	N/A	N	N/A
Testing for Nutritional Deficiencies	Y	Y	Y	Y	Y	Y	N

Supplementation to Address a deficiency	Y	Y	N	Y	Y	Y	Y
Herd Reduction to Safe Carrying Capacity	Y	Y	Y	Y	Y	Y	Y
Grazing Management Strategies	Y	Y	N	Y	Y	Y	Y
Land Regeneration Strategies	Y	Y	N	Y	Y	Y	N/A
Earlier Turnoff / Early Weaning	Y	Y	Y	Y	Y	N/A	Y
Sending Animals via a Finishing System	Y	N	Y	Y	Y	N	Y
Pivot Irrigation	Y	N	Y	N	N	N	N
Align muster with Southern Feedbase	N	N	Y	N	Y	N	Y
Targeting Grass Fed Markets	Y	N	N	N	Y	Y	Y

4.8.5 Handling management practices MER

All producers recognised the importance of and implemented reduced stress handling practices (Table 25). Six of the seven businesses educated their weaners to reduce stress and handling pressure. Producer 3 aimed to educate weaners where possible, however lacked the infrastructure and time to consistently achieve this due to the scale of their enterprise. Within the constraints of their portable yards, they would hold the herd following draft (rather than immediately releasing from the race) to give the cattle more exposure to humans. They also culled heavily on temperament to reduce stress in the yards and would educate any replacement heifers that were getting released to a new location in permanent yards prior to their release.

All businesses aimed to destress cattle in the yards both pre- and post- transport, providing them with nutritional supplementation to further ease transport stress and minimise shrinkage. Techniques for reducing transportation stress included consistency of environment pre and post transport (e.g. handling methods, feed type), minimising time off feed/water, and holding cattle in yards on hay/water to settle prior to release into paddock.

All properties have a vaccination program relevant to the diseases in their region. Vaccinations are administered during the muster, which occurs once a year for most stations, with a trice yearly muster occurring at property 4. Trap yards are used to reduce muster stress on properties 2 and 6, while other stations are unable to use trap yards due to waterpoint configuration, camel problems or scale. Properties using helicopters to muster use aerial pressure-release techniques and have noted increases in muster efficiency since implementation.

Three businesses make use of out-of-season/year round sales to attract a premium. For producers 1 and 3 this is possible due to their integrated supply chain and production system.

Table 25. Summary of handling practices used across the seven main businesses assessed. Legend: Y = Business using, N = Business Not Using, I = Business Interested in Using, N/A = Unsure

Management Practice	**Businesses Using**						
Business Number	***1***	***2***	***3***	***4***	***5***	***6***	***7***
Reduced Stress Handling	Y	Y	Y	Y	Y	Y	Y
Weaner Education	Y	Y	I	Y	Y	Y	Y
Destressing in Yards Pre-/post- Transport	Y	Y	Y	Y	Y	Y	Y
Supplementation Pre-/post- Transport	Y	Y	Y	Y	Y	Y	Y
Movement using attractants	Y	N/A	N	Y	Y	Y	N
Disease Management (Vax program)	Y	Y	Y	Y	Y	Y	Y
Out-of-season sales to attract premium	Y	N	Y	N	N	N	Y
Integrated Supply Chain	Y	N	Y	N	N	N	N

Trap Yards	N	N	N	Y	N	Y	N
Twice Yearly Muster	N	Y	N	N	N	N	N

4.8.6 Data collection and analysis MER

The level of data collection and analysis varies greatly between properties (Table 26). Two of the six stations don't have NLIS tags on all breeding animals due to the cost and risk of cattle losing them as well as no need for them given limited ability to collect or analyse data (e.g. infrastructure, time, technical capability). The properties with fewer cattle typically had more time to manually analyse their data, however noted that more detailed analysis of the data they had been collecting would be beneficial.

Remote monitoring systems were used by some businesses to inform management decisions. Producer 1 analyses this information to inform decisions, especially in relation to their pivot irrigation backgrounding. Producer 3 recently purchased an Optiweigh system and aimed to work with UWA to analyse the data to inform management, however some delays and positioning issues minimised the data available for analysis. The producer will continue to be engaged and supported with their data collection and analysis.

Three of the stations had portable weigh systems which they used in conjunction with NLIS tags to capture lifetime weight information for their cattle. Most of the other properties have weigh scales at permanent yards, which are used to collect weight information on their sale cattle. Producers 5 and 6 have collected pre-transport weigh data to enable estimation of shrinkage. Producer 3 don't have a need to capture weight information on station as all cull cattle move to their southern property where they are weighed and drafted accordingly. All producers weigh for sale decisions, however only two weigh for management during backgrounding, although two other stations are interested in this with remote weigh systems.

Most properties were interested in whole of supply chain data analysis to help inform decision making and management. The interested businesses are working with us for their data analysis, with results at various stages of completion. Producer 3 did not see value in further data collection and analysis, as they had previously collected data and were able to get consistent estimates by visual assessment and weight information, based off previous analysis.

Table 26. Summary of data collection practices used across the seven main businesses assessed. Legend: Y = Business using, N = Business Not Using, I = Business Interested in Using, N/A = Unsure

Management Practice	**Businesses Using**						
Business Number	***1***	***2***	***3***	***4***	***5***	***6***	***7***
Remote Weight Monitoring	Y	N/A	N	Y	N	I	N
Remote Pasture Monitoring	Y	N/A	N	Y	N	N/A	N
Remote Water/ Weather Monitoring	Y	N/A	N	Y	N/A	Y	N
Lifetime Performance Recording (NLIS all animals)	N/A	Y	N	Y	N	Y	Y
Portable Weigh System	N/A	Y	N	Y	N	Y	N
Data Analysis to Inform Land Management	Y	I	N	I	N	I	N
Weigh for sales decisions	Y	Y	Y	Y	Y	Y	Y
Weigh for management	Y	N	N	I	N	I	Y
Whole of Supply Chain Data Analysis	N/A	I	N	I	I	I	I

4.8.6 Summary of interventions made on station

Due to the project's timeframe, there was limited opportunity to track changes due to interventions made on farm. As such, historical data was predominantly used to assess success of previous interventions, with some data collection and station-led trials being set up during the 2024 muster for future analysis. Additionally, relevant information and contacts were provided to stations to support future implementation in identified areas for improvement. Below is a summary of the interventions made or planned, as well as the challenges with implementation and analysis for each:

- Reduced stress handling techniques to reduce transport shrinkage (Producer 5)
  - Historical data – producer not certain on management practices implemented that hadn't been previously documented
  - Historical data incomplete in some places (e.g. not all animals available, bulk weight rather than individual weights)
  - Current year's data yet to be received for analysis
- On Station backgrounding to value-add out of spec cattle (Producer 6)
  - Small sample size of highly variable cattle
  - Data pulled from 2021 – producer not certain on management practices implemented that hadn't been previously documented
  - Estimation of shrinkage from historical data
  - Preparing to set up new trials for on-station backgrounding with better sample size/trial design
- Optiweigh data analysis to inform management (Producer 2)
  - Optiweigh arrived later than anticipated, delaying deployment
  - Rainy conditions prevented deployment in optimum area resulting in only a small number of cattle accessing it
  - Unmarked cattle can be weighed but unable to be tracked over time
  - Late muster so high proportion of unmarked weaners
- Using parentage information from DNA samples to inform selection (Producer 4, Producer 3 = information provided)
  - Identification of poor performing sires/dams (i.e. limited progeny) – cull
  - Analysis against feedlot/carcass data to identify sires/dams of high vs low performing animals
  - DNA Samples being analysed in November 2024 for analysis against performance data in 2025
  - BCA on anticipated returns from genetic
- Use of EBVs/Selection indexes to inform bull purchasing decisions to improve production (Producer 2, Producer 3, Producer 6)
  - Training on EBVs/selection indexes provided in May, July and November 2024
  - Changes from improved genetics take many years to become visible/observable, especially for complex traits (e.g. fertility, growth, carcass quality)
- Historical data analysis to benchmark and identify contributing factors to finishing performance and meat quality (Producer 7, Producer 5)
  - Historical data
    - Issues accessing backgrounding performance data from Galagher
    - Issues accessing non-MSA kill sheets
    - Minimal data from stations

        - Limited to information that was previously collected – some incomplete data
    - Only have full dataset for a specific 'type' of animal
    - Inform optimum time for induction
    - Comparison between stations, years, sexes
- Data collection and analysis to benchmark performance (Producer 5, Producer 6, additional producer)
    - Muster yet to occur – results from slaughter will not be available until next year
    - Changes over time will be required following benchmarking

Additionally, preliminary data analysis results were presented at the Gascoyne Catchment Group Conference on 7th November 2024 in Coral Bay. Feedback from the producer and industry audience members was positive, with several producers discussing improving their data collection, analysis to inform management decisions and support capacity in the region. This feedback highlights opportunity to further engage and support producers with practice change.

5 Conclusions/recommendations

The project successfully met the objectives and provided valuable insight to industry on the current status of data collection at each point along the supply chain; the range of rangeland cattle on-feed in Southern finishing systems and the ability of rangeland cattle to meet MSA grade. The project has laid groundwork for subsequent investment and realisation of benefit from supply chain data.

One of the significant achievements of this project was the creation of a comprehensive data set that captures existing on-farm practices, including breeding, weaning, transport, and growing-out systems in the northern regions of WA. The integration of this data with feedlot performance metrics has provided a clearer understanding of the optimal growth path for cattle transitioning from rangeland to finishing systems. This has helped to highlight areas where improvements in breeding strategies, nutritional management, and overall herd management could be made to enhance cattle performance. By focusing on economic models and incorporating the MSA eating quality index, producers have gained insights into how to select cattle better suited to the southern finishing systems, ultimately improving profitability.

The extension activities delivered by the project team has generated substantial interest in data collection, analysis and feedback from a wider range of producers than what were directly engaged in the project. The recommendation is to capitalise on goodwill and motivation to use data to improve decision-making by further investment in ways to improve data access and integration into business decisions. A benchmarking activity was suggested to enable producers to understand where their cattle performance currently sits for finishing and processing to enable them to identify areas of focus for breeding and management. Further engagement with producers in the Kimberley region regarding international buyer specifications is also warranted. Additionally, enhancing data analysis and exploring innovations like AI and parentage testing can further optimize breeding and feed management strategies for greater efficiency.

5.1 Key findings

The project successfully collected valuable data on rangeland cattle from feedlot, backgrounding and processing systems in Western Australia, laying the groundwork for further investment.

- Majority of cattle entered the backgrounding property in September/October, aligning with the typical muster period, whereas the majority of cattle entered the feedlot property in February.
- Although overall weight gain was similar between backgrounding and feedlot properties, the average induction and exit weights were lower at backgrounding compared to feedlot. Backgrounded cattle typically had longer days on feed and often a lower ADG.
- Differences between backgrounding and feedlot (e.g. weights, performance metrics, season of intake etc) are expected due to the different roles each system plays and the feed types offered to cattle.
- Several cattle moved from backgrounding to a feedlot once entry weight was reached, however some animals went direct to processor (pasture-fed) or to live export.
- On-station data for individual animals is often not recorded (age and weaning weight), although "bulk weight" prior to transport was recorded by some stations.
- Producers are using several on-farm management practices to improve cattle suitability to Southern finishing systems.
- Producers seek to improve their management and breeding practices to best prepare cattle for southern systems, but often struggle with where to focus given the limited feedback they receive.
- Meat quality was, for a small proportion of backgrounded rangeland cattle, comparable to the WA average.
- Use of genetic technologies such as parentage testing may be an option to improve estimation of individual animal performance, however should be used with caution due to the marginal to negative return on investment at current testing prices.
- Producers had highly variable understanding and application of genetic techniques (e.g. EBVs), although majority of producers had limited confidence in using EBVs prior to a genetics workshop.
- Significant engagement from producers in genetics management practices and data collection.

5.2 Benefits to industry

- *Practical application of the projects insights and implications to the red meat industry*

The research was unable to determine the drivers of those cattle that met the MSA standard, due to the beginning of life data (e.g. age and weaning weight) not collected by the producers. However, the research was able to identify that the opportunity exists (i.e. producers that are willing to collect data and conduct experiments) and clear guidance on the type of data required to support future investigations has been created.

The research recorded the steps required to map data from start to end of the supply chain and identified where technical support may be needed. Additionally, the project has improved the understanding of the breeding, management and data collection practices used in different production systems, regions, and stages in the supply chain. Development of case studies and BCA enable improved understanding of how best practice techniques can be applied in various systems.

- *Benefits to the wider red meat industry as a result of this project and its outcomes.*

The project has delivered a better understanding of data accessibility at control points across the supply chain and established that producers can source data from each point in the supply chain, although the data owner may not have the administrative capacity to produce data in a useable format (i.e. PDF). Further investment into training users in how to export raw data and provide data reports are needed. However, it is critical that producers are articulate the decision that will benefit from data analysis.

The project identified gaps in data collected at each point in the supply chain, the significance of collecting the missing data and the challenges to collection. The project can assist organisations to prioritise R&D funding to those areas that can provide the greatest benefit to generating new knowledge for rangeland cattle producers. In particular, age and breed are difficult to quantify, which may reduce the ability of producers to report against different sustainability and carbon-certification frameworks used by key markets (e.g. Australian Sustainability Reporting Standards).

The project engaged at least 15 additional producers (outside the required 5) in workshops, case studies and station visits.

The project increased the advisory capacity for WA producers by:

- building new relationships between Animal Genetics Breeding Unit, University of New England and producers.
- Strengthening existing relationships between Animal Genetics Breeding Unit, University of New England, University of Western Australia, and producers.
- Training one University of Western Australia early career staff member in effective communication of genetics R&D to producers.
- Upskilling three University of Western Australia early and mid-career staff in rangeland cattle production, data mapping, analysis and extending findings to producers.

6 Future research

In conclusion, this project has successfully met its objectives of collating valuable data on rangeland cattle entering from feedlot, backgrounding and processing systems in Western Australia, while also identifying opportunities for improved on-farm breeding, management practices and supply chain efficiency. By focusing on feedlot performance and meat quality, the project has enhanced the understanding of cattle sourced from northern WA herds and how their performance can be optimized for domestic markets. Through engagement with producers, feedlotters, and processors, the project has also facilitated the creation of feedback pathways that allow for better-informed decision-making across the supply chain, helping producers increase market access and reduce dependency on live export.

A key aspect of this project was the successful collaboration with five core producers. For example, a co-design, participatory approach with one producer greatly benefited the benefit: cost analysis scenario development and interrogation of the results. Future research could benefit from more structured producer engagement with the research design.

Future research goals include improving the weight gain of heifers without excessive fat deposition, identifying high-performing animals more effectively, and reassessing breeding objectives to increase productivity and adaptability on the stations. Additionally, further development of data analysis capabilities will help make more informed decisions about cattle performance and management. Innovations such as artificial insemination (AI) and parentage testing, alongside the expansion of pivot irrigation systems, can further refine breeding programs and feed management strategies.

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