# Maximising Efficiency and Performance:
# A northern Australian beef producer perspective on best practices for pre-entry cattle management and preparation

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Maximising Efficiency and Performance: A Northern Australian Beef Producer perspective on best practices for pre-entry cattle management and preparation.



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# Executive Summary

This report presents the findings of the author's global exploration of diverse agricultural enterprises and highlights the identification of a focus on leveraging minute efficiencies to enhance business optimality, performance and sustainability. The author's belief in the statement that 'from little things, big things grow' was repetitively reinforced as the principle that small, incremental improvements can collectively yield significant gains, was dissected from agricultural mastery being practiced across the globe. Through a comprehensive analysis of best practice cattle management, this author reveals that even marginal enhancements of 1% can have a profound impact on overall productivity, market competitiveness and business sustainability. The difference between these efficiencies could very well be the deciding influence on which of Australia's beef producers thrive into the future.

The Australian beef industry is poised for significant growth, with demand for beef protein projected to increase by up to 15% in 2030 (ABARES, 2022). The Red Meat 2030 strategic plan, coinciding with Australia's commitment to United Nations sustainable development goal timeframe of 2030, highlights strategic priorities for building industry capacity to remain profitable whilst accommodating to volatile climatic, societal and economic variabilities. With the Australian population meant to reach 30 million between 2029 and 2033, an estimated 11.9% increase (Australian Bureau of Statistics), Australian beef producers are challenged to implement best practices that optimise their feed consumptions, engage a continuous commitment to the improvement of animal welfare standards and minimise cost inefficiencies to drive profitability across the entirety of the beef supply chain.

Backgrounding cattle to ensure preparedness for feedlot entry is a crucial step in the Australian beef production process as over 50% of beef production nationally (MLA, 2022) and up to 70% globally (Rayner, 2022) is comprised of grain-fed livestock. By proactively backgrounding cattle, producers can ensure their market access with a consistent supply of high-quality products that are well-suited to feedlot environments. By investing time and resources into backgrounding practices, producers can reap the benefit of broadened and sustainable market access and suitability.

Northern Australian beef producers, in emphasis, face a unique set of challenges in preparing cattle for optimal efficiency and performance in market, to include, but not limited to:

- Remote geographical locations and logistical constraints;
- Volatile climatical and environmental conditions;
- Biosecurity and disease management concerns;
- Market volatility and fluctuated demand;
- Regulatory compliance and certification requirements; and
- Limited access to capital and resources.

In response to these challenges, this report advocates for innovative and meticulous approaches to cattle management, emphasizing the need for Northern Australian beef producers to adopt a paradigm of continuous improvement, innovation and optimisation. This research contributes to the existing body of knowledge on beef

production productivity and market access, offering actionable insights and recommendations for stakeholders seeking to optimise their cattle management practices and navigate the increasing complexities of modern market entry, demand and satisfaction. A particular emphasis is placed on the critical factors influencing successful backgrounding of cattle for optimised market access, including genetic selection, precise nutritional preparation, correct education of livestock, disease prevention and management, and acclimation to feedlot conditions.

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# Foreword

My grandfather, a World War II veteran and dairy farmer from Southeast Queensland, was both in the literal and hypothetical sense, my hero. His passion for Agriculture was contagious, and I was fortunate to have caught the bug. His dedication, perseverance, entrepreneurship, and just general knack for putting his best foot forward and having a go, no matter the scale of the task at hand, has continued to inspire me well beyond my time spent following in his footsteps around the farm as a child. Although he is no longer here with us on this beautiful earth today, I am grateful beyond measure for him sharing his love of Agriculture with me and instilling a lifelong passion that has afforded me opportunities and experiences beyond my wildest imagination.

My involvement in Agriculture deepened throughout my schooling years and my developed interest in the red meat industry had me aboard the first flight leaving Brisbane, enroute to Mt Isa, after my year 12 graduation ceremony. The following decade I spent working within commercial beef enterprises as a station hand and stockman, before being granted the opportunity to proceed into leadership positions.

The beef producer masterfully balances the delicate relationship of harmony between animal welfare, respect and care for the land, environmental stewardship for future prosperity and sustainability and unpredictable weather conditions amongst volatile market demands, rapidly changing societal views and hostile financial climates, not a feat for the weak hearted by any measure. My inspiration comes from the many men and women that dedicate their lives to the production of red meat in our vast country, and I would love the opportunity for my research and experiences to shed light on a method or two that could potentially help drive their success further and beyond.

I have been conscious of my lack of education and have in the past limited my belief in myself, my abilities, and my significance. Hungry for more, I took a leap of faith, and I made a commitment to step well out of my comfort zone, enroll in university and apply for a Nuffield scholarship. I would never have dreamed of being not only welcome, but contributive, in a room full of phenomenally successful CEO's, managers, business owners, pioneers of their fields and academics. My Nuffield journey has taken me around the globe and into rooms full of incredible people.

For anyone who reads my report, and resonates with my story, I hope you take a chance on yourself.

**Table 1. Travel Partaken**

| Location by Country | Visits/contacts |
|---|---|
| **New Zealand** | Attended Scholar Triennial<br>Parliament – Wellington.<br>Aidan Bichan |

| | |
|---|---|
| | Paliser Ridge – Kurt Portas<br>Mount Nicholas Station<br>Rural Leaders Agribusiness Summit |
| **Singapore** | Brent Purtell<br>Andrew Cox, Meat and Livestock Australia<br>Bryan (Wet markets)<br>ANZ Bank<br>University of Singapore |
| **Borneo** | Jane Bennett<br>The Sarawak Biodiversity Centre<br>Salcra Palm Mill<br>Borneo Eco Fish<br>Baranka's Farm |
| **Denmark** | Bernadette Mortenson<br>Food Nation<br>Danish Agriculture and Food Council<br>Mathias<br>Regitze<br>Mannerup Mollegard<br>DLF<br>Bertel and Marianne Hestbjerg<br>Flakkebjerg Research Farm<br>Heimdal Entofarm – Insects<br>Hans Frederik Larson<br>Musholm Trout Farm<br>Velas – Agricultural Consulting Company |
| **Brazil** | CNA/SENAR/ICNA<br>The Ministry of Brazilian Agriculture<br>Embrapa Cerrado<br>EC Field Tour<br>JLS Argo<br>Bandeirinha Farm<br>Grupo Faz Uniao |

| | |
|---|---|
| | Mulungra Farm<br>Fazenda Agripastos<br>Podolam Farm<br>Blackberries – Porto Brazos<br>Carlos Farm<br>Castrolanda (Paulo)<br>Sempreverde<br>Chacara Marujo – Jan Haasjes |
| **Australia** | Beekeepers Inn – Honey and Brewery (Mark Lockwood)<br>C-Quest with Mark Webb<br>Marty Gransden<br>Conobolas Eggs, Robert Peffer<br>Gundamin Pastoral<br>David Brown – Allora, SE QLD<br>Paul Meibusch of Colere Group<br>Marcus Doumany of Stockyard Beef<br>Ray Thieme of Cunningham Cattle Company |
| **United States of America** | Lucas Neira<br>Charlie Johnson of Flying Diamond Catte Ranch<br>Home Ranch, Steamboat Springs<br>John Sanislow of Teton Ridge<br>Karin Williamson<br>Brady Miller – Texas Cattle Feeders Association |
| **Canada** | Brenda Schoepp |

# Acknowledgments

My deepest gratitude is extended to the contingent of individuals of whom have encouraged me, believed in me, and supported me prior to and throughout my Nuffield journey. Without their contribution, I would never have dreamed of the reality that I have been afforded since my selection as a scholar recipient.

My admiration for the Nuffield organisation is unwavering. Their exceptional and continued efforts to foster innovation, leadership and connection in the global Agricultural community is done tirelessly, through a dedication to excellence, inclusivity, and impact. My exposure throughout the program to like-minded individuals of whom are enthusiastic about shaping the positive future of Agriculture will forever inspire, motivate, and empower me. The Nuffield journey is a transformative experience that extends far beyond the scholarship itself. Thank you for the chance.

I offer my sincerest appreciation to the contribution and vision of the Northern Pastoral Scholarship investors; the Australian Agricultural Company (AACo), Consolidated Pastoral Company (CPC), Elders and S. Kidman & Co, who's generosity and dedication to fostering growth in the Northern Australian pastoral sector has a profound impact on supporting the next generations of leaders, change makers and pioneers in this field. A special thank you to Troy Setter of CPC, Mark Allison of Elders and Carl Greaves of S. Kidman & Co for your valuable time to converse with me and add value to my research.

To my employers at the time of my travel and research commitments, Darcy, and Kara Knudsen, of Knudsen Cattle, thank you for affording me this opportunity and for your immense support throughout. In addition, a sincere thank you to my colleagues of whom carried my weight in my absence, I am incredibly grateful to each of you.

Thank you to the participants of my Global Focus Program (Denmark). The conversation, companionship, and connection shared was pivotal to shaping the success of our journey together. To every vendor who hosted us, and shared their story with us, thank you for your hospitality, kindness, and time. Additionally, a recognition of every business, organisation, and entrepreneur who selflessly volunteered their contribution throughout our Contemporary Scholars Conference travel and my independent travel, thank you.

Lastly, but by no means least, my incredible family and friends, of whom have never faulted in their love, belief, and support. My partner Jade, and my son, Harvey, for keeping the wheels turning at home in my absence, loving me from afar and then travelling across the globe with me during my independent travel.

I am humbled by the kindness and generosity that I have been shown, and I look forward to the opportunity to reciprocate it tenfold through my contribution to industry, the Nuffield alumni, and my personal and professional development.

# Abbreviations

| | |
|---|---|
| AACo | Australian Agricultural Company |
| BCRC | Beef Cattle Research Council |
| BRD | Bovine Respiratory Disease |
| CCA | Canadian Cattleman's Association |
| CRC | Cooperative Research Center |
| CRSB | Certified Sustainable Beef |
| CWT | CWT (Hundredweight) centum weight, a unit of mass equal to 100 pounds. |
| EBV | Estimated Breeding Values |
| EU | European Union Cattle Accreditation Scheme |
| GBV | Genomic Breeding values |
| HACCP | Hazard analysis critical control point |
| HGP | Hormone Growth Promotant |
| MLA | Meat and Livestock Association of Australia |
| MSA | Meat standards Australia |
| NSW | New South Wales |
| NQ | North Queensland |
| SCU | Standard cattle unit |
| VBP+ | Verified beef production plus |

# Objectives

With a focus on the production originating in Northern Australia, the objectives of this scholar's report are to contribute to the burgeoning discourse on optimising cattle production in Australia by investigating the confluence of market access, productivity performance, and sustainable practices, with a view of supporting industry capability to remain profitable whilst accommodating to increasing climatic, societal and economic variabilities. As dictated in the Red Meat 2030 strategic plan, Australian beef producers are challenged to optimise their feed consumptions and improve their animal welfare management whilst minimising cost inefficiencies.

Objectives:

1. Identify and evaluate best practices for the preparation of cattle for market access, with a focus on optimising productivity and reducing costs.
2. Examine the relationship between productivity performance and market access, to identify key drivers of success in the Australian beef industry.
3. Encourage and inform the implementation of sustainable and economic practices by Australian beef producers, through the development of evidence-based recommendations.

# I: Introduction

The Australian beef industry's production cycle has undergone significant transformation over the past three decades, driven by shifting consumer preferences, increased economic pressures and tailored export market demands. Increased global demand for beef is being met from two main sources: (i) rapidly expanding feedlot production; and (ii) the intensification and spatial expansion of managed grazing systems (McAlpine, 2009). Feedlots have emerged as a crucial component of the Australian beef industries success and competitivity, providing ongoing capacity for the delivery of a consistent, efficient, and profitable product.

Historically, the northern Australian beef sector operated in a state of relative autonomy (Whan, 2006) but has since become an integral part of the national beef industry value chain, comprising of in excess of 64% of the total Australian beef cattle herd in 2024 (ABARES, 2024). The challenges and adversities faced by Northern Australian beef producers are unique, extensive, and astute. Ensuring the maximisation of yield per head is an imperative objective to stabilising the future sustainability and feasibility of these enterprises. The optimisation of livestock efficiency and performance, achieved through the implementation of best practices for pre-entry cattle management and preparedness, presents a profound opportunity for northern Australian beef producers to build resilience, drive profitability, capitalise on strategic opportunity and align their direction with the ambitious vision of the Red Meat 2030 industry priorities.

Revised and published in 2023, the Red Meat Industry Council paper identifies six foundational priorities that are pivotal to the achievement of '*doubling the value of Australian red meat sales by 2030 as the trusted source of the highest quality protein*' (Red Meat Advisory Council, 2023); our people, our customers, consumers and communities, our livestock, our markets, our environment and our systems. Northern producers' contribution to the successful fulfilment of this vision requires a congruent commitment and adoption of best practice implementation for pre-entry preparedness with correct nutritional deliveries, revised genetic selection, increased herd management and data monitoring, innovative solutions, and strong disease management protocols.

This report aims to deliver a comprehensive overview of the opportunity for Northern producers to engage in practices that could prepare their livestock for optimal success and performance varying markets, with a focus on the feedlot environment. The author further provides insight into real life tribulations of Agricultural entrepreneurs and experts that contributed to the success of this scholar's Nuffield experience and his emphasis on the power of minute improvements to drive sustainable and significant change. The author explores practices, methods and resources available to Australian beef producers to cultivate a creative and innovative industry culture.

# II: Best practice cattle management and preparation

## 2.1 Paving the way to optimal performance

Tracking and traceability is an essential step towards optimal performance. Elders have a program specifically designed for tracking the use of methods tailored to the preparation of cattle for feedlot entry and continuing to maintain industry-standard animal welfare protocols. Rob Inglis says “We want to guarantee suitability of cattle for feedlots through both traceability and tractability to the standard that the feedlots expect. We work closely with our livestock producers to make them more productive, more efficient and do it in a sustainable ethical way.” (Elders, 2024)

The system promotes industry best practices whilst not losing sight of supply chain and customer expectations and encourages premiums for the cattle that have been through the program, all animals are provided with a certification and when passed the criteria, an identification tag is supplied. The criterion for certification requires of Clostridial Vaccination, a BRD vaccination, Multimin Evolution Injection and yard weaning for a minimum of seven days.

A similar HACCP program that started development in 2004 as VBP and launched in 2016 operated by the Beef Cattle Research Council (BCRC) in Canada called Verified Beef production plus (VBP+), aims to validate responsible on farm practices. “Verified Beef Production Plus is a voluntary, market-oriented, producer managed forward-looking program enabling Canadas beef industry to anticipate and meet emerging and growing demands for beef production systems throughout the Canadian beef value chain.” (Canadian Cattlemen’s Association (CCA), 2021)

What started out as an educational initiative started by the CCA evolved into a program to meet growing demands for consumers of transparent, accountable, and sustainable beef production.

The program includes training and auditing for animal husbandry, biosecurity, environmental stewardship, and on-farm food safety practices. VBP+ allows beef producers to highlight their dedication to sustainable beef cattle production practices and environmental responsibility. This criterion is verified with measurable and reliable benchmarks that producers must meet to achieve and maintain certification. This gives the value chain and the customer the confidence that the product is of high quality and is produced in a sustainable production system. This is significant for both national and global demand for Canadian beef. The framework also provides producers with certification under the CRSB (Certified Sustainable Beef) framework and is recognised in certified sustainable beef value chains.

“VBP+ appreciates Cargill’s commitment to not only source beef from certified sustainable operations but also to reward producers for their on-farm activities.”

“This is a significant development for producers seeking to contribute to certified sustainable beef sourcing and the great story it tells for our customers. The more opportunity for cattle to qualify through the chain, increases supply available for retail

and food service partners and allows beef producers to be rewarded for the work they do every day to contribute to beef sustainability." Says Shannon Argent, VBP+ Business manager. VBP+. CCA (2021).

Studies by the BCRC, beef cattle research council, regarding the uniformity and its consistent influence on price, lots with weight spread of under 100lb(45.3kg) were favoured (+$1.18 - $2.30/cwt) but weight spread exceeding 200lb(90.7kg) where discounted (-$2.03 - $2.67/cwt).

Further to the study done on "*evaluating premiums for weaned calves marketed with value added management characteristics"* mentioning the use of the "VBP+" system added $1.63/cwt and EU eligibility added $1.72/cwt. The percentage of lots mentioning VBP+ increased from 3% to 15% from years 2016 to 2020 an EU eligible cattle 0% to 8% increase in value. (BCRC, 2024)

The influence of HGP, (Hormonal growth Promotants) in Australia has been enormous, the MLA report prepared by R, A, Hunter references an increase in growth rates by 10-30% and feed conversion efficiency has been recorded to improve by 5-15%. As of 2006/07 6.5 million HGPs where used in Australia and approximately 7% of Australian beef production is directly attributed to the effects of HGP use. In that year (2006/07) the Australian beef herd of 28 million cattle would have needed to reach 30.3 million to achieve the same production without the use of HGPs. Market demands of carcass composition, enhancing growth rates, and improving feed conversion are the leading factors for the use of HGP and will have substantial contribution to the sustainable development goals set out by the United Nations. Seasonal restrictions on pasture growth in Australia, particularly in the northern regions, adds prolonged periods required for grass-fed cattle to reach maturity. The use of growth promotants allow continuous growth throughout the animal's life. Careful consideration should be given to collaborate the correct program for the needs of the animals. Factors that contribute should include the seasonal availability of nutrition, the genotype and the specific carcass composition and quality requirements of the desired market also the efficiency of administrating the treatment and the frequency of which the cattle are yarded.

### 2.2 Genetics

Ray Thieme, General Manager of Cunningham Cattle Company poses that "genetics and genomics are a real opportunity now as we scale up and develop the north as far as productivity in wire and water, you have to think what the next pieces are? and I think that's where genetics and genomics fits in." (Thieme, 2024)

In regard to intensifying at scale, providing the animal husbandry practices and disease management processes are followed, will help to identify the genetics that are either desirable or undesirable. By focusing on not only the tail end but also the lead end of the herd, you will start to shift the bell curve. The bottom end or the tail end is usually quite simple to identify and usually comes out with husbandry practices, such as preg-testing and weight monitoring, whereas the lead of the herd can be difficult to determine, this is often achieved through raw data, however linking raw data to individual animals can prove as difficult. The application of genetics and genomics are particularly valuable in this area of development. Tools like the use of EBV's and

selection of sires, paired with the selection of the lead and the tail of the herd with genomics can be used to tighten the gap in herd variance.

Particularly when creating a plan for developing performing herds it is essential to have clear goals and objectives around the expected performance of the herd tailored to your environment and business structure or intentions. Fertility is often measured in age of puberty and days to calving intervals, tightening these metrics can be a management tool used to improve weaning age and growth uniformity and consistency, the value of having less weight and age variance in weaner calves provides influence on performance and on price.

The use of targeted indexes such as “BREEDPLAN” can offer producers the opportunity to enhance the genetic advancement of their herds and offer unbiased data on the cattle they sell.

“BREEDPLAN uses an advanced modern genetic evaluation system (based on Best Linear Unbiased Prediction (BLUP) technology incorporating multi-trait analysis procedures) to produce Estimated Breeding Values (EBVs) for recorded cattle across a range of important production traits.” (BREEDPLAN, 2022)

“Our goal or target is to select from bulls in the top 25% of the breed for the export index, why top 25%? Because that will shift the needle instead of selecting for average or just above, you have to really strive for the top 25% to shift the needle.” “Whereas in our bull breeder herd we have selected the top 5% of the live export index” (Thieme, 2024)

The benefits of using index for medium to large scale herds is that they are not single trait selection and this in turn gives a balanced approach to managing performance traits at scale.

The expectation of higher performing cattle with the intention of entering intensive feeding operations can be dependent on their performance potential. A considerable number of producers are choosing hybrid vigor and adding breed complementarity to their herd for efforts of development in particular breeder traits, and also with intention of producing terminal cattle for sales.

The challenges that northern producers may be facing are implementing bos Taurus breeds for market grid access but retaining the adaptation to the environment in which they have to perform. One solution to this is composite breeding and adapted taurus that adds hybrid vigor and market access but does not affect the resilience of the animals towards extreme climates and environments.

Another tool that can be used similar to EBV’s, are GBV’s or Genomic Breeding values, this system does not replace EBV’s, but works well to compliment the EBVs by providing producers with insights to pinpoint high achieving replacement females and enhancing informed decision making and rapid genetic progress.

BREEDPLAN offers producers a significant opportunity to pinpoint animals that excel in various genetic traits. Nevertheless, the number of animals recorded in BREEDPLAN from a northern based herd remains slim. Despite an increase in herds recording and submitting BREEDPLAN data, there remains a substantial knowledge gap in genetics and methodologies for identifying superior breeding animals. This gap is particularly pronounced in northern herds, where it is imperative to identify

genetically higher performing animals, especially for traits crucial to productivity and profitability. (Rayner, 2022)

Whist these metrics have only indirect connection to the topic of maximising feedlot efficiency and performance, the BCRC have done research around feed efficiency and its heritability. The heritability of feed efficiency is approximately 35%-40%, indicating that the selecting breeding stock with high feed efficiency will enhance the overall feed efficiency of the population over time. However, accurately measuring individual feed intake to calculate metrics like residual feed intake or feed to gain ratios is both labour intensive and costly. Notably, feed efficiency is genetically linked with average daily gain, as about a quarter of the genes influencing growth rate also affect feed to gain ratios, a logical connection since average daily gain contributes to this ratio. Furthermore, advancing the identification and validation of dependable DNA markers associated with feed efficiency could potentially mitigate testing expenses and accelerate genetic advancements in this critical area.

Feed efficiency encompasses a range of traits related to how effectively animals utilise feed, such as feed conversion ratios, residual feed intake, and efficiency in growth and maintenance. Enhancing feed efficiency in beef production hinges on optimizing these traits across both breeding and terminal cattle, considering factors like growth rate, mature size, and reproductive efficiency. Collecting for a lower residual feed intake can reduce feed intake in young cattle and cows with compromising growth performance or increasing cow size. However, prioritizing a lower feed to gain ratio to boost growth rates may result in larger cow size and increased feed intake, the challenge lies in realizing the benefits of genetic selection strategies at both the cow calf and feedlot stages, as each seeks different traits that may exhibit negative correlations.

Measuring efficiency in beef cows involves evaluating the quantity of feed consumed relative to the economic returns. Cow efficiency encompasses her live weight, which dictates her reproductive success. Achieving a better (lower) feed conversion ratio, such as 17kg DM/kg of calf weaned verses 24kg DM/kg, can be accomplished through strategies like reducing the mature body weight and by doing that it will have the effect of lowering the cow's energy requirements, increasing weaned calf weights (including higher survival rates), and enhancing reproductive efficiency. The objective is to achieve a growth curve that bends favorably, ideally with calves born at lower weights, maintaining the same mature weight while achieving heavier weaning weights. This approach results in faster-maturing cattle in turn quicker turnover. Residual feed intake is particularly relevant to breeders aiming to improve feed efficiency without increasing cattle size. Residual feed intake identifies variation in feed intake caused by differences in the animal's metabolic rate, factoring out elements like growth rates and fat thickness. Approximately half of the genes influencing residual feed intake overlap with those affecting feed to gain ratios (feed). Therefore, selecting for improved residual feed intake in breeding stock also enhances feed efficiency in progeny that enter the feedlot.

"Eliminating the worst 10% will increase performance faster than spending a lot of dollars looking for the best. However, the base of any selection process is good data." (BCRC, April 2012)

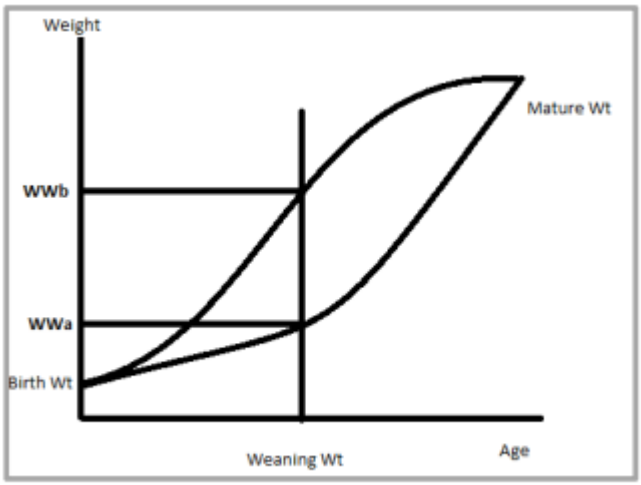


Figure 1. Bent Growth Curve

**Figure 1. Bent Growth Curve (BCRC, 2020)**

## 2.3 Nutritional preparation

“Identifying weaners that are hanging back and not eating as much, they are going to become a liability later on in life and the best time to identify that is when they are weaners” (Jackson, 2024)

There is a lot that producers can do to improve their herd health and performance outside of the backgrounding faze that will have positive impacts on performance on the animals end result, and centre stage is rumen preparation for animals going into a feedlot or intensive system, what are the positive and negative impacts around herd nutrition?

It all starts with the breeder because they will have the influence in the calf and the feeder. Calving times are essential to matching up with diet quality, controlled mating joining on the green date, and trying to calve out before the end of the year for preparation for better feed, assuming the season will provide. Maintaining good rumen function and ensuring that the animals are being fed properly in turn the bugs are being fed properly and that will give the opportunity to grow probiotics, and not compromise the gut, also ensuring that the animal is gaining weight at all times.

The dietary requirements for the animal being fed (as shown in figure two, feeding livestock) can be monitored but the ever-changing seasons and pasture quality takes a little more management, diet quality testing and having knowledge of what quality and volume of feed is available to the animals. This allows producers to match the right cattle up to the right paddocks, following on from that the producer will have the management tools to know what the animal is doing at any given time, also the producer will be able to look at objective signs in pastures as a tool to know if the animals are likely to be gaining or loosing weight.

The importance of looking at the stage of physiological development of a calf and how as producers are we going to allow them to have the necessary dietary requirements (as shown in figure two, feeding livestock) . Segregating weaners into weight ranges

to avoid animals competing for the required nutrition is a practice that is proven to make differences in the bottom line. What do we have an influence on in terms of management? There is large opportunity for growth around the use of the quality of hay and feeds that producers are using. The benefits around the providing good quality, and sufficient hay to weaners is tenfold. Given, there is an element of that the logistics of supply of quality hay can be difficult, premium feeds and the security of supply is volatile.

Following the animal right from when it is born and asking questions, has it been born at the right time, what do I need to change here and looking at the whole production cycle of the cow. Do I split my first calf cows off my mature cows, when do we wean, what is the quality of feed that we are feeding, what are the health challenges and critical stages of the animals?

Low input systems can be managed more economically by identifying which animals have the highest requirements of what nutrition in what paddocks, and how are we going to meet the requirements of those animals to minimise the volume of supplements that we have to feed to those animals. When producers pull their calves off the cow that reduces the adult equivalent and therefore the pressure on the country, that then in most cases, justifies the expense of good quality and sufficient amounts of hay. This practice in turn brings the calves up into the next weight bracket so that producers can transition them back into the paddock as soon as possible and not be feeding them for such a long period of time, cost of inputs are definitely a consideration not to be taken lightly, and when setting the goals that are set for the objectives with the weaners it is essential that the primary goal is to keep them going forward, secondly, that the weaners become pasture ready, and the third, is we want to bring our bottom line up, in this case the lighter weaner.

## Energy and protein requirements of various classes of cattle

**Table 6.1: Steers and heifers (after weaning) (see Table 10.1 for early weaned, lighter calves).**

| Liveweight (kg) | Growth rate (kg/day) | Maximum daily dry matter (DM) intake | | Metabolisable energy (ME) requirement (MJ ME/day) | Minimum ME concentration of diet (MJ ME/kgDM) | Crude protein % of dietary dry matter |
|---|---|---|---|---|---|---|
| | | % of liveweight | (kg) | | | |
| 150 | 0 | 2.9 | 4.3 | 22 | 5.2* | 8 |
| | 0.5 | | | 37 | 8.7 | 12 |
| | 1 | | | 48 | 11.2 | 13 |
| 200 | 0 | 2.8 | 5.5 | 26 | 4.8* | 8 |
| | 0.5 | | | 44 | 8.0 | 11 |
| | 1 | | | 57 | 10.4 | 13 |
| 300 | 0 | 2.5 | 7.6 | 35 | 4.6* | 8 |
| | 0.5 | | | 56 | 7.4 | 10 |
| | 1 | | | 73.5 | 9.7 | 13 |
| 400 | 0 | 2.4 | 9.4 | 45 | 4.8* | 8 |
| | 0.5 | | | 72 | 7.6 | 10 |
| | 1 | | | 94.5 | 10 | 13 |
| 500 | 0 | 2.1 | 10.7 | 55 | 5.1* | 7 |
| | 0.5 | | | 82.5 | 7.7 | 10 |
| | 1 | | | 110 | 10.2 | 12 |

** Cattle on these diets may not eat to full appetite because of the very poor quality (low ME values) of these particular diets.*

**Figure 2. Feeding livestock (Department of Economic Development, Jobs, Transport and Resources, 2017)**

## 2.4 Education

An element of the nutritional requirements is ensuring that when the animals are getting handled, how much of a disruption is that to the requirements to gain weight, and how long is that animal not receiving enough nutrients.

NSW agriculture's Beef CRC (Cooperative Research Centre) conducted research comparing weaning methods and their subsequent effects on feedlot performance. The study revealed that yard weaning led to significantly better weight gain and lower incidence of respiratory disease in feedlot cattle compared to conventional paddock weaning methods. Factors such as feed quality of hay or silage ad lib – ME 8.5 or better and protein of 12 percent or better, good quality water, density of 4m2 per head for weight ranges 180kg - 260kg and some socialisation with humans, but no structured education and keeping the yards free off boggy areas provided the platform for better performance and lowered the risk of disease.

The five minimum freedoms for animals under human control are:

1. Freedom from hunger and thirst: by making sure that the animals have easy access to water and a nutritious diet.

2. Freedom from discomfort: by providing an appropriate environment, including shelter and a comfortable resting area.

3. Freedom from pain, injury, or disease: by prevention through quick diagnosis and treatment.

4. Freedom to express normal behaviour: by providing sufficient space, proper facilities, and company of the animals' own kind.

5. Freedom from fear and distress: by ensuring conditions and treatment that avoids mental suffering (Webster, 2016).

Ideal weaning conditions would see that calves are segregated into physiological groups, assuming that there is a lighter end of the calves, this may not be as big of an issue if the calves are all over the weight of 200kg, but generally if the goal is to pull them off a bit lighter and are still developing then this can be an ideal way to draft weaners. The practice of segregating the calves has many advantages one being that having calves split into the weight group allows producers to supply appropriate hay and energy supplements to those cattle and ensures that the bottom end of cattle aren't bullied, this allows the bottom line a chance to catch up to the other weaners through judicious feeding, secondly, developing the rumen so as the animals are pasture ready in terms of the fibre digestion microbes in the gut.

Tailing cattle out as early as possible and locking the weaners up at night on decent quality feed and water is seen to be the best way to get premium results with low inputs. This gives the animals the opportunity to "Freedom to express normal behaviour."(Webster, 2016) This element of the weaning process is seen to be essential to the performance of the animal, it also reduces the risk of animals being

shy feeders and having a top and tail in weight ranges as apposed to confinement feeding weaners. The feed is often consumed rapidly in a yard, and this eventuates to cattle standing without feed, therefore having a negative response to the yard and in turn poor performance. Another positive Impact this practice makes is reduces the risk of disease in calves by getting them out of the yard quickly and onto pasture.

The weaning process proves to be potentially stressful on the animal, so other animal husbandry should be performed at a different time to weaning, ie. Castration, dehorning, branding, and vaccinations.

As a minimum for yard weaning requirements:

- Wean for a minimum of five days
- Segregate to weight groups
- Sufficient access to clean water
- Feed appropriate energy and hay supplements ensure hay is quality tested prior to purchase
- Make feed changes slowly
- Keep yards hygienic
- Minimise stress
- Observe behaviour

“Minimising Stress during weaning is not only more profitable in the long run for cattle producers, but also more attractive to consumers. Consumers are increasingly concerned about the welfare of the livestock and the use of antimicrobials. Low stress weaning techniques are the key to good welfare and disease prevention in freshly weaned calves, thereby reducing the need for antibiotic treatments.” (BCRC, 2013)

## 2.5 Disease prevention and management

There is a number of animal health considerations associated with the entry and preparation of cattle with the intention or possibility of entry to lot feeding or intensive feeding conditions. BRD or Bovine respiratory disease, is found to be the most substantial infectious disease of feedlot cattle loss in Australia. The cost associated with the treatment and mortalities combined with the negative impact of reduction in performance gain and increase in labour costs is detrimental for the industry.

The bacterial and viral microorganisms that are implicated in BRD are not proven to be the alone causes of serious illness. In response, beyond specific infectious agents, the various environmental, animal, and management risk factors play critical roles in BRD development under associated field conditions. Pathways such as decreased systemic and local immune responses are among the impacted. Stress factors including weaning methods, handling in yards, transportation, dehydration, weather conditions, dietary changes, comingling, and competitive pen environments can compromise immune function. This reduced immune response may facilitate opportunistic infections in the lower respiratory tract by potential pathogens, contributing to the onset of BRD.

The rapid temperature changes and more frequent and intense temperature fluctuations have been suggested to be responsible for the increased incidence of BRD rather than the absolute temperature levels. This observation is more prominent in

USA as opposed to Australia. One of the known challenges with feeding northern cattle in feedlots is transport of stock and logistics to feed and supplement. A report by Cusack, (2023) outlines the implications of long travel times and the relation to feed conversion and BRD susceptibility. While controlled studies specifically examining the link between extended transport times and BRD outcomes are not extensive in Australia, one study assessed metabolic changes in cattle during transport and identified bos indicus steers subjected to 72 hours of road transport showed evidence of a level of dysfunction persisting for up to 6 days post transport. This potential prolonged susceptibility to infectious agents, although not directly tested in the study. A Polish study demonstrated that a 72-hour transport period covering 1700km resulted in significantly reduced leukocyte viability when exposed to leukotoxin from mannheimia haemolytica. The stress associated with transport durations under 24 hours has primarily been attributed to the loading and unloading processes. Cattle transported for 6 hours or more within a 24-hour period of entering a feedlot showed a slight increase in BRD risk compared to those transported for less than 6 hours within the same timeframe. To add to the complexity of logistics of cattle entering feedlots from northern Australia, cattle that are held in overnight yards and transported a longer distance have been found to have heightened incidence of BRD. This could be a result of one or a combination of both transport distance and transport duration. Furthermore, the elevated levels of handling as a result to being held overnight in holding yards can play a part in the susceptibility of BRD in the cattle. Two US studies referenced in the document identified an increase in BRD morbidity risk of 10% for kilometres travelled in 160km increments, the studies also show a negative impact on hot carcase weight and daily gains.

Vaccinations against BRD have the potential to decrease the BRD risk but show no direct correlation to the effect of growth rate in the feedyard. The evidence from the report referenced show that the financial analysis behind vaccinating against BRD at least 28 days in facilities adjacent to feedlots would generally prove to be unprofitable, due to the benefits of the effects of backgrounding outweighing the influence of effect of vaccination against BRD, the benefits may include enhancing immunocompetence, restoring rumen function, and achieving positive energy and protein balance prior to entry to the feedlot.

The risk if BRD caused from dehydration and prolonged transport can be one of the mechanisms related to the association between transport and BRD morbidity. Distances travelled exceeding 500 to 750km increased BRD dramatically during summer months. Although this is not adequately defined to be a direct contribution to BRD cases.

A study referenced in the report (Cusack, 2023) outlines the benefits of maintaining cattle together as a group from weaning until feedlot entry as opposed to producing numbers from multiple sources and sale yards. The cattle produced higher growth rates and adapted to supplied feed quicker over the first 37 days when sourced from one location compared to multiple sources. These cattle supplied from saleyards also had higher mortality and morbidity from BRD than those produced from one vendor.

Combining mobs 28 days prior to feedlot entry has seen to have a reduction in the risk of BRD in Sale yard cattle, during the observation there was no indication of significant direct impact, this suggests that the effects were medicated through the mixing process

rather than directly attributed to saleyard conditions. furthermore, prolonging the time between saleyard purchase and entry to feedlot provides the animals time to recover from the experience. Implementation of HGP (Hormone Growth Promotants) has no effect on increasing the risk of BRD in cattle. Cusack, (2023) outlines that, ”There was no effect of hormonal growth promotants implantation on antibody titres in response to vaccination. Not only is the risk of BRD unaffected, the BRD preventative measure of vaccination appears to also be unaffected by treatment with hormonal growth promotants.” (Cusack, 2023)

## 2.6 Acclimation to feedlot conditions

“Less methane is produced in the feedlot than on pasture, although, It is important to have methane in the gut, if you have no methane, you will have no protozoa, even though we know a lot of protozoa are parasitic they have an important function in the gut and we don’t want to wipe them out completely, because they take out a lot of the hydrogen ions that are produced, there is always a balance and I think we have to think critically.” (Jackson, 2024)

Australian beef production has become increasingly reliant on feedlots. In the quarter of September 2023, feedlots accounted for approximately 30% of Australia’s total quarterly cattle turn off, in Queensland, the largest cattle producing state in Australia, feedlots produced 39% of total cattle turn off of the same quarter. (ABARES, 2023)

Efforts to make Australian beef production more reliable have led to growing numbers in feedlots, with the intentions of drought proofing and providing a consistent supply of beef for domestic and export markets despite changes in seasonal conditions. This is beneficial to Australia’s beef production system as it provides Australia and other major trading partners with more consistent supply of beef products.

The social and psychological aspects of cattle in feedlots refer to the way cattle interact among each other and the impact this has on their overall welfare, wellbeing and behaviour. This plays an important part in the health and productivity of the animals. The social hierarchy and group dynamic must be established in the pen and preferably prior to entry to feedlots

The acclimation process is a pivotal component to optimum performance of an animal in feedlot conditions. Transitioning from pasture and more natural environments to feedlot settings can be disruptive to the function and performance of cattle. This provides reason for the need of backgrounding or introduction to feedlots and their environments. Structure and plant and equipment are not always common for cattle to be exposed to in levels of the feedlot, the exposure to diets relative to that of the feedyard is also necessary if the animals are to perform at their potential. Introductions to the social aspect is also a benefit to the performance and how the cattle react to the feedlot environment, by establishing social groups in the pre-feedlot stage the animal has the foundation to excel in the feedlot without the restrictions of settling to a new social group. Bunk and trough exposure is usually introduced to animals at backgrounding stage, this provides the conditioning of animals to the source of their feed and water. The ultimate goal is to reduce stress, create social dynamics and establish social hierarchy and introduce the gradual implementation of feedlot

environments. Many of the challenges can be mitigated at weaning via yard weaning techniques.

“An animal needs to consume 10% of their body weight in water before it can process 3% of its body weight in food” (Porter, 2024)

# III: Agricultural mastery in practice: real-world case studies and perspectives

## 3.1 David Brown – Allora

“Profit isn’t a dirty word”

In short visit with David the topics were direct to the study of the importance and benefits of “good practices” in beef production. He stressed the relevance of the nutritional element of production and how the industry still has room for development in this area not only in practice but also in education of our leaders and potential future successors. It is Critical to have an efficient energy conversion and to do that you need to have stable rumen function. The development of simplistic solutions that can be implemented in areas that are remote and vast is an area of improvement. For example, the feedlot in question is positioned with use of the landscape and how it creates a katabatic wind, this is wind that During and after sunset, particularly on a clear day/night, air at and near the top of elevated land surfaces, cools relatively quicker than air at lower altitudes. As the air cools it becomes denser and therefore heavier. The cold air then flows down the side of the mountain, resulting in a katabatic flow. (SKYbrary Aviation Safety, 2024) Thinking outside the box but not reinventing the wheel.

The diverse knowledge of David added worth to the perspective of value verses expense and the impact that has on the net bottom line of production.

David has a video on Future Beef addressing Feedlot industry Investments. (FutureBeefAu. 2012)

## 3.2 Flying Diamond Ranch – Colorado

“Flying Diamond Ranch is a fifth-generation family owned and operated commercial cattle ranch located in eastern Colorado. Our family has been running cattle and caring for the arid prairie rangeland here in Kit Carson since 1907. As we look towards future generations on the Flying Diamond Ranch, we remain steadfast in managing a financially sustainable operation by continually improving our cattle, enhancing our natural resources, and persevering our close family relationships.” (Flying Diamond Ranch, 2024)

The philosophy of “working with nature” at the Flying Diamond Ranch has not only reduced operational expenses but also fostered sustainable ecological conditions for both the land and cattle. By shifting the calving season to may, when the natural forage supplies align with the nutritional needs of the cows, there has been a notable reduction in the amount of supplemental forage required during winter months. Additionally, this decision has led to a decrease in calf mortality caused by adverse weather conditions.

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The Flying Diamond Ranch manages cattle genetics according to the principle that the environment defines the optimal type of animal. The culling criteria prioritizes females that consistently wean a calf each year from the age of two onwards. “This approach has fostered a healthy, moderately sized herd that thrives in our environment, characterized by an average rainfall of thirteen inches and an annual temperature ranging from below freezing to over 38 degrees Celsius. By expanding the herd with cattle that excel in our specific conditions, we anticipate long term sustainability advantages for the operation.” (Flying Diamond Ranch, 2024)

“The flexibility to raise our own replacement heifers or to sell those bred heifers if a drought has decreased our carrying capacity helps us to prioritize our most important resource, grass, over cattle.” (Flying Diamond Ranch, 2024)

Since the early 1990s, the flying diamond ranch has implemented a high-density, low-frequency grazing system guided by holistic management principles. This approach is reinforced by extensive water infrastructure and fencing, enabling them to effectively manage and leverage herd impact to achieve their desired range of improvements. Riparian areas are either fenced off or carefully monitored to ensure responsible grazing practices. This system guarantees that each grazed area receives ample rest, with no pasture grazed for more than twenty days annually. As a result, the ranch has facilitated elevated levels of productivity, health, fertility in both the cattle and rangeland.

Whilst this system may not suit all producer’s operations, it certainly is one way to optimize production of grassland and produce a high-quality article for the desired markets that the Flying Diamond Ranch supports. The author commends the ranch on the efforts to produce quality beef sustainably, whilst remaining resilient and efficient in their practices, also it is a great honor to receive welcome and hospitality in the pursuit to find high performing beef operations.

## 3.3 Home Ranch – Colorado

The Home Ranch cattle operation specializes in breeding highly valued Akaushi beef cattle (the most cherished of the four Japanese cattle breeds collectively known as Wagyu) with one of America’s top beef breeds, Red Angus. Free range and grass fed for life, home ranch’s signature American Wagyu breed produces exceptionally marbled beef recognized for its excellent cooking and eating quality – and the Elk River Valley’s nutrient rich alpine grasses give this unique beef a higher percentage of heart-healthy monounsaturated Omega-3 and Omega-6 fatty than traditionally-raised American beef. These health and quality benefits, combined with lower-stress and eco-positive range management practices make Home Ranch cattle a breed apart in the American beef industry.

**Stockyard – Marcus Doumany**

Marcus Doumany, the General manager at Kerwee feedlot believes that there is growth potential in northern Australia in many ways but believes that genetics and breeding practices are one among the many opportunities related to optimising

performance in feedlots and other market avenues. Focusing on rebreeds, calving times, optimizing nutrition, maintaining body condition score, managing paddocks and grass, stressors, manure testing and weaner performance are some of the main areas of concern in the eyes of Marcus. “Everyday counts” continuing to maintain cattle using nutrition strategies help to increase animal health and performance “don’t risk losing market access” it is important to aim towards the correct article that is required for grids of the relevant market. Falling outside of the specifications can lead to the loss of market access. When talking breeder and cattle performance, genetics play a major part in market access and performance. This could be related back to hybrid vigour, adaptation, resistance to parasite load and composite breeds that can aim for specifications such as MSA (Meat standards Australia) grading. Although the feedlot may not be the intended avenue for some producer’s cattle, the intentions in most cases remain the same, Producing the correct article for the intended market sustainably, consistency in finishing within market specifications specially when meat quality determines unit price.

## 3.4 Teton Ridge and T9 Ranch – Texas

The meeting with John Sanislow was incredibly influential and inspiring, covering topics about the business and what are the key elements to continuing the success of Teton Ridge. He emphasised the importance of one main foundational component to the sustainable success and development of an enterprise; the people. Recognising specifics and pairing them to the talent and ability of the people.

# IV: Conclusion

The opportunity exists for producers to generate beef cattle specific to value chain protocols, with a potential increased market share by using proven techniques of managing cattle to prepare them for intensive systems with the possibility of financial credit and premium with improved efficacy towards the efficiency and performance of their cattle. Improvements that feel small in nature can have profound benefits for the bottom-line result in beef cattle enterprises. Northern Australian beef producers face a number of challenges and it is vital that opportunities to improve procedure and practice by even 1% can profoundly impact the future sustainability and feasibility of these enterprises.

**Figure 3. Nelore cattle in the feedlot, Bandeirinha, Brazil (Source: Author)**

**Figure 4. Composite Angus Heifers, Flying Diamond Ranch, Colorado (Source: Author)**

**Figure 5. Jade, Harvey and Jarrod at Valley Equine, Texas USA (Source: Author)**

**Figure 6. Jade, Harvey and Jarrod. (Source: Author)**

# V: Recommendations

- Maintain industry-standard animal welfare protocols and husbandry practices and disease management processes.
- Retain both traceability and tractability.
- Don't lose sight of supply chain and customer expectations.
- Implement sustainable beef cattle production practices and environmental responsibility.
- Uniformity has consistent influence on price.
- Tools like the use of EBV's and selection of sires, paired with the selection of the lead and the tail of the herd with genomics can be used to tighten the gap in herd variance.
- Particularly when creating a plan for developing performing herds it is essential to have clear goals and objectives around the expected performance of the herd tailored to your environment and business structure or intentions.
- Selecting for improved residual feed intake in breeding stock also enhances feed efficiency in progeny that enter the feedlot.
- The heritability of feed efficiency is approximately 35%-40%, indicating that the selecting breeding stock with high feed efficiency will enhance the overall feed efficiency of the population over time.
- The use of targeted indexes such as "BREEDPLAN" can offer producers the opportunity to enhance the genetic advancement of their herds and offer unbiased data on the cattle they sell.
- Rumen preparation for animals going into a feedlot or intensive system is advised as well as physiological development of a calf and how as producers are we going to allow them to have the necessary dietary requirements.
- Segregating weaners into weight ranges to avoid animals competing for the required nutrition is a practice that is proven to make differences in the bottom line.
- Consider the quality of hay and feeds being used.
- Look at the whole production cycle.
- Low input systems can be managed more economically by identifying which animals have the highest requirements of what nutrition in what paddocks.
- When setting the goals that are set for the objectives with the weaners, it is essential that the primary goal is to keep them going forward, secondly, that the weaners become pasture ready, and the third, is we want to bring our bottom line up, in this case the lighter weaner.
- An element of the nutritional requirements is ensuring that when the animals are getting handled, how much of a disruption is that to the requirements to gain weight, and how long is that animal is not receiving enough nutrients.

- Yard weaning leads to significantly better weight gain and lower incidence of respiratory disease in feedlot cattle compared to conventional paddock weaning methods.
- As a minimum for yard weaning requirements:

1. Wean for a minimum of five days.
2. Segregate to weight groups.
3. Sufficient access to clean water.
4. Feed appropriate energy and hay supplements ensure hay is quality tested prior to purchase.
5. Make feed changes slowly.
6. Keep yards hygienic.
7. Minimise stress.
8. Observe behaviour.

- Cattle that are held in overnight yards and transported a longer distance have been found to have heightened incidence of BRD.
- The financial analysis behind vaccinating against BRD at least 28 days in facilities adjacent to feedlots would generally prove to be unprofitable, due to the benefits of the effects of backgrounding outweighing the influence of effect of vaccination against BRD.
- Combining mobs 28 days prior to feedlot entry has seen to have a reduction in the risk of BRD in Sale yard cattle.
- Structure and plant and equipment are not always common for cattle to be exposed to in levels of the feedlot, the exposure to diets relative to that of the feedyard is also necessary if the animals are to perform at their potential.
- The ultimate goal is to reduce stress, create social dynamics, establish social hierarchy, and introduce the gradual implementation of feedlot environments. Many of the challenges can be mitigated at weaning via yard weaning techniques.

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