Richard Roderick, Newton Farm

HCC Scholarship 2016

Beef Production and Management Systems in the Mid-West, USA – Is the composite cow a low cost, efficient and effective suckler cow?

Contents Page

Executive Summary

Background

I farm Newton Farm in partnership with Helen and we have three sons aged between 16 and 20. I joined the family business in 1984 on leaving WAC, Aberystwyth. At that time Newton was 220 acres. Over time the business has grown and diversified. I now farm 650 acres and are a mixed farm, with 75 suckler cows, with the progeny finished and run 1050 breeding ewes, 100 breeding ewe lambs and 160 non-breeding ewe lambs. We grow 55 acres of cereals and 11 acres of fodder beet. The farm joined Tir Gofal in 2000, Glastir in 2012 and Glastir Advanced in 2015. In addition we run a holiday cottage nearby which sleeps 12 people in six bedrooms, have a long term let as well and in 2015 we installed a 75kw wood chip biomass system utilizing wood from the farm. We also have small scale solar thermal & solar PV.

My ambition is for all sectors of our business to be profitable excluding support income. To achieve this my strategy is to focus on genetics and maximizing the use of forage and root crops.

In 2013 we decided to alter our beef production system. Traditionally, the farm had a herd of Belgian Blue & Limousin cross cattle. However, the herd was becoming increasingly expensive to feed, with temperament and calving issues. In addition we wanted to breed our own replacements to reduce the risk of buying in problems, which we had suffered while replacing a quarter of the herd lost in 2010 to TB. Following a study tour in 2012 we decided to try the Stabiliser breed. This breed is designed to produce consistent cattle which are able to maximise weight gains from forage based farming systems; enabling us to optimise use of the farm's grass as a feed source and reduce running costs. This is very much work in progress and my aim over the next 5-10 years is to balance the herd, and optimize growth rates and feeding systems. I want to keep suckler cows as part of a sustainable mixed farming system, but they will have to pay their way.

Profitable suckler beef production is currently a big challenge, and looking at successful businesses in other countries, understanding their key data, understanding how their breeds have changed and how improvements have been made was the main driver in my HCC Scholarship application.

I wanted to visit America where some of the world's top cattle genetics have been developed. The philosophy being developed there is to focus on profit per acre from cattle, based on a small, hardy cow producing fast growing calves at more than 50% of the body weight of the mother at weaning with good marbling and excellent eating quality.

The American beef industry has been at the forefront of genetic improvements over many decades and to me they seem to be leading the world when it comes to cow fertility, calf mortality, growth rates and eating quality.

Our Itinerary

During the scholarship period we visited 11 ranches, 2 feedlots and 2 research centres. We covered 3,500 miles during our visit and spent time in Colorado, Wyoming, Nebraska, Kansas and Utah before leaving via Arizona and Nevada. Ranches ranged between 200 and 12,000 feet above sea level. The quality and availability of grazing differed hugely, as did weather conditions and cropping was largely determined by access to water.

Findings from Visits

There are no direct subsidies on beef in the US.

Breeding of composite cattle in America has been borne out of extensive breeding programmes and research from Government and State Research Centres. “We began with the end in mind.” JD Anderson, founder of Powerline Genetics.

Individual cattlemen have taken this research and bred up from it. E.g John Maddux, Lee Leachman and Powerline Genetics. Ranches are beef focused businesses. People running the businesses have a high level focus, knowledge and technical ability. Many have degrees in Beef Production & Beef Management.

There is a high level of on-going research and cooperation between the Universities and the ranchers themselves. Forward thinking cattlemen work with the USDA Research Centre at Clay Centre to research and resolve problems. The USDA have a research herd of over 800 cows.

Cows must be fertile, conceive in under 60 days and wean a calf at 50% of its body weight each year to remain in the herd. They have a zero tolerance attitude towards beef production – if a cow’s offspring underperform she is axed from the herd. Temperament is always high on the list of key desirable attributes.

Heifers are always calved down at 24 months of age.

Artificial insemination is widely used in breeding programmes to ensure the maximum gain from the best bulls. Sweeper bulls are used to follow AI.

The American Beef Industry is data driven, performance databases exist across all purebreds and composites. A huge volume of data exists and is used to make decisions.

The databases differ by breed but several breeds and composites have attempted to quantify EPD’s (Expected Progeny Differences) into a profitability index split between producer and finisher, enabling bull or semen purchasers to choose from individual traits or the most beneficial combination which will produce the most profit for the producer or finisher or combination of the two.

There is currently a major focus on feed efficiency across all breeds, with the most feed efficient bulls highly sought after. A one pound gain in feed efficiency is reported to equal $80 a head to bottom line profit. In line with feed efficiency the USDA are currently using metergenomics focusing on the digestive tract and the lining of the rumen. Beef producers are excited by feed efficiency gains. As Daniel Mushrush put it, “The exciting thing about feed efficiency improvements is that in time we may be able to compete with the white meat industry.”

We found that very few females are traded, as Joey Freud put it, “We can raise a better one than we can buy.’ Buying in replacements is expensive and increases the risk of purchased health issues.

The American packer has a high focus on ribeye size, marbling and meat yield. Tenderness and flavour testing is being developed. The resultant breeding has largely been from an Angus or Hereford base, with all breeds demonstrating Angus traits. Even the continental breeds we saw, including Limousin and Charolais have an Angus profile.

Water is a key concern across all states. Water rights are based on seniority, with some moves by central government to take over all water decisions. Droughts are a common feature and aquifers have been depleted. Lack of Water is a major risk to the Cattle Industry.

Conclusion

The HCC scholarship has provided the opportunity and the impetus to study new ideas and technologies in other parts of the world where different approaches and innovations have been adopted.

We have been hugely privileged to meet some of the most impressive Cattle men and women in the USA and our heartfelt thanks go to them for allowing access to their businesses and their homes.

We have seen and heard about successful beef production systems as well as genetic and technological improvements. This opportunity will help to make our business more efficient with the aim of having a profitable suckler beef herd.

The aim was to learn about successful farming practices to bring them back to Wales to implement, where applicable, on our farm and to share with other farmers and the red meat industry across Wales. Over the coming months we will report on our findings and share our enthusiasm.

I have started to change direction in my beef production system and this opportunity has enabled me to investigate breeding options – the aim is to produce a great eating experience, tender and marbled beef from a smaller, more efficient, forage based suckler cow.

Lessons Learned to be applied back home in Wales

- Use cross-breeding and multiple breeding to combine the most beneficial cattle traits from all breeds
- Focus on maternal traits to build your herd – disposition, calving ease and growth
- Use AI to speed up the process and use the best bulls in the industry
- Record data to ensure that your breeding programme is going to plan
- Maintain a zero tolerance policy for animals which do not perform to your strategy
- Understand the effects of EPD's on Profitability or trust indices
- Evaluate profit per acre and not just profit per animal

Remember Gary Rolland's 3 P philosophy. Cattle production should be **Profitable, Perpetual and Pleasurable.**

Lessons for Others

- Universities and research centres which focus on beef production and their collaboration with farmers is hugely beneficial for the industry as a whole
- The EUROP grid in the UK does not evaluate quality or lead producers in the UK to produce what the customer wants
- Education is important – specific courses in Beef Management and Production Systems

Thanks

Our thanks go to HCC for the scholarship award and to Ryan Peterson of Leachman Cattle of Colorado, Ursula Taylor of the BIG Company in the UK and Richard Tudor, Llysun for their help and advice in putting together our itinerary.

Detailed Report

Introduction

The HCC scholarship provides the opportunity and impetus to study new ideas and technologies in other parts of the world where different approaches and innovations have been adopted. The aim was to learn about successful farming practices to bring them back to Wales to implement, where applicable, on our farm and to share with other farmers and the red meat industry across Wales. This opportunity would help to make our business more efficient with the aim of having a profitable suckler beef herd.

Profitable suckler beef production is currently a big challenge and looking at successful businesses in other countries, gathering their key data and knowledge would be a great help in putting us on the right road.

I chose to visit America where some of the world's top cattle genetics are being developed. The philosophy being developed there is to focus on profit per hectare from cattle, based on a small, hardy cow producing fast growing calves at more than 50% of the body weight of the mother at weaning with good marbling and excellent eating quality.

The American beef industry has been at the forefront of genetic improvements over many decades and to me they seem to be leading the world when it comes to cow fertility, calf mortality, growth rates and eating quality.

We visited the Mid-West States

Itinerary of Visits

1. Leachman Cattle of Colorado
2. Colorado State University – Agricultural research, Development and Education Centre
3. Maddux cattle Company
4. Lincoln County Feedyard
5. Powerline Genetics
6. United States Department of Agriculture – Meat Animal Research Centre
7. Rempe Farms
8. Mushrush Red Angus
9. Gary Rolland
10. Pharo Cattle Company
11. Beefmaster, Lasater Ranch
12. Running Creek Ranch
13. Nottingham Ranch
14. Trampe Ranch

1. Ryan Peterson, Leachman Cattle of Colorado (LCoC)

Ryan is the Director of Sales for LCoC and spends a lot of his time working with bulls on test, manages the herd sires and is also the semen representative for Colorado. Ryan's background includes growing up on a family run commercial cow-calf and feedlot operation in southwest Michigan. He was heavily involved in Future Farmers of America serving both as a State and National Officer. Ryan earned a degree in Agri-Business from Michigan State University and a Masters Degree in Animal Science from Colorado State University, when he undertook research into feedlot nutrition. Subsequently Ryan went on to manage the Colorado State University Research Facility at Fort Collins, Colorado. Ryan has been with LCoC since 2010.

A huge thanks go to Ryan for organising a number of our visits and for spending his valuable time with us at this hectic time.

At the offices in Fort Collins we saw Sim Angus Stabilizer Bull Prophet, Sim Angus Stabilizer Bull Trinity, Yosemite, a composite stabilizer bull and Visionary, an Angus Bull. These bulls can produce between 300 and 700 straws a day. Prophet has impressive feed efficiency of 4:1 together with a 17 inch ribeye. He is 3/8 Simmental and 5/8 Angus.

Both Angus and Simmental breeds have extensive herd databases and therefore it is easy to find a bull to meet your requirements. With the Gelbvieh and South Devon breeds databases are more limited.

LCoC maintain the largest database of multi-breed data in the US, with 800,000 animal breed records on a Microsoft Access Database.

Water is a big issue in the US. It is heavily regulated, is based on seniority and pastures with irrigation are much more valuable.

We visited a feedlot owned by the Horton family. It is a custom finisher, the 15,000 cattle there are finished on a B&B basis. 80% of cattle in the US are finished on feedlots. All the feed is purchased from within a 120 mile radius. On average they come in at 900lb for 125 days and can be expected to gain 4lb a day finishing at 1400lb. The correct ration is mixed in the trucks and the trucks drive around and fill the bunks from which the cattle eat.

One of the main problems of farming cattle in Colorado is high altitude sickness or 'Brisket Disease.' High mountain or brisket disease is an economically costly disease of cattle raised at elevations greater than 1500 m (5000 ft). It appears that no one breed is resistant to the effects of high-altitude hypoxia. Some breeds, and pedigrees within breeds, appear to be more naturally resistant to the effects of high altitude. Multiple factors contribute to the variance in pulmonary arterial pressure in cattle, including breed, gender, body condition, concurrent illness, environmental conditions, elevation, and genetics. Pulmonary arterial pressure testing is an effective diagnostic and management tool used to identify clinically affected and high-risk animals. The procedure can be performed in the field and is an economically valuable method for the selection and breeding management of beef cattle raised at high altitude. To guard against this Leachman are breeding high altitude bulls and putting them through a Pulmonary Artery Pressure Test. Here a catheter is fed through the neck, down through the heart to the Pulmonary Artery. Saline is then added and a test done to see how quickly the saline is pumped back out – the lower the score the less susceptible the animal is to becoming ill. 10% of the Leachman bulls are tested each year.

2. Colorado State University Research Facility

The facility opened in 2000 and is aligned to the University. Under the Morrill Act land was given to each state for education, outreach and research. LCoC uses the facility to feed efficiency test both heifers and bulls. The day we were there some of Sam Rempe's heifers were being tested. They are tested for at least 45 days.

Heifers can be bulled at 65% of their mature body weight (800lbs v mature body of 1250lbs). LCoC have found that the 4 way cross is much more reliable than the two way cross.

LCoC understand their customers and have the breeding bulls to do the job. On the ranges the ratio suggested is 1 bull to 30 cows. A combination of understanding EPD's and trusting the $Profit calculation allows Leachman to provide the right bulls to customers.

In total LCoC have eight bull sales a year including one sale of high altitude bulls. The sales take place across the US and LCoC attempt to match bulls to the local requirement/environment.

"The fastest way of improving your herd is through the use of AI." We noted that all Stabiliser/Charolais etc in the US are all of an Angus type and very different from the UK Charolais.

EPD (Expected Progeny Differences)

Expected progeny differences (EPDs) provide estimates of the genetic value of an animal as a parent. Specifically, differences in EPDs between two individuals of the same breed predict differences in performance between their future offspring when each is mated to animals of the same average genetic merit. EPDs are calculated for birth, growth, maternal, and carcass traits and are reported in the same units of measurement as the trait (normally pounds). EPD values may be directly compared only between animals of the same breed. In other words, a birth weight EPD for a Charolais bull may not be directly compared to a birth weight EPD of a Hereford bull (unless an adjustment is made to account for breed differences).

Leachman $Profit

In America there is a huge amount of data to study. With over 20 EPD's (Expected Progeny Differences) traits and so many measurements buying the best bull has become really confusing. Every bull is good on some traits and weak on others. The challenge is figuring out how each of those traits is going to impact your bottom line.

Back in 2005 Lee Leachman was tasked with coming up with one number which sorted the Bulls on their impact on bottom line profitability.

$Profit assumes that the average commercial bull will have 100 progeny over its lifetime. The model assumes that you keep 30% of your heifers as replacements and the remainder are taken through to slaughter. The simulation model then factors in all of the effects on both income and expense to come up with a net profit figure for each bull. $Profit allows the comparison of any two Bulls across a herd.

$Profit includes nearly every trait that impacts profitability. The effect of most traits on profit is fairly simple to understand. Here is the list of what is included and its effect.

Revenue Traits
- calving ease = more calves
- weaning and yearling EPD = more weight

- Fertility (days to conception) = more weight and more calves
- carcass weight = worth more up to 1050 lbs (maximum dead weight limit)
- marbling = valued based on grid premiums
- ribeye area = value as impacts yield grade
- % retail product = more yield is more meat

Cost Traits
- cow mature size = bigger eats more
- cow intake = more intake costs more
- feedlot efficiency = cost of gain

There are a few traits not yet included in $Profit such as longevity, structure and disposition. While these are important traits they are difficult to express in dollars and are therefore currently excluded.

$Profit is split into two elements :-
- $Ranch shows the profit from birth through to weaning
- $Feeder shows the profit from weaning through to slaughter

Having a financial method of comparing cattle is extremely useful.

3. John Maddux, Sandhills, Nebraska

“Fertility is the number one driver for everything we do.”

From a very early age John Maddux decided that the thing he most wanted to do was a buy a ranch. "I was intrigued with the idea of putting together a place all on my own, a place that would be solely mine rather than a place that I inherited from my family."

For the next 25 years or so, everything he did, he did with that goal in mind, and when he was 34 years old his goal came to fruition. The 8000-acre 2S Ranch on the headwaters of Spring Creek is the ranch he vowed to own when he was young.

Maddux received his undergraduate degree from the University of Nebraska. He worked for Elanco Animal Health for a year or so afterward, then went to the University of Chicago for an MBA. He had plans all along to come back to the ranch when he finished his MBA, but he realized that the only way he would ever be able to save up enough money to buy his ranch was to get another job. That ultimately led him to his next stop — Wall Street.

For the next 10 years or so he traded bonds for Goldman-Sachs. He was good at his job, and he definitely made his way. “New York was a hoot, and I enjoyed what I was doing," John says.

Although he enjoyed his adopted New York City and thrived in the environment on the bond trading floor, he always had ranching on the brain. In the spring, while sitting in his upper East Side Manhattan apartment, he planned his cow matings, and in the fall he worked on his yearling breakevens.

"Once I’d accomplished my goal, though, there was really no need for me to stay, so I came home to run my ranch. I miss the urban lifestyle and nightlife," he admits, "but I’m glad I’m not selling bonds any longer. I’m happy to be ranching."

When Maddux came home, he also became a full-time managing partner in Maddux Cattle Co., the family operation headquartered at Wauneta which he runs with his father, Jack.

John runs his ranch, more or less, in conjunction with the family operation. Maddux Cattle Co. in all consists of about 40,000 acres of deeded and leased country, the majority of which is in the Sandhills of Chase County, Nebraska. Here they run some 2500 head of red cows, a composite herd consisting primarily of Red Angus, Red Poll, South Devon and Tarentaise genetics.

John's primary responsibility in the family operation is caring for the replacement heifers and bull selection and development.

COMPOSITE FORMATION PLAN

Creating the "Maternalizer"

After a cow dispersal in the fall of 2005 Maddux formulated a plan to repurchase Red Angus heifer calves over the next few years, looking for market opportunities to repurchase these heifers at attractive prices. Heifer calves are more attractive than purchasing bred heifers and young cows. Heifers can be purchased and developed on relatively low-cost feedstuffs, cheaper than buying a similar bred heifer or cow. Consequently, any heifers that are culls or opens will have been run similar to a yearling feeder heifer program and can be marketed accordingly. Also, heifers are advantageous in that they can be developed to handling techniques, developed to the target breeding weight and bred to bulls that fit the ranch's breeding plans.

This results in more cows in the herd than the operation can run and highlights the need to continue to build programs to sell excess heifers/cows.

They worked with scientists at the Meat Animal Research Center at Clay Center, Nebraska, to develop an animal that best suited their goals and objectives. The composite is made up of Red Angus, Tarentaise, Red Poll, and South Devon genetics.

The goal was to recreate a moderate sized British type crossbred female, similar to the previous composite as displayed below:

The Maddux family are fans of crossbred cattle. In their opinion, there is no single management practice, which can have more impact on your bottom line than crossbreeding. The use of crossbreeding yields two important advantages over straight-bred cattle. First is that the crossing of two breeds results in higher levels of performance for most economic traits. Secondly the use of multiple breeds allows producers to harness the traits of one breed to "compliment" and improve desirable characteristics of another breed. No one breed has optimum levels of performance

however, through breed combinations and hybrid vigour, one can develop highly desirable animals for a broad range of traits.

Hybrid vigour, more commonly referred to as heterosis, is the superiority that crossbred animals exhibit over its straight-bred parents. Generally, heterosis has the greatest effect on those traits, which have a lower level of heritability, moderate heterosis is observed in moderately heritable traits, while highly heritable traits show little or no affects from heterosis. Traits such as fertility, longevity, and health have relatively low heritability yet show large responses from cross breeding. This is important for two often overlooked reasons. One is that while most genetic change is focused on the highly heritable traits like frame size and growth, the truly important economic traits like overall cow productivity are not the focus of the seed stock community, because of the low heritability. Even if it were a focus in selection, making change in these areas would be quite limited. Secondly, crossbreeding allows one to make much larger strides in genetic improvement by utilizing breed differences. Through recent efforts to characterize the important economic traits and biological type for beef cattle breeds, one can easily identify which breeds excel in any one trait and use that breed to introduce those genes for that trait into your crossbred population. You can make much more progress in one cross than a lifetime of selection for a trait, even one with high heritability.

Producing crossbred calves has advantages in terms of heterosis and blending of breed differences but the major advantages of cross breeding accrues to the crossbred cow. Hybrid females generate a more desirable environment for her calf through improved maternal ability. This results in higher calf survivability and higher weaning weights. On average a crossbred cow has a 4% higher calving rate, raises one more calf, and produces a cumulative 600 more pounds of calf over her lifetime. This higher productivity gives you more pounds to sell every year per cow and reduces your replacement rate due to higher fertility, longer lives and healthier more “maternal” cows. This higher productivity and lower replacement rates are powerful factors affecting overall ranch profitability.

In order to capture the benefits of hybrid vigour, the plan was to develop a composite population of Maternalizers”. The Maternalizer cows are designed to emphasize maternal traits. These cows are well suited to the family’s environment and production system. They are smaller framed, easier fleshing, early growth cows with desirable udders. They want cows that deliver low birth weight calves without assistance. The composite is designed to graze year round with minimal feed inputs. With this genetic emphasis, and through the use of cornstalks and late spring calving, only in the case of severe weather will any hay or supplementation be fed. And while some emphasis was given to carcass quality/marbling in breed selection, the main focus is on whether the breed can deliver fitness and convenience traits. Moreover, with the composite herd, genetic change is not necessarily the goal. Instead Maddux is trying to fix a set of traits at a given level of production. High growth and more milk are not necessarily desirable because of the higher maintenance and feed costs associated with higher production. Selection for fitness and convenience traits trumps high production. The goal is to have every cow pregnant and raise a calf albeit at a lower weaning and yearling weights than most production systems.

Their ideal cow will have the following convenience and fitness characteristics:

1. 1150 lbs mature weight.
2. Frame score 5 or less
3. Fault free udders
4. Docility
5. Fertility
6. Polled
7. Longevity
8. Pigment on eye and udder
9. Fleshing ability
10. Calving ease

11. Modest early growth and milk

Here is a table Modified from the USDA MARC Germ Plasm Evaluation project that characterizes the production traits and biological type of the parent breeds, which Maddux selected to be contributors to our composite.

Breed	Growth Rate	Age Puberty	Milk Produc
AR Red Angus	XXX	XX	XXX
TA Tarentaise	XXX	XX	XXX
DS South Devon	XXX	XX	XXX
RP Red Poll	XX	XX	XXX
HE Hereford	XXX	XXX	XX
DE Devon	XX	XXX	XX

The Red Angus breed provided an excellent base for the composites. Red Angus offers carcass quality, maternal traits and calving ease. One drawback is that they have a far smaller breed population compared with Black Angus.

The Breeding Process

In Step 1 of the breeding process Red Angus females were bred AI and cleaned-up with calving ease Tarentaise sires like the bull below left. Tarentaise females like below right bring excellent udders and maternal traits to the composite but with marginal carcass qualities and greater than optimum milk production.

The females from this mating (AR-TA F1s) enter the herd as replacement heifers. The Tarentaise and Red Angus breeds deliver optimum levels of production and fitness traits. Several years of this mating generated a sizable number of these TA-AR F1 heifers to enter the herd as replacements.

In Step 2, these F1 heifers (and later as cows) were then mated to equal numbers of purebred bulls of Devon, South Devon and Red Poll. All bulls and heifers from this mating were considered full composites. As a result of this mating the composite was on a herd basis, i.e: ¼ AR, ¼ TA, 1/8 HE, 1/8 RP 1/8 DE, 1/8 DS. In Step 3 in order to speed up the process of infusing different genetics into the composite Maddux contracted with breeders to raise F1 bulls of Tarentaise with: Red Poll (RP), Devon both South (DS) and Red (DE). These sires were used AI and naturally bred to the AR females to produce composite females. These cows (and bulls) ½ AR, ¼ TA and either ¼ RP or ¼ DS or ¼ DE. These were full composites as well. They continue to look for outside maternal genes to contribute genetic diversity to the composite.

Devon genetics offer moderate size, muscling, and decent maternal qualities but marginal quality grade. Also, the horned gene is in the population. Here are representative pictures of a Devon sire and dam.

Red Poll contributes excellent fertility, age of puberty and marbling to our composite population. They may be faulted for poorer udder quality and lack of fleshing ability. Below are representative Red Poll photos.


South Devon contribute excellent marbling and decent maternal qualities but tend to be larger framed and some questionable udders can be found in the breed. Below is a South Devon bull and cow.


Hereford offers moderate size, fleshing ability, optimum milk production and in some bloodlines, good maternal traits. Herefords don't make a significant contribution to carcass quality. A Hereford bull and cow are below.


After initially developing the composites they have continued to select for maternal and convenience traits. Convenience traits such as disposition, udder quality, calving ease, polled, and

superior feet and legs are the focus of selection pressure. Special attention is focused on body type including mature size, muscle expression and fleshing ability. Maximizing growth will be avoided in order to maintain the maternal qualities of moderate size, which is central to the composite development plan. Carcass traits are monitored and improved through genetic markers and new genetic infusion to move the population in the desired direction.

The Maternalizer cows are well suited for year around grazing in a low input system. They deliver problem free production with an early growth calf, which is suited to a yearling system.

Maddux Cattle Company, situated in the Sandhills of southwestern Nebraska, has one primary objective — to be a low-cost producer.

Like most cow-calf operators in the area, the Madduxes are also able to protect their bottom line by keeping winter feed costs to a bare minimum. They do this by renting readily available supplies of corn stalks on quarter-section pivots from area farmers.

"The winter is our cheapest time of the year," Maddux says. "Having a ranch close to a big farming area is our unfair advantage, because we have all these corn stalks and other crop residues that we can utilize. It's much cheaper than feeding hay or cake, or even running them on grass."
"If it rains, the hardland will carry more cattle," John says, "but during drought the sandhills are more dependable because they're better able to make use of available moisture."

The average annual rainfall is about 17 inches, but moisture has been extremely short the last several years.

John and his dad do most of the thinking, figuring and planning for the future, and the day to day management is left in the hands of their invaluable and dedicated employees, many of whom have been with the company for 15 to 25 years.

Today Maddux Cattle Company has five full-time men on their cow-calf crew. There's also a man who runs the feedlot, another who does the haying and fencing, and a secretary who keeps the books. They also hire a lot of high school kids as summer help.

They've chopped up their sandhills pastures using three-wire electric fences. Most pastures are about 350 acres in size and the cows are rotated through the pastures in a fairly quick manner.

"We like to bite that one plant one time before we move on, and we want to move before that grass has an opportunity to grow back," Hill explains. "In other words, we only want to graze warm season grasses once in the growing season."

Their cool season grasses, like needle and thread and western wheatgrass, are also an invaluable part of their grazing program.

"We try to get out with our pairs by the 15th of April."

Sand bluestem is the "ice cream" plant of the warm season grasses, and it is used as an indicator of range condition.

"If there is more sand bluestem and it is increasing in vigour, then we're doing things right," he comments. "At least that's what we tell ourselves, because it's the first plant that cattle will graze. It's an indicator for what we're trying to do."

Prairie sandreed, on the other hand, is their "workhorse" grass.

"We call it that because it produces the most volume," Hill explains. "It's real palatable and drought tolerant as well, but it is a touchy grass. It's easy to hurt if you graze it too hard in June and July."

Normally the cows are pulled off grass the first of November and mostly trailed, but in some cases shipped, to nearby corn stalks.

They'll run one bunch of cows, usually 500 to 900 head, on a quarter-section pivot for four to five days. It takes lots of planning to move them between the circles.

They rent the corn stalks by the acre. Last year they rented some 11,000 acres and fenced 75 pivots using a single high tensile Gallagher wire and fiberglass posts. Hill is mechanically inclined and rigged up some hydraulics on a couple of the trucks, and now they can fence a 130-acre pivot in an hour or so.

Though they do get their share of snow, it's generally not a problem. The cows come back home the first of March, just before calving. On average they get about 110 days of grazing on the stalks. With better combines and corn varieties there isn't as much corn left in the fields as there was 10 years ago. This has prompted a move toward a smaller, easier-fleshing type of cow that can prosper on more husks and stalks and less grain. Also competition for the corn stalks is definitely increasing.

"We think it's going to get harder and harder to get enough corn stalks, especially as new crop rotation reduces corn acreage. We might be forced to rent fewer pivots, stay longer on each pivot, and supplement our cows with some distillers' grain."

"Plus, it's much more effective to make genetic change through breed differences than it is to try and do it through selection pressure in a traditional breeding system. The whole idea for having composites is that you use breeds which complement each other and produce a certain level of production suited for your environment."

They have about 900 cows in their "elite" composite herd, from which they choose all of their replacement heifers and bulls. The other cows are divided into two terminal herds, and all of these calves are fed out in their own feedyard.

Maddux Ranch also raises all of its own bulls. Bull calves are sorted at weaning, and the culls are castrated and fed out at home. The remaining 300 head or so are put on a 45-day gain test. The top end of the bulls on test are the ones they kick out with the cows. The others are castrated and put on feed.

Yearling heifers are artificially inseminated at the end of April and then turned out with the bulls for another 45 days. The cows are bred beginning about the 25th of May for 60 days. Only heifers breeding in the first 21 days and cows in the first 42 days are retained. Others are sold in calf.

They use yearling bulls and don't semen test anything. Therefore they always overstock, running about 15 cows to a bull.

When the bulls are pulled out the last of July, they go straight to the feedyard where they're cut and put on feed. They're a long yearling kind of bull that weighs on average about 1000 pounds. They do not necessarily make a lot of money feeding these cutting bulls but because they are sold as steers this cuts breeding costs. Depending on the profitability of the cut bulls, breeding costs average from $2 to $15 a head.

The heifers begin calving around the first part of February and the cows the first of March.

Calves are fenceline weaned on irrigated grass, a cool season mixture of smooth brome, meadow brome, Garrison creeping foxtail, some bluegrass and orchard grass. The cows are kept a hot wire away in a drylot for several days. They scatter a few bunks out on grass and start those calves out on some corn gluten and distillers' grain.

Ranching has been good to the Maddux family. It's been a way of life now for four generations, and while the family history is rich with tradition, ranching for them has always been more than just a way of life. It's a business, John Maddux points out; every goal, every decision on the ranch is made using sound economic principles.

It's that kind of philosophy, passed down from generation to generation, he concludes, that has kept them in the cattle business all these years, and that same philosophical approach will keep them in business long into the future.

4. **Kevin Unger, Lincoln County Feedyard**

They have 12 pivots covering 130 acres each and producing 1 million bushels of wet corn.

Kevin showed us a state of the art steam flaking machine. This takes dry corn, putting it through a steam process and flattening it, like 'cornflakes'. This releases more starch which is more efficient, lowering conversion by 30% and saving cost by 10-15%. The balance of fat and starch is essential, otherwise you can cook the rumen too much.

The feedlot has

21,000 head of cattle and 20-25 people working there. The ration is mixed in a hopper as seen above and tipped directly into the lorry before being fed to the animals. The computer works out the exact quantities of each sort to go into the hopper for a range of pens. Each lorry has GPS and automatically knows which pens to feed with which ration.

Steve Schultz, the owner has a philosophy of integrating farming and feedlot, trying to buy in better genetics to the feedlot. Approximately 7,000 of the cattle are based on Leachman genetics. Some cattle are B&B based, meaning that ownership is retained by the rancher and they pay the feedlot for feeding their animals. Billing takes place on a two weekly basis.

The feedlot had been purchased in 2007 when it was a 4,000 head yard in a poor state of repair. Since 2009 he has completely renovated the yard, designing and building it into what it is today. They now have 250 pens, with between 50 and 250 head in each.

Kevin reported that on Stabilisers they have a net benefit of more than $150 per animal. They are cheaper to feed and have better carcass results.

For Angus the average is 5% prime, 40% CAB and 90% choice
For Stabiliers it is 12% prime, 66% CAB and 90% choice

Steve runs 2,000 of his own cows on his ranch and also has 2,000 cows in feed pens. Those in the feed pens are weaned at 120 days. He uses all Leachman genetics.

At the yard Steve is completely data driven and as such has the ambition for the feedlot to be completely based on Leachman genetics.

At the feedlot we saw Jersey Bulls, all Leachman genetics out of Jersey cows. Kevin explained that these animals perform even better than beef animals, with between 20 and 30% prime. They come in at 500-600lb in weight and go out at about 1400lb. Maximum carcass weight in the packers is 1075lb.

Cowboys are an essential part of every feedlot. They enter the pens every day and assess the health of the cattle. If one is sick they draw it out and put it in the hospital pen for treatment.

Ranches vary, in an ideal situation they wean for 45 days, vaccinate and then send to the feedlot, but some are unable to do this and in this case the calves come in straight off the cow.

In the lot cattle are measured at hip height on day 1 and then again two thirds of the way through to finishing. Cattle are batched together based on this measurement to ensure consistent supply to the abattoir.

Selection is based on :-
1, $Profit
2. Feed efficiency/weight
3. Carcass quality

Kevin described the $Profit calculation as 70% science, 30% art.

For milk the optimum EPD is between 15 and 25. Also with feed efficiency tests in mice have shown that if you push feed efficiency too much the mice become "couch potatoes" - they don't eat much, but they don't move much either - which would not be good for a stock bull out on the range.

Kevin hopes to sell the $Profit calculation to other seed stock producers as it is the best tool available to the industry today and in his opinion Lee Leachman is the best data analyst in the business.

Kevin described to us that the cattle industry in the US has a 10 year cycle and over that the the average cattleman makes zero profit. The top 10% always make money and the bottom 10% never make money. Therefore it is essential that you are data driven and profit driven.

The average age of a rancher is 58 years old.

5. Powerline Genetics, Arapahoe

Powerline Genetics is a result of the evolution of a simple idea to **begin with the end in mind**. Power Genetics feed yards represented a supply chain based on high quality cattle; in order to feed better cattle you need to access to better cattle. That concept led to bull marketing business that sells bull to producers who are involved in the supply chain. Continue to make the bulls better and make them accessible to producers. Use those bulls to produce some of the highest performing, feed efficient and high carcass merit calves in the world. Bring those calves back into the feed yards, feed them and close the loop.

Today the system has evolved into separate entities Power Genetics and Powerline Genetics who will each focus on their strengths and competencies. Power Genetics is a group of feed yards with a contract with Cargill to fill a specific need for high quality cattle. Powerline Genetics is a bull marketing business now owned by ABS Global Inc. based on the idea of taking the highest profit proven sires in the country and multiplying them. Each party works to build an incredibly strong supply chain for the industry based on the focus growth, efficiency and carcass. Powerline Genetics will continue to develop bulls who provide unique genetics to commercial cattleman who want to be involved in a supply chain. Power Genetics will work with the commercial cattleman to procure calves that will be some of the best feeders found anywhere. A simple concept – begin with the end in mind.

Powerline genetics, initially the brainchild of J.D. Anderson is now part of ABS Global. (American Breeder Service). J.D. Anderson believes that the connection with ABS will enable the company to move forward quickly and promote differentiation. The company now has 4 geneticists working for them. Over the last 10 years Powerline have increased the influence of the Black Angus breed, as it has an excellent brand reputation. The Sim/Angus cross cow is said to be the most popular cow across the U.S.

Powerline's competitive advantage is DISCIPLINE. They apply the strictest standards without exception to every single bull that is evaluated and marketed. If they don't meet the standards, they become steers.

- It doesn't matter if they have the highest daily gain. If they have a nasty attitude – steer!
- It doesn't matter if they have the biggest rib eye. If they have poor feet — steer!
- It doesn't matter if they have awesome eye appeal. If they don't meet our growth rate standards – steer!
- It doesn't matter if their dam was national champion. If they aren't sound — steer!

Powerline carefully selects sires from the Angus, SimAngus and Simmental line-up at ABS to shift the genetic curve in the desired direction.

They selected Angus and Simmental to create the Powerline Hybrid as a result of the way these two breeds stacked up in the Germ Plasm Evaluation Project at the Meat Animal Research Center in Clay Center, NE.

ECONOMIC TRAIT	SIMMENTAL RANK AMONG CONTINENTAL BREEDS	ANGUS RANK AMONG BRITISH BREEDS
Calving Ease	First (tie)	First
Weaning Weight	First	First
Percent Choice	First	Second

Carcass Weight	First	First
Post Wean Gain	First	First
Pounds of Retail Product	Second	First
Shear Force (tenderness)	First (tie)	First
Feed Efficiency by Wt. Gain	First	First
Feed Efficiency by Marbling	First	First
Feed Eff. by Retail Product	First	Second
Feed Eff. by Days Fed	Second	Second
Percent Puberty	First	Second
Percent Pregnancy	Second	Third
Maternal Calving Ease	First	Second
Maternal Weaning Weight	Second	First

Another compelling reason to build a SimAngus hybrid is, quite simply, to produce feeder calves that relationship feedyards want to buy and feed! The Power Genetics feedlots have fed well over 2 million cattle for their current grid marketing program and have made clear that they prefer SimAngus feeder calves.

Beyond selecting the "right" breeds, they carefully select the right sires within each breed to build genetic merit for PROFITABILITY.

The Angus sires are selected from the top end of ABS' unique and exclusive Circle A Sire Alliance. For more than a decade, ABS Global has been conducting this unique progeny test where Angus sires are compared based upon Real World Data™ that results in a genuine Profit EPD. All factors are considered, including: 1) Calving ease, 2) Pre-weaning performance, 3) Feedlot gain and feed efficiency, and 4) Carcass yield and quality. Tenderness is measured also, though it does not enter the profit equation (yet).

Simmental and SimAngus sires are selected based on data generated in the central Powerline Bull Test Centers as well as designed progeny tests that produce feeder steers that are fed and harvested within the system. We also appreciate and utilize the data generated by the American Simmental Association through its progeny-test-for-profit project at the University of Illinois.

Powerline utilizes a GrowSafe system to measure feed efficiency on a portion of the bulls consigned to the Arapahoe, NE bull development facility. This allows more accurate identification of young sires with potential to move the curve, and also beefs up the genetic evaluation database which, in turn, allows Powerline Multipliers to more effectively stack pedigrees for what matters – money.

Powerline computes EPDs and index values from its own database. Similar to a breed association, each animal in the database is uniquely identified and has a pedigree structure. Weights and measures are compiled in the database similar to the way a breed association would compile such information. The mathematical computation methods used to calculate EPDs are well established. Powerline utilizes these methods just like breed associations do.

Powerline elected to build its own database and compute its own EPDs and indexes to take full advantage of the unique data available through Powerline's centralized bull test centers, and to fully utilize the huge volume of feedlot performance and carcass data that is available through the PG feedlots.

From an economic perspective, what is important to them is
1) how fast will they grow in the feedlot?
2) how much feed is required per pound of gain?
3) what is their optimum finish weight?
4) what is their carcass quality and yield when they reach their optimum finish weight?
These are ECONOMICALLY RELEVANT traits.
Because Powerline has access to data on Economically Relevant Traits such as those cited above, they can compute EPDs that more accurately depict PROFIT differences. That's why they do their own internal genetic evaluation rather than relying entirely on breed association data.

Power genetics have 40 feed yards, with between 7,000 and 50,000 in each. Part of the Anderson family run the Power genetics feedyard in Arapahoe. Power genetics has a contract to supply Cargill with 250,000 cattle a year. In order to control the quality of the cattle coming into the feed yard Powerline Genetics provides the bulls for the commercial cattlemen to use.

They run 7 or 8 bull sales a year including the States as far afield as Utah, Wyoming, Dakota, Alabama and New Mexico. Sales are by video auction, but are also made via private treaty. 1300 bulls are part of the yearly programme. All bulls are tested for feed efficiency; during a 35 day trial 128 bulls at a time can be tested using the Growsafe system. All the usual EPD traits are measured and DNA is checked. Behaviour, soundness and disease are all analysed. One third of the bulls, about 300 are PAP tested in readiness for working at altitude.

Powerline Genetics also lease bulls @ $1,500 for the season. They are reportedly currently working on a project to take stem cells from one bull to inject into other ordinary bulls' testicles to spread the genetics more quickly. They provide sexed semen too. The cost of semen is $20 a straw, $40 for sexed semen.

It is important to match the bull to the cow herd. For the rancher ease of calving is a primary driver whereas down the line carcass traits such as grade and yield are of great importance.

The Benefits of AI (according to ABS)

- ✓ Enhance Reproductive Efficiency

The first 30 days of your calving season are critical to your success. Females that conceive early in the breeding season wean bigger calves, remain in the herd longer and generate more lifetime profit.

- ✓ Cost Savings

With today's bull prices AI is a cost competitive alternative to natural service which can extend your bull power and save you money.

- ✓ Added Genetic Value

AI gives you the ability to incorporate high accuracy, proven genetics into your herd. Choosing high accuracy sires can reliably add value to both your calf crop and for the long term betterment of your cow herd.

Natural Service Costs per Progeny				
Bull Purchase Price	$4,000	$6,000	$8,000	$10,000
15 cows for 3 years	$139.62	$195.40	$251.18	$306.96
20 cows for 3 years	$104.72	$146.55	$188.38	$230.22
25 cows for 3 years	$83.77	$117.24	$150.71	$184.17
30 cows for 3 years	$69.81	$97.70	$125.59	$153.48
Assumes $1,800 salvage value, $1,000 feed, facilities and vet expenses, 95% pregnancy rate, 6% risk and 5% interest rate.				

AI Costs are equal or less than Natural Service				
Synchronisation and AI cost per pregnancy with Fixed Time AI	Pregnancy Rate			
	40%	50%	60%	70%
MGA PG and Fixed Time AI	$83.75	$67.00	$55.83	$47.86
7 Day Co-Synch plus CIDR	$111.25	$89.00	$74.17	$63.57
14 Day CIDR – PG & Fixed Time AI	$105.00	$84.00	$70.00	$60.00
Calculated using IOWA beef centre synchronisation systems planner. Assumes $2.50 cost for prostaglandin and Gnrh, $2.50 for MGA, $11 CIDR cost, $26 combined semen and technician cost.				

6. USDA (United States Department of Agriculture) Clay Centre, Nebraska

The USDA animal research centre in Nebraska has been studying cattle performance since the late 1970's and specifically looking at whether various breed connotations retain heterosis.

They have been studying 9 pure breeds with 100 cows in each breed and 3 composites consisting of 3 variations:-

1. ¾ British, ¼ Continental
2. ¼ Hereford, ¼ Gelbvieh, ¼ Simmental, ¼ Angus
3. Charollais, Black Angus and Limousin

During the breeding up from F1 to F4 Heterosis was maintained during this long term study. The Stabiliser was sold out of the Mark II composite. 50% British & 50% Continental met the specifications while the other versions were either too much British or too much Continental. The Gene Plasma Utilisation programme determined that the Mark II fitted the carcass end-point well, while retaining a good balance of maternal traits. This analysis had taken place prior to the development of EPD's.

In understanding heterosis they saw that composites were more uniform than purebreds – in pure breds the recessive gene segregated and caused noise. Ultimately they concluded that the first cross has maximum heterosis and that a two way cross did not retain as much as a 4 way.

They undertook analysis of the ability to calve at 2 years old and found that in most breeds this was possible and that heifers would produce enough milk.

Even the continental breeds here have been bred up from Angus and a 7/8 Sim would be registered as a pedigree animal.

The Gene Plasma Project is continuing, analysing 18 breeds that have the most influence and are economically the most relevant across the US. The project is measuring cow productivity and carcass traits. All in all about 8,000 cows have participated in this project. At the centre they are able to collect a lot of data across a lot of animals.

Another project being undertaken is measuring feed efficiency in cows, in steers for harvest and in heifers. The challenge in measuring feed efficiency in cows is that measuring what cows eat in confinement does not necessarily correlate with what they eat out at pasture and obviously there

are major differences when they are dry & open as opposed to rearing and pregnant. Major research is now being undertaken to assess these different states.

In lastest research metergenomics is being used. In particular the digestive tract is being analysed. In cattle the ability to understand why some are efficient converters and others inefficient could be hugely powerful – as the influence on the ruminant has a huge influence on the cost of producing that animal. They are using a Gain & Feed quadrant and are looking at animals at the most extreme ends – these are being slaughtered at the Clay Centre and samples are being collected throughout the digestive tract. One of the known factors is the differences in the lining of the rumen between animals which affects absorption rates.

The research centre has its own feedlot too and in addition the centre has access to a huge amount of data from the packing plants.

They research animal health & disease resistance, bio-security, respiratory diseases, vaccination programmes.

Finally the meat science group undertakes research into tenderness and flavour. Camera systems are now being used widely for meat grading and current research is looking at whether tenderness can be evaluated this way too. Research has shown that Belgian Blue/Piedmontese is the most tender, Angus is quite good too followed by Hereford. They are currently trying to quantify differences in flavour.

7. **Sam Rempe, Superior, Nebraska**

Sam Rempe has a degree in Beef Cattle Management from Fort Hays University and has undertaken an internship with LcoC. Sam has a strong working knowledge of breeds, bulls and bloodlines. He also provides custom AI and synchronisation services.

Sam Rempe is currently running 750 cows, increasing to 850 next year. The ranch consists of 4,000 acres of cash crops and 4,000 acres for the cows, a quarter of which is irrigated.
The original base for the cows was Sim/Angus and originally they were 100% red. After meeting Lee Leachman Sam has introduced black genetics as there is a bigger gene pool. While there is an Angus premium for black hides Sam says there are other premiums which are just as important. The Angus brand has done a good job of marketing the breed as a quality product.

Sam calves approx. 200 heifers a year. He markets pairs and some in calf heifers, all by private treaty. They are good commercial cows. A commercial heifer in calf can be sold for $2,000.

Of the best 70 heifers on paper he is feed efficiency testing his favourite half at the CSU in Fort Collins.

He does IVF flushes on young animals and puts embryos into the bottom 25% of cows. He gets a 50% conception rate on IVF. Sam uses experts in IVF based in Iowa.

Sam has 4 different herd groups
A) female cow in herd
B) embryo in, if it doesn't stick then natural service
C) embryo in, no sweeper bull
D) sold at weaning time

Sam is extremely harsh on udder scoring and hence cows can slip into categories B and C. Sam makes mating decisions based on $Profit, making phenotypical adjustments. He uses Embryo transfer and AI extensively. He AI's using synchronisation on the first cycle and heat patches on the 2nd. He uses sweeper Bulls at a rate of 1: 70 cows. He AI's 80% of his cows (60% timed AI).

Sam is an expert AI technician and AI's in the region of 3000 cows within the local region (within 2 hours travelling time) . Sam can AI one cow per minute. Two technicians can do 450 cows a day.

Cows are pregnancy checked at the end of October/November and fed through the winter on corn stalks. Calving begins in February and lasts for 60 days. Calves are weaned at 150 days old.

Calves receive 3 rounds of respiratory vaccine. At 60 days (modified live vaccines for worms, pinks and pasteurella) at pre-conditioning and 2/3 weeks after weaning (modified live vaccine).

Fat cattle grids and premiums are based on your performance versus plant averages . An infrared camera assesses rib- eye size and inter-muscular fat.

We looked at Sam's 2nd generation stabilisers - 70% out of BIG Gene, son of Trinity.

For feedlotting after weaning they use 80% wet distillers from the local ethanol plant and 20% straw. The grass in the 60 acre paddocks is of most value and quantity in August.

Finally we looked at Sam's heifers on a 640 acre section.

Sam's main focus has been on growth. He aims for a 205 day weaning weight of over 50% of the mother's weight. At weaning, 150 days the average weight is 550lbs and by 205 days they will add a further 150-189lbs.

The current mature cow weight is 1350lbs. While Sam is keen to control mature cow weight and is looking for the best feed efficiency cows he will back off this focus if it affects growth rates of calves.

Sam describes intake versus cow size and birthweight versus growth as antagonists and therefore striking the correct balance is essential.

They have a no till policy at the ranch and have some resistant weeds. They have signed up to an Environmental scheme and as such have planted sunflowers as a cover crop. They have other options incorporated. Sam & his Dad look after the cattle side if the business while his Uncle and cousin take care of the arable side.

8. Mushrush Red Angus, Joe, Connie & Daniel Mushrush

The Mushrush family ranch is situated near Strong City, in the Flint Hills of Kansas on the last remnants of the Tallgrass Prairie. The family are farming 27 different pastures, which is inconvenient, but there is lots of competition for land. Of the 14,000 acres being ranched, one third is owned and two thirds are leased. The current cost of leasing is $25 per acre and $2,000 per acre to buy.

The rough topography and limestone ridges make the land unsuitable for cultivation, with hardy grasses surviving on the mineral laden soil. Each year weed and brush, ticks and worms are controlled by burning off the pasture in April & May. Regrowth appears within 2 weeks. The grass is 18% protein in May, June and July, 8% protein in August and September and only 3% by February. The area gets approximately 40 inches of rainfall a year. There is a 90 day season on the grass; the cattle eat it and then move on, just as the buffalo used to.

The US Beef industry is currently heading towards the bottom of its 10 year cycle. Following oversupply and drought in 2011/12 everyone kept too many heifers. Latterly US Beef is said to have

been used as a pawn in US trade negotiations, with Brazilian beef now being allowed into the country (and not requiring a country of origin stamp).

The ranch has 800 pure-bred Red Angus cows, calving 450 in the Spring and 350 in the Autumn. The average mature cow weight is 553kg and the cows are challenged to wean a calf of at least 50% of their cow weight. Many cows are achieving a 205 day weight of 60% of their body weight. Some exceptional 900lb cows are weaning calves weighing 600lb, 75% of their body weight at 205 days. Stocking rate on the ranch is in the region of 1 pair to 8 to 12 acres.

The Mushrush family have a buy-back policy whereby they buy back heifers from their bull customers and feed them on the ranch. They average 500lb in weight – last year they cost $3.40/lb and this year $1.50/lb. Heifers are AI'd and the larger ones are sold in calf. Historically they have been achieving $5,000 a head in calf.

The emphasis is on reducing cow size without the detriment to other EPD's.

Feedlots are reportedly losing money currently. 200 pedigree Red Angus bulls are sold each Autumn. They are all videoed and sold at auction at the ranch. They are available to be viewed at the sale. The Red Angus breed are preferred because they adapt to heat better and as a breed they have stuck to the basics better.

This focus on function and efficiency is a key profit driver in low input systems and is the reason that Mushrush Red Angus genetics are gaining popularity. Combined with a drive for low birth weights

and easy fleshing calves the Mushrush herd is producing functional, maternal cattle that can perform in the extensive and challenging rangeland beef systems of the Central States.

Efficiency is a key focus; anything weaning 40-45% of its weight is usually a cull cow. The breeding philosophy is based on a program, not individuals. Phenotypically, they select for moderate framed, easy fleshing individuals with a lot of natural thickness. The cows calve unassisted in large pastures, raise a calf and maintain their breeding status in the herd all with minimal inputs. Because of this, extra focus is put on Calving Ease, Maintenance Energy, and Stayability EPD's without sacrificing the carcass qualities that so many cattlemen need in today's grid based markets.

Mushrush strive to provide their customers with "all the data all the time" because this produces the most accurately described genetics possible. They diligently record birth weight, weaning weight, yearling weight, and ultra sound data on every animal sold. Additionally, data is collected on all cows at weaning time including, weight, body condition score and feet and udder evaluation. The contemporary groups stay intact until yearling weights are taken in order to accurately describe yearling weight and ultra sound data. Most of the EPD's are now enhanced with Genetic testing.

The family are also testing feed efficiency with the best achieving 4:1. Daniel Mushrush sees feed efficiency increases as an exciting development, "The exciting thing about feed efficiency improvements is that in time we may be able to compete with the white meat industry,"

Red Angus Production Indices

Two Red Angus economic selection indices are available to simplify the task of genetic selection. The Herdmaster index will move a typical commercial herd toward their goal of profitability through retention of their replacement heifers and marketing steers while the Gridmaster will move resultant calf crops towards added value achieved through post weaning performance and premium carcass merit.

Both Herdmaster and Gridmaster are quoted for each bull along with the corresponding percentile rank which describes how each bull's indices compare versus all non-parent Red Angus.

- The purpose of an index is to estimate differences in an operation's overall profitability resulting from a sire-selection decision
- EPD weightings which determine index values are not determined or adjusted using human perceptions, but are completely based on science
- While the process of calculating an index is very complex, the resulting selection tool is very simple to implement
- Red Angus selection indices provide producers with a user friendly yet powerful selection tool built on an unbiased scientific data
- Use the Herdmaster Index if the selected sire will be used to generate replacement females
- Use the Gridmaster Index if you are not retaining replacement heifers from the selected sire

Genomic Testing & EPD Accuracy

At Mushrush every Red Angus Bull has enhanced EPD accuracy due to genomic testing. For many traits genomic testing provides the same amount of data as the bull's first year of natural service calf crop. This is especially valuable for carcass and reproductive traits where phenotypes are measured later in the progeny's life. EPD's will be more accurate (closer to the animal's true genetic merit)

because of genomic testing. Along with enhanced EPD accuracy, parental validation is another benefit of genomic testing with the ability to verify every Sire and Dam.

9. **Gary & Garrett Rolland, Norton, Kansas**

Gary Rolland is a supporter of 'Leachman' genetics. He says that the premiums on Leachman genetics are very helpful in a depressed market. In the 1990's Gary was running a sizeable red Angus herd. At the same time he was working at Fort Hays University and was building up a composite herd there.

The composite herd at the University was disbanded and Gary was able to buy some of the cows. From that point on he has been aggressively building his composite herd using AI to roll the generations as fast as possible. All heifers are retained and the best of the best are AI'd to high $Profit Bulls. They use proven sires which they know make money.

The emphasis for Gary has been on producing a functional female, with every heifer coming back in calf.

In addition Gary has been working with other herds, almost all of which are fed at the Lincoln County feed yard. He reports that those with Leachman genetics average $150-$200 premium over the market.

All the herds that Gary/Garrett have worked with to develop a breeding and management programme are beating the market using stabiliser genetics. With the stabiliser breed you can keep the mature weight down, but keep all carcass traits including ribeye size. Cattle are assessed using ultrasound and when harvested infrared is used to electronically calculate the marbling and ribeye area. By splitting the $Profit calculation into Rancher and Feedlot it has been possible to move every trait forward.

Finished animals are taken to 1400-1500lbs live weight and can be finished to take advantage of the widest possible window. A 1lb improvement in feed efficiency is equivalent to a gain of $80. The versatility of the stabiliser is good too, able to harvest them at a young age with a 64/65% red meat yield.

He reports that it is possible to quickly move the mean on a generational gene pool. I.e. In a generation it is possible to make significant improvements to disposition, calving ease and growth.

While working at the University Sam Rempe was a student. Gary, Garrett and Sam now share Bulls and discuss genetics. Instigator, an excellent maternal bull is used as a sweeper by both Rempe and Rolland.

The main herd has been based on Trinity, Resolution and Big Gene. The black

heifers have been AI'd to Yosemite, due to calving ease and mature weight. Thanks to a good solid AI programme the $Profit of the herd is increasing. To build a maternal cow herd you need to build a breed programme and a management strategy to fit.

Gary calves in April/May. Survivability is good at 99%. They are checked once a day during the calving season, and calves are weighed and tagged. They wean at the beginning of October. Prior to weaning the cows and calves are fed Purina molasses based tubs, containing coalated minerals which boost the immune system and ensures that the vaccine take up is good. After weaning the calves are fed stress tubs, a combination of vitamin and mineral.

The pasture land here in Norton, Kansas is low maintenance country. There is a good balance of grasses, no fertiliser is used and there are not many invasive weeds. In the winter the cows are wintered on milo and corn stalks.

Gary's philosophy is to work as much as possible with nature, calving in April/May makes economic sense.

Your herd should be based on the 3P's
1. Profitable
2. Perpetual
3. Pleasurable

Beef producers are the only independent sector in US, with no direct subsidies. There are programmes which help with capital equipment such as water development or cross fencing.

Gary says, "Lee Leachman is the smartest guy in the cattle industry."

10. **Kit & Tyson Pharo**

Kit Pharo has been breeding composite cattle for over 25 years. He describes his composites as nothing more than a synthetic breed comprised of two or more breeds. The strengths that exist within the breeds are combined to form a new, superior breed. He has trail blazed a philosophy of breeding low input cattle in synch with nature while building a cattle breeding company now running 3,000 cows across ranches in 12 states.

The Pharo composite cattle have been designed to provide the right genetic combination to fit many different environments and production goals. They are 25 to 50% continental breeding (Tarentaise, Simmental and or Gelbvieh), 25-75% Red or Black Angus and 0-25% Hereford. They can be red or black in colour.

The aim of the Pharo cattle company is to produce a 3 and 4 frame cow weighing 1100-1250, compared with the average of 5-7 frame. The cows we saw were generally short and deep and were in the region of 1250lbs. They use AI and the stocking rate is generally 25 acres per pair. Most of Mr. Pharo's 3 frame cows (122.5 cms to hip height) wean more than 50% of their body weight and the very small cows, the 2 frame cows (120-122 cms) wean nearly 60% and do it for 10 to 15 years. He argues that by switching to rotationally grazing smaller cows, a ranch can stock 50% more cattle after a few years.

Rainfall here is 12-14 inches per annum

All heifers are kept in the herd. 15-25% of male calves do not make it as Bulls.

Kit Pharo believes that profit per acre can be substantially increased by replacing tall, high maintenance cows with shorter, low maintenance cows. He believes that producers must think in terms of production and profit per acre instead of per animal. They need to produce cattle that fit their environment instead of artificially changing the environment to fit their cattle.

Cattle are evaluated for disposition, thickness, muscling, masculinity, fleshing ability, hair coat, fly resistance and calving ease.

Cows out winter on the ranch and are generally only fed during blizzard conditions. Cows are generally red as the Red breeds adapt to the heat better.

$maller cows = Bigger Profit$

The emphasis is on a small tough cow, grass fed, fertile, easy calving with good shape, muscling and ribeye.

The Pharo cattle company run 3 Autumn bull sales in Ohio, Nebraska and Colorado. All Bulls are videoed ahead of the sale. They are at the sale in pens, but do not go through the stress of running through a ring. They sell 700-800 Bulls a year

Grass Fed beef - Pharo cattle company report that there has been an annual growth in the grass fed beef sector averaging 25-30% for the last 12 years. Packers and retailers are adding grass fed beef to their offer because customers are demanding it, and are willing to pay a premium for it. Reportedly this is due to negative publicity about confined animal feed operations, and positive publicity about the beneficial nutrients that are increased two to five times in grass fed animals, especially omega 3 fats and conjugated linoleic acid

11. **Dale & Alex Lasater, Lasater Beefmasters, Matheson, Colorado**

The development of the Beefmaster was begun in the early 1930's by Tom Lasater. Tom crossed long bodied stretchy red-eyed Herefords with droopy eared Brahmans (originally from India). He bred Hereford Bulls to Brahman cows and Brahman Bulls to Hereford cows to produce Hereford/Brahman

cattle.

Tom then bought a couple of Shorthorn Bulls and he experimented with various combinations of the three breeds. "As soon as the three-way cross calves hit the ground, we could see that they were far superior to either of the straight crosses." These cattle became the foundation of the Beefmaster breed. The Beefmaster breed has been closed since the purchase of the Shorthorn Bulls" I.e it has been a closed herd in the truest sense for circa 85 years. No fresh genetics, no AI, no embryos.

The breeding was carried out using multiple sires in range conditions and continues in that way today. This ensures survival of the fittest. To remain in the herd a cow must wean a calf each year. If she does not she is immediately culled, even if the cause of death is outside her control. For example lightening. Under the Lasater philosophy a cow whose calf had been killed by a coyote would be culled rather than the coyote shot. The same concept is still being applied to parasites - any animal unduly affected is culled. For example the Lasater's do not use any form of fly deterrent and over time the cattle have become less affected by them. The same too is true of lice.

Tom Lasater believed that a sound breeding programme should select only for six characteristics - disposition, fertility, weight, confirmation, milk production and hardiness.

1. Disposition

Having been raised in identical range conditions, the difference in disposition between individuals is readily apparent during the first several days following weaning. Those with poor dispositions are culled. Thereafter disposition is judged annually.

2.
a) Males. Bulls go into service at around 14 months of age. Breeding is carried on in large, multi-sire herds. The Bulls most capable leave the most inheritance, those least capable leave the least and the infertile leave none.
b) Females. Heifers are bred at 14 months. If she does not breed within 60 days she will be culled.

3. Weight
a) Males : selection for weight is based primarily on weaning weight and post weaning gain. The weaning weight reflects the milking ability of the dam. The post weaning gain reflects the own individuals efficiency.
b) Females. At weaning time light weight heifer calves are culled. Thereafter a cow is not culled on her own weight but for weaning a light calf.

4) Confirmation
Judged as type on the hook and not on the hoof. It is based on carcass yield.

5. Hardiness
Is exemplified by those animals which carry on their relentless production year after year with the minimum of assistance.

6. Milk Production
a) Males - as only bull calves with top weaning weights are considered for the herd as sires, they perpetuate the heavy milking qualities of their dams.

b) Females. Lightweight calves from poor milking dams are culled at weaning. Cows weaning lightweight calves are culled.

Being a closed herd for all this time is in effect a genetic experiment. Even the family expected to find a genetic problem from in breeding, but this has not yet occurred. Dale Lasater believes that in-breeding can be positive and not just negative.

In this region, Matheson Colorado they are stocking at around 30 acres an animal. 45 acres are needed for a cow and calf.

The company have developed a grass fed beef company. Their USP is that the cattle are raised and finished off grass without antibiotics, pesticides, hormones, growth implants, animal by products or steroids. The cattle have never been confined to a feedlot. There is small, but growing concern by consumers of the feedlot policy and especially of growth promoters and antibiotic use.

Dale's one son runs the meat company and his other son Alex now runs the ranch.

12. Running Creek Ranch, Elizabeth, Colorado, Joey Freund

In 1988 the Freund family began breeding Limousin cattle. Their base at that time was both Black & Red Angus cows. Over time they have bred up and now run over 1,000 registered pedigree Lim cows. The cows calf in April.

Joey sells 200 pedigree Lim Bulls a year, at an age of 2 years. All Bulls are guaranteed for the first season. Joey only sells 'virgin' Bulls and offers a bull buy back scheme. Under this scheme Joey buys back Bulls where the purchaser does not want to keep them over the winter. They are fed for one

month and then sent to slaughter. Effectively they are slaughtered before they are 30 months old. They are sold to the American Foods Group on a dressed basis. Bulls yield 63.5% on average. The primary reason for killing Bulls after just one season of work is the risk of a venereal disease called "trichimonais" which can be passed to Bulls by cows and thereafter spread by the bull. This disease is a disaster for cattle producers as it causes abortion in the cows. While there is a test which can be carried out on the Bulls, it is deemed safer to Cull them. For Joey it means he has customers returning year after year.

Bulls are all sold by private treaty, with 3 different prices offered:-
1. They sell 20-25 elite Bulls for seed stock producers
2. Price for commercial cattlemen
3. Volume discounts

Joey has 8-10 customers running 1500-2500 cows and buying up to 15 Bulls at a time. Last year the Bulls averaged $5,500.

Here they place importance on a 'docility' EPD for the North American Lim. They report that there is a direct correlation between docility and carcass quality.

At Running Creek Ranch they are filling a growing demand for Non Hormone Treated Cattle (NHTC). This is one of the requirements of one of his major customers, the meat company Tyson. They want all natural cattle. In addition Joey is part of the "Global Animal Partnership" (GAP). Under this regime the Ranch is audited and all production practices from calving on are verified.

Replacement heifers are home bred. As Joey puts it, "I can raise a better one than I can buy." Cows in the herd are generally between 3 and 8 years of age.

He uses AI on his cows, with 95% of them synchronised, with a 70% success rate. Sweeper Bulls are used for 45 days thereafter. Cows are pregnancy checked after weaning and sold if open. Joey's cows have an average frame score of 5.5 and a post weaning weight of 1350lbs. The focus has been on breeding a cow to this size, which weans a calf of half her body weight. (i.e. 205 days adjusted weight)

The costs of AI -

Home semen - $2.50 per straw
Bought in semen - $20 per straw
AI programme - $65 per cow
Self service - $45 per cow

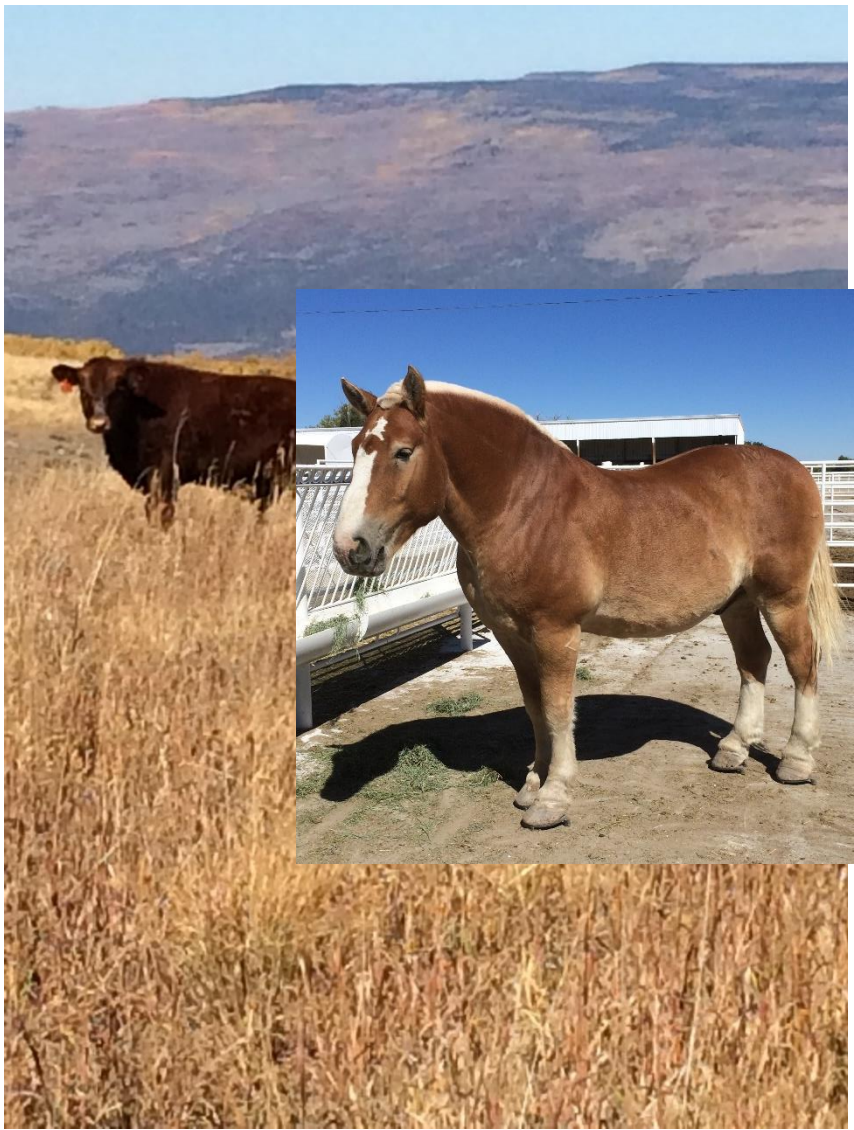
Joey uses the Rocky Mountain stud to collect seed stock from Bulls. Huge expertise and excellent success rates.

Assisted calving is around 10-12% on heifers.

Calves are branded and vaccinated at 60 days. They are weighed at birth and at weaning. After weaning they stay at Running Creek Ranch for 75-90 days before being feedlot reared at Platteville, Colorado. Heifer replacements are dry lotted at home.

Joey has 3 full time staff. He buys all his hay and alfalfa in. He has 7,500 deeded acres and leases a further 15,000 in the summer time.

Although a very modern ranch, with up to date equipment and shelters in each pen the ranch still uses horses. The maximum number of cattle being fed at Running Creek is 1400 cattle. Hay is fed using Belgian horses, raised in Indiana by the Armish. They have two horses on the ranch, one of which is 25 years old. The horses pull a trailer packed with hay, stopping at each bunk for the hay to be unloaded.



13.The Nottingham Ranch, Burns, Colorado

Susan Nottingham runs 1500 cows on 20,000 owned and 20,000 leased acres in the Rocky Mountains, Colorado at circa 10,000 feet.

At this elevation the most important EPD is the PAP score, followed closely by calving ease.

Heifers calve first at the end of February and the cows start calving on 1st March. Calving is complete by mid May.

The ranch has 4,000 irrigated acres, from which enough Hay is made to cover the cattle when snow arrives. If there is no snow it is possible to keep the cows out on grass until February or March when calving begins.

The pastures are irrigated predominantly using 9 centre pivots, including two of the largest pivots in the world (dispensing 2,800 gallon per minute, each covering 640 acres).

Calves are weaned onto the aftermath and are sold at 16 months old at an approximate weight of 900lbs each.

For Susan finding good labour is a major issue. She has 4 full time workers including a Herd manager and a General Manager and hires in temporary help as and when required.

From a Hereford/Angus base Susan has been using Leachman stabiliser genetics and will by 2017 be using 100% stabiliser Bulls. She puts her complete trust in Lee Leachman to select the most appropriate high altitude bulls for her cows. Cows are AI'd and sweeper bulls used for 45 days.

Since using PAP tested Bulls the incidence of brisket disease has reduced significantly. She has a share in High Country, which has a PAP score of 39 and is better than the Top 1% for $Ranch, $Feeder and $Profit.

14.Bill Trampe, Trampe Ranches, Crested Bute, Gunnison

In total farming 850 cows, 500 of which graze owned pastures and government lands around Crested Butte, near Gunnison, Colorado. The original base for the herd was Hereford.

Crested Butte is a major ski area and in the summer has become a major playground for mountain bikers, horse riders, walkers and off-roasters, as well as hunters in the fall. While federal lands are quite cheap to rent Bill has to maintain all the fences and water systems and to deal with the many adverse effects of the ever increasing recreation use of the area.

Heifers calve from 15th March (with 72% calving down in the first 21 days) and cows in April at the home ranch near Gunnison. In May/June they are brought to the valley bottom owned grounds in Crested Butte. They remain on the owned lands until after a 45 day breeding opportunity, mainly using natural service using Leachman genetics, but Bill is not a co-operator at the moment.

Bill has been using Leachman genetics since the 1990's. Any Bulls bought must have a low PAP score and by this time many of the Bulls being used by Bill come from Bill's elite herd because of the height.

This year Bill has used a Leachman bull named 18 carat, a high production bull with a PAP score of 39 at Fort Collins (6,000 ft) and a score of 42 at Crested Butte, in excess of 10,000 ft.

The cows bred by Bill all have a low PAP score. Over 4 years Bill has tested 50-60 of his own retained Bulls and they all have a low PAP score too. Bulls are used at a rate of 1:25 cows.

Bill has 4 blocks of land, between the low and high country.

This year Bill has retained 260 red stabiliser heifers. This year they have been bred to black stabiliser Bulls, heifers are exposed for 30 days only, any not in calf will be sold. The black gene pool is far bigger than red from which to choose.

Bill sells some in-calf heifers at a Leachman bull sale at Grand Junction, Colorado. Two years ago heifers averaged $3,500, while the price had dropped to $2,500 last year.

Calves are weaned in late October and taken home to Gunnison to the re-growth. They weigh 550-575lbs at weaning. They spend one month on grass (growing at 2lb per day) and then move to the corral to get used to feeding from bunks, using water troughs. Here they are given high energy corn cake, gaining 1-1.5lbs a day.

Bill partners with the feedlots he uses and 675lb steers are sent at the turn of the year, while the 600lb steers at the turn of the year are sent one month later.

Three years ago finished cattle were averaging $2,300, circa $2.20/lb, last year $1,850 and currently running at $1,140, circa $1.20/lb.

Over the years Bill has worked with the Colorado State University to develop his breed genetics. He believes that the calves born now, with their growth rates are at the upper end of what their heart and lungs are able to cope with.

Bill's Dad had links to the CSU back in the 1920's and Bill attended there in the 1960's becoming the top Ag student. Unfortunately his Dad died and he left his studies to help his Mum on the ranch.

However Bill retained links with the University and if he had a problem with his cattle he went back to the University to help solve it. They have been hugely helpful in brisket research aligned with altitude.

An English graduate has also been invaluable. He stayed at the Trampe Ranch while he undertook a Masters Degree and PhD. He researched reasons for the death of cattle, analysing metabolic (e.g. Acidosis) versus Infectious causes (pneumonia/pasteurella).

As a result calves are vaccinated 3 times before they are six months old for pasteurella.

In Bill's words, "Progressive ranchers go back to the Universities for help."

Each year Bill will keep his best 10 Bulls for breeding.

The key to bull selection for Bill is,
1. PAP
2. Max birth weight of the calf must be less than 85lbs (but not so small they have no vigour)
3. $Profit

Bill has also focused on reducing his cow size while maintaining his weaning weights. From a weaned cow weight of 1600lbs Bill is now achieving 1250-1300lbs.

Bill has 5 full time employees, all Mexican.

Summary

Our sincere thanks go to everyone who has given up their time to spend with us and especially for allowing us to intrude on their lives. We have met some truly inspirational people who clearly understand their key business and profit drivers. In each case the businesses were critically aware of what they wanted to achieve and how to get there.

Special thanks too to Ursula Taylor of BIG Ltd in the UK and Ryan Peterson of LCoC for organising some of our visits. Thanks too go to Richard Tudor, Llysun for his advice and contacts.

Lessons Learned to be applied back home in Wales

- Use cross-breeding and multiple breeding to combine the most beneficial cattle traits from all breeds
- Focus on maternal traits to build your herd – disposition, calving ease and growth
- Use AI to speed up the process and use the best bulls in the industry
- Record data to ensure that your breeding programme is going to plan
- Maintain a zero tolerance policy for animals which do not perform to your strategy
- Understand the effects of EPD's on Profitability or trust indices
- Evaluate profit per acre and not just profit per animal

Remember Gary Rolland's 3 P philosophy. Cattle production should be **Profitable, Perpetual and Pleasurable.**

Lessons for Other Agencies

- Universities and research centres which focus on beef production and their collaboration with farmers is hugely beneficial for the industry as a whole
- The EUROP grid in the UK does not evaluate quality or lead producers in the UK to produce what the customer wants
- Education is important – specific courses in Beef Management and Production Systems

With Sadness

We have heard that Dale Lasater has died tragically in a horse accident on his ranch, just three weeks after our visit. A real gentleman, our thoughts are with his family.







GROWTH
FFICIENCY
CARCASS



Thank You All, Thank you HCC!