In the last 25 years improvements in animal agriculture for efficiency…

POULTRY 250% HOGS 80% CATTLE 20%

- UNDERSTANDABLE: CATTLE WEIGHTS ARE OFTEN USED TO RECOGNIZE THE VALUE OF OUR CATTLE
  - VALUE DOESN'T TELL YOU IF IT WAS PROFITABLE OR SUSTAINABLE
  - CONSIDERING REDUCING INPUTS OR AT LEAST RECOGNIZING INPUT COSTS IS IMPORTANT
  - NEED TO LOOK BEYOND PRODUCTION/COW. PRODUCTION/LAND UNIT

  - CHALLENGE: THE IMPORTANCE OF MATERNAL EFFICIENCY
    - FERTILITY, LONGEVITY, CALVING EASE, UDDER QUALITY, FEET & LEGS, AND FEED & PASTURE UTILIZATION
    - REBALANCING GENETIC PRIORITIES

    - EFFICIENCY- "WAY TO DETERMINE AN EFFECTIVE OPERATION AS MEASURED BY A COMPARISON OF PRODUCTION VALUE WITH COSTS"

THE PRIMARY REASON WE EXIST AS RANCHERS, OUR SWEET SPOT, WHAT KEEPS US RELEVANT…

- THE ABILITY OF CATTLE, BEING RUMINANTS TO CONVERT GRASS AND ROUGHAGES TO A HIGHLY NUTRITIOUS PROTEIN DENSE PRODUCT
- IT IS WELL UNDERSTOOD THAT WE SELL OUR GRASSES AND ROUGHAGES THROUGH THE PRODUCTION OF CATTLE.
- WITH CATTLE WE CAN CONVERT GRASSES AND ROUGHAGES, WHICH HAVE NO HUMAN VALUE TO THE DIET, TO A HIGHLY, NUTRITIOUS DENSE PROTEIN PRODUCT, LOADED WITH ESSENTIAL AMINO ACIDS

- OUTSIDE OF LAND MAINTENANCE COSTS OF THE COWHERD ARE THE LARGEST COST OF BEEF PRODUCTION
- 70 % OF OUR ANNUAL COSTS ARE FOR FEED AND PASTURE
- 70% OF FEED CONSUMED FROM BIRTH TO SLAUGHTER IS FOR MAINTENANCE
- UP TO 75% OF THE TOTAL COST OF BEEF CATTLE PRODUCTION IS FEED (BASARAB, 2002)

MAINTENANCE COSTS ARE HUGE PART OF CATTLE/BEEF PRODUCTION

UNTIL NOW, LITTLE DATA HAS BEEN COLLECTED ON THE BREEDING HERD, WHICH CONSUMES ABOUT 70% OF THE FEED UTILIZED THROUGHOUT ALL BEEF PRODUCTION SYSTEMS.

North Florida Research and Education System

TRADITIONAL FEED EFFICIENCY INDICATORS

ADG-AVERAGE DAILY GAIN

F:G – FEED TO GAIN

DMI- DRY MATTER INTAKE

ME-METABOLIC ENERGY

$EN-DOLLAR ENERGY

FRAME SIZE

BODY FAT – BODY CONDITION

THEY ALL HAVE SOME VALUE BUT NEED TO BE WEIGHTED DIFFERENTLY IN HOW YOU USE THEM.

While ADG & F:G have great value in the feedlot, but they both tend to increase frame size and feed costs in the cowherd. This is compounded when breeder's fail to emphasize maturity and mature size in their selection discipline.

DMI: doesn't tell you whether an animal is efficient in relationship to input cost vs output values. But when tied to production (weaning weight, body weight, yearling weight) it is important.
Intake is related to appetite and we need cows that can actively forage.

Frame Size: often considered "low maintenance" but don't confuse low maintenance with efficiency

Body Fat: While Body Condition is important, just because she's fat doesn't mean she is efficient. Often time's those heavily conditioned cows are your most inefficient as they are putting more into themselves and less into their calf.

$EN & ME: Basically these are trait associated values. If a cow has good weaning weight then it is assumed she eats more so she will have a poorer $EN (negative). Problem is it doesn't account for genetic variation in DMI and it doesn't' compare to actual input costs against production values (weaning wt).

When it first came out a lot of our top producing cows had the poorest $EN.

RFI Index

RFI (Residual Feed Intake)

- RFI = the measure of feed intake headed for maintenance and production
  - The difference between actual intake and predicted intake based on animal's gain, body weight, and composition.

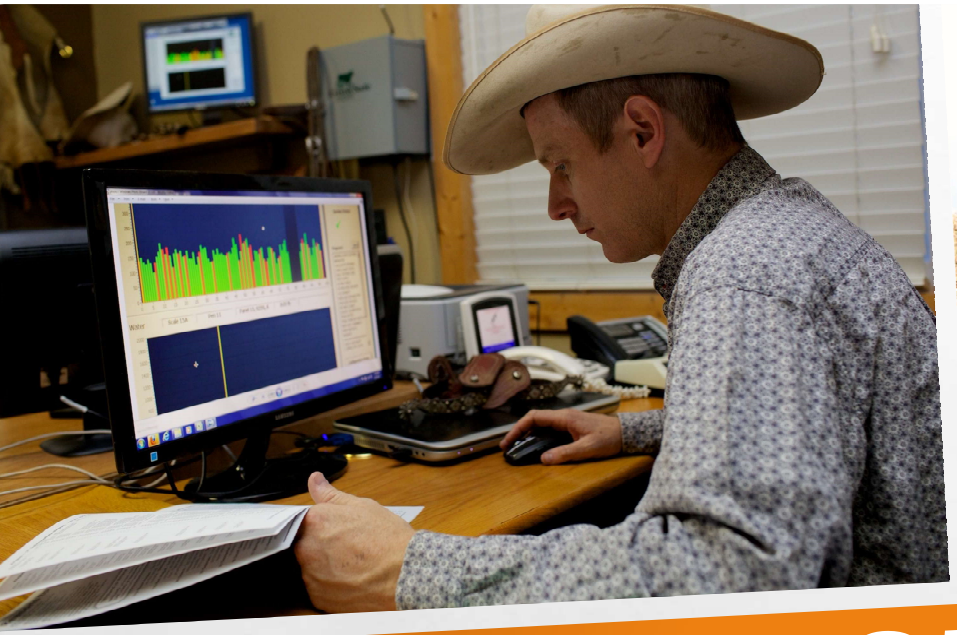
- RFI = a calculation of true feed utilization indexed within that group
  - A negative number (-1.5 lbs/day) is more efficient than a positive number (+1.0 lbs/day) when balanced with production and the amount of feed needed to satisfy both production and maintenance requirements.

- RFI is not a stand alone efficiency indicator. It needs to be balanced with production traits. RFI allows you to look at a large group of bulls of various weights, gain & feed conversion and find your most efficient animal

BENEFITS OPPORTUNITIES & VALUES OF RFI

- 38-40% heritable
- 90% correlation between how a tested bull does & how his daughter will perform
- Independent trait with no correlation (negative or positive) to other traits such as fertility, milkability, performance, frame size, body condition, carcass, etc.
  - You can select for RFI without having a negative impact on other economically important traits.
- Efficiency benefits are found in both the cowherd and the feedlot
- Potential to improve efficiency by at least 20-25%
- Economic sustainability – with at least 70% of the feed and pasture consumed going towards maintenance the benefit here is extremely valuable
- Never been selected for so you can make rapid improvement
- Allows one to reduce intake without effecting production
- Costs no more to select for than traditional genetics

Improvement's in feed and forage efficiency by RFI is especially critical when the cost of feed resources continues to increase, the availability of forages continues to decrease, and the concern for the cattle industry's environmental impact at its highest.



WHY GROWSAFE AND RFI??

Feedlot studies have demonstrated that a 10% improvement in average daily gain improved profitability by 18%; whereas, a 10% improvement in feed efficiency returned a 43% increase in profits. (Fox, et,al. 2001)


For the first time in recent years we have a tool that is about the cow and cowherd.
• Better utilization of grass & feed
• More drought resistant females
• Improved Nutrition Utilization
A better way to select for improved efficiency in the feedlot that will improve cow efficiency.

WHAT DOES THE RESEARCH SAY?

Young bulls tested for feed intake and RFI will have a genetic correlation of .90 for the same genetic improvement in the daughters retained for in-herd use.

Australia & Canada

Dr. Basarab in 2003 found that there was as much as an 8 lb difference in feed consumed per day for steers that gained & weighed similar. This 8 lb difference in feed intake would amount to half a ton of feed ($150/ton) in a 120 day feeding period.

Plenty of research shows considerable variation in feed intake above and below that which is expected or predicted on the basis of size and growth rate.

In Australia, at four years of age, 284 4 -year old cows that had been feed intake tested and RFI ranked as calves after weaning were measured /retested for intake after their calves were weaned that year.

RESULTS: no difference in body weight of cows, rib fat, or weaning weight of calves. Females that were more efficient as weaned calves, required less feed as mature cows.

DAN SHIKE – UNIVERSITY OF ILLINIOS

- "The relationship between heifer intake and cow intake is encouraging" – heifers that are more efficient based off of RFI will consume less dry matter than cows, with no difference in cow or calf performance or reproduction.
- June 19, 2014 (Beef Improvement Federation Symposium) Shike admitted little progress has been made on beef cow efficiency because the industry has focused increasing output, with increased input requirements as a consequence. Feed intake of a developing heifer is a likely indicator of her intake requirement as a mature cow.

A STUDY EVALUATING GROUPS OF HEIFERS FOR RFI, RESIDUAL BODY WEIGHT GAIN, AND ONLY DRY MATTER INTAKE (from their development period through breeding and delivery of their first calves, and up until the heifers in each group were bred for a second time.

- "Heifers with a favorable RFI (eating less than expected) also ate less as cows, with no significant differences in mature size, reproductive performance, or calf performance."
- Heifers exhibiting low intake during development weighed less at 2 years of age and their feed intake remained lower. There were no differences in rebreeding rates between low and high – intake heifers as 2 - year olds.

CARSTONS & TEAM
TEXAS A&M

Females with low RFI as heifers consumed 17% less (P<0.01) forage compared to females with high RFI as heifers but maintained the same BW, BW gain, and body composition.

RFI classification did not affect calving date.

Heifers identified as having low post-weaning RFI have greater efficiency of forage utilization as pregnant females, with minimum impact on growth, body composition, calving date, and calf birth BW- compared to their high RFI counterparts.

LACOMBE RESEARCH CENTER, CANADA

Confirmed the moderate to strong repeatability of RFI over different stages on the animal life. Replacement heifers identified as –RFI and +RFI when they were 8-12 months of age, were also –RFI and +RFI when measured again as 4-7 year olds.

2010 DR MONTY KERLEY
UNIVERSITY OF MISSOURI

Intake among calves similar in body weight and daily gain will vary by 40%

- Contrasting the 1/3 most efficient against the 1/3 least efficient calves can reduce feed costs 20% or more.
- The 1/3 most efficient cows consumed 20% less forage when nonlactating and 12% less forage when milking compared to the 1/3 least efficient cows.
- IMPACT OF EFFICIENCY HAS ALWAYS BEEN IMPORTANT BUT NOW MORE THAN EVER

Body Condition Score was also similar between efficiency groups

- Intake by efficient cows was 27 lbs per day and by inefficient cows was 34 lbs per day.
- Intake by efficient cows 21% lower than by inefficient cows.
- These data agreed with other research that reported a reduced forage intake by negative RFI cows.

Few management techniques can be offered to beef producers that yield 10-15% improvement in production efficiency.

By stacking generations selected for RFI improvement, greater than 20% in production efficiency can be achieved!

UNIVERSITY OF ARIZONA REPORTED

Measuring forage intake on cows that have survived under Arizona range conditions at the UA V-V Ranch.

- Low RFI cows consumed hay at 1.9% of body weight
- High RFI cows consumed hay at 2.4% of body weight

This is a field study of only 40 cows but suggests that RFI may be useful in selecting cows that survive under arid range conditions.

UNIVERSITY OF UTAH - 2010

- The largest impact for ranchers when using RFI values in a selection program is reduced feed costs.

- It has been demonstrated that low RFI value sires & dams are more likely to produce low RFI progeny.

This links back to how heritable the trait is.

MORE RESEARCH…

- Cows at the Bair Ranch measured for RFI as calves, showed the same efficiency as producing cows with a 30% variance in feed intake as first and second calvers.

- Accounting for today's costs that's a $50 (or more today) difference in wintering costs alone.

(Paterson, MSU)

West Virginia University:

- Studied steers from a low RFI sire and from a high RFI sire and measured intake through the summer.
- This summer saw a drought develop, and as the drought got stronger the negative RFI steers excelled even more.

NO SURPRISE – the cattle who metabolize their feed better will excel on limited feed and pasture conditions.

Tested as heifer calves then retested as 3 year olds after they had their 2nd calf.

Individual heifer RFI Values ranged from -4.5 lb/d (most efficient) to 4.1 lb/d (least efficient) and individual cow RFI values ranged from -7.51 lb/d (most efficient to 11.8 lb/d weights (BW), BCS and ADG.

However, those which were most efficient (Low) consumed 3 lb/d less than those which were intermediate (Medium) and 4.9 lb/d less than the least efficient (High) heifers.

When cow performance was assessed based on heifer feed efficiency rank, cows which were most efficient as heifers had significantly lower DMI than their counterparts and consumed 2.6 or 2.8 lb/d less than cows that were Medium and High heifers.

Interestingly, DMI was the only parameter that differed between groups, and the most efficient heifers subsequently became cows that were phenotypically similar, but consumed less feed than cows that were considered less efficient as heifers. There was also no difference in days to first ovulation.

North Florida Research Center

FORAGE UTILIZATION

In non-lactating beef cows fed a forage-based diet, the most efficient cows (top third) consumed about 20% less forage than the least efficient cows (bottom third: Table below). Therefore, small increases in efficiency may lead to a large improvement in cowherd maintenance when forage is limited. Therefore, selection of replacement heifers based on efficiency could assist in the reduction of maintenance costs of the cowherd.

Average Dry Matter intake (DMI) from forage by cows with low and high residual feed intake

Variable	Low RFI	High RFI	
DMI, lbs /day			
Experiment 1	27.28	34.32	26 % more
Experiment 2	27.50	31.05	13% more

(RFI: adapted from Meyer et. al. 2008)

Research in Alberta and Australia shows that selection for low RFI can have significant results

- **Lower maintenance requirements of the cow herd by 9-10%**
- **Reduce feed intake by 10-12%**
- **Have no effect on average daily gain or mature size**
- **Improve feed conversion ratio by 9-15%**
- **Slow gain in empty body fat by 4% cent, but still grade A, AA, or AAA**
- **Lower weights of liver, stomach and intestines**
- **Have no effect on distribution of 9 wholesale cuts**
- **Improve calf-weight-per-cow feed intake by 15%**
- **Lower methane emissions by 25-30%**
- **Reduce manure nitrogen, phosphorus and potassium production by 15-17%**
- **Effici9ent growing animals are efficient as adult cattle**
- **Progeny of efficient beef cattle are also more efficient than those of less efficient cattle.**

Canada

2019 STEERS AT SIMPLOT

188 STEERS

Breed_Description	Sire		Dam's age	Arrival weight	Calf Value $$	GS Start Weight	End Weight	Total Gain	Average Day Gain	Average Daily Int	DMI EPD		Feed Conv. Lbs	RFI	COG $	Feed Cost $$
angus	31	ML		678.9	1045	932	1571	893	4.4	23.84	0.24		5.4	-0.5292	0.74	661
Simm	59			673.75	1038	921	1523	853	4.2	25.87			6.16	0.5166	0.85	725
Angus	102	TC 8107		661.7	1032	915	1545	883	4.35	25.53			5.88	0.1002	0.81	715
Angus	108	Perf 401		667.1	1034	894	1513	846	4.17	27.49	0.44		6.61	1.0138	0.91	770
Simm	162			622	983	909	1496	875	4.31	24.31			5.68	-0.2713	0.78	683
Angus	16230	Com		625	988	860	1457	832	4.1	25.21			6.16	0.3284	0.85	707
Angus	16233	Com		650	1014	852	1471	821	4.04	25.42			6.32	0.7358	0.87	714
Leo/MJB	24c	MJB McD 24C	1st Calver's	619	978	873	1433	814	4.01	21.96	-0.3		5.47	-1.0197	0.75	611
Leo's	Cap	AV Capitalist	1st Calver's	655.5	1023	951	1520	865	4.26	21.71	1.21		5.11	-1.2554	0.7	606
Leo's	Com	Blevins Comm	1st Calver's	605.6	969	868	1420	815	4.01	20.81	-0.18		5.23	-1.5822	0.72	587
Angus d	FV35	FV		662.8	1027	900	1490	827	4.08	25.61	0.01		6.3	0.4925	0.87	719
Angus	L7334	L7		663	1028	921	1554	891	4.39	25.68			5.87	0.1052	0.81	722
Angus	L7352	L7		672.5	1036	957	1580	907	4.47	27.75			6.21	0.9046	0.86	780
Angus	ox20	oxb		641.9	1001	863	1479	837	4.13	26.4			6.41	0.9157	0.88	737
Angus	OX45	oxb		651	1016	884	1487	836	4.12	23.94			5.83	-0.165	0.8	669
Angus	U	Uson		664.2	1030	903	1529	865	4.26	24.52	0.6		5.79	-0.432	0.8	692

2019 SIMPLOT STEERS

PROFIT

Arrival Weight	Calve price/lb	Calf Value $$	GS Start Weight	End Weight	Fed price/lb	Sale Value	Total Gain	Average Day Gain	Ave Daily Intake lbs	DMI EPD		Feed Conv. Lbs	RFI	COG $	Feed Cost $$		Net $$$
678.9	1.54	1045	932	1571	1.17	1838	893	4.40	23.84	0.24		5.40	-0.5292	0.74	661		131
673.75	1.54	1038	921	1523	1.17	1782	853	4.20	25.87			6.16	0.5166	0.85	725		19
661.7	1.56	1032	915	1545	1.17	1808	883	4.35	25.53			5.88	0.1002	0.81	715		60
667.1	1.55	1034	894	1513	1.17	1771	846	4.17	27.49	0.44		6.61	1.0138	0.91	770		-33
622	1.58	983	909	1496	1.17	1750	875	4.31	24.31			5.68	-0.2713	0.78	683		85
625	1.58	988	860	1457	1.17	1705	832	4.10	25.21			6.16	0.3284	0.85	707		10
650	1.56	1014	852	1471	1.17	1721	821	4.04	25.42			6.32	0.7358	0.87	714		-7
619	1.58	978	873	1433	1.17	1677	814	4.01	21.96	-0.30		5.47	-1.0197	0.75	611		88
655.5	1.56	1023	951	1520	1.17	1778	865	4.26	21.71	1.21		5.11	-1.2554	0.70	606		150
605.6	1.6	969	868	1420	1.17	1661	815	4.01	20.81	-0.18		5.23	-1.5822	0.72	587		105
662.8	1.55	1027	900	1490	1.17	1743	827	4.08	25.61	0.01		6.30	0.4925	0.87	719		-4
663	1.55	1028	921	1554	1.17	1818	891	4.39	25.68			5.87	0.1052	0.81	722		68
672.5	1.54	1036	957	1580	1.17	1849	907	4.47	27.75			6.21	0.9046	0.86	780		33
641.9	1.56	1001	863	1479	1.17	1730	837	4.13	26.40			6.41	0.9157	0.88	737		-7
651	1.56	1016	884	1487	1.17	1740	836	4.12	23.94			5.83	-0.1650	0.80	669		55
664.2	1.55	1030	903	1529	1.17	1789	865	4.26	24.52	0.60		5.79	-0.4320	0.80	692		67

SELECTING FOR GROWTH OR FEED EFFICIENCY

ANGUS NON PARENT

AVG WW EPD	SELECT FOR									
+ 54	+70 (TOP 6% OF BREED)	EXPECTED IMPROVEMENT	16 LB	X	.4 HERITABILITY	= 6.4 LBS	X	$1.50	=	$9.60

AVG YW EPD	SELECT FOR									
+92	+ 110	EXPECTED IMPROVEMENT	18 LB	X	.4 HERITABILITY	= 7.2 LBS	X	$1.25	=	$9.00

10% IMPROVEMENT EFFICIENCY IN COW ($500 FOR FEED AND PASTURE)	$50.00
10% IMPROVEMENT IN FEEDLOT - PUT ON 800 LBS AT 70 CENTS COG =	$56.00
10% IMPROVEMENT IN YEARLING ON GRASS [285 LB X $0.45 COG] =	$10.00
10% IMPROVEMENT IN WINTERING CALVES [200 DAY X $1.30/DAY] =	$26.00

With RFI you can do BOTH

DETERMINING THE VALUE OF A BULL- ASSUMING 4 YEARS BREEDING – 100 CALVES; OF WHICH 20 ARE KEPT FOR REPLACEMENTS

Add 10 lbs weaning weight	80 market calves x 10 lbs = $1200
Add 20 lbs yearling weight	80 market calves x 20 lbs x $1.25 = $2,000
Add 10% Efficiency in 20 Replacements for 7 years:	$50/year x 20 x7 = $7000
Add 10% Efficiency 80 calves for backgrounding and grass:	$36 x 80 = $2880
Add 10% Efficiency 80 calves to finish	$56 x 80 = $4480

Assuming you're already selecting for maternal traits including longevity, stayability, & fertility, etc.

Assuming your selecting for reasonable birth weights and carcass traits.

100% OF THE GENETICS YOU INTRODUCE INTO YOUR HERD COME FROM BULLS YOU USE

Can you tell which bull offers you over $17,000 more in progeny value?

Bull A: ADG: 3.47 Dry Matter Intake 28.73 lbs/day
Feed to Gain Ratio 8.28 lbs of feed/lb of gain RFI 3.90

Bull B: ADG: 3.26 Dry Matter Intake 22.45 lbs/day
Feed to Gain Ratio 6.90 lbs of feed/lb of gain RFI -2.77
21% less feed for the same production.

There are a lot of folks claiming to have efficient cattle.
But, we all know you can't select for a trait if you don't actually measure it.

For Example . . .

Bulls A & B were both tested at Midland and both came off the efficiency test at 1,100 lbs. Bull B is eating 6.28 less feed per day on a dry matter basis.

That's an $80-$120/head savings in the feedlot and $60-$80/year savings on daughters retained in the cow herd without impacting any weights of their calves.

Here's the math, figuring 3 calf crops:

45 steers & 15 heifers to the feedlot x $80/head	=	$4,800
30 heifers retained in the herd x 7 years x $60/head/year	=	$12,600
Total Value	=	$17,000

(and that's the low side)