"Staying Current to Stay in Business"

Celebrating the 65th Annual

Proceedings

May 4 - 6, 2016

Department of Animal Sciences

Alto and Patricia Straughn IFAS Extension Development Center
Gainesville, Florida

UF UNIVERSITY of FLORIDA
IFAS Extension

UF UNIVERSITY of FLORIDA
IFAS
Department of Animal Sciences

2250 Shealy Drive
PO Box 110910
Gainesville, Florida 32611
352-392-1916
352-392-9059 (Fax)

Welcome to the 2016 Florida Beef Cattle Short Course:

The 2016 Florida Beef Cattle Short Course Program Committee and the Department of Animal Sciences would like to welcome you to this year's Short Course. We look forward to this week every year in anticipation of delivering the premier educational event for serious beef cattle producers in the Southeast. We hope that you enjoy the program and take away some new knowledge about the beef cattle industry's future direction, additional management decision making skills, and new information about specific production and management practices that impact your beef cattle enterprise.

Planning for the Florida Beef Cattle Short Course is a year-round event. Shortly after every Short Course we review the survey comments from those participants that return them to us. The surveys are one of our key mechanisms to get your feedback about the quality and content of the Florida Beef Cattle Short Course. We appreciate the feedback that we get and would welcome all of our participants to return the surveys and voice their opinion. Late in the summer we begin evaluating subject areas and specific topics for the next year's Florida Beef Cattle Short Course. Our program committee works hard to identify important, timely topics that impact our beef cattle producers. We then work through the fall to identify the best speaker for that topic area and invite them to speak at the Florida Beef Cattle Short Course. We are privileged to get nationally recognized individuals to speak at the Florida Beef Cattle Short Course and appreciate the limited time they have in their schedules. Our excellent speakers come from both out of the state and within UF/IFAS. Our UF/IFAS speakers are a valuable resource, with Florida specific experience and an investment in the Florida beef industry. Likewise partnering with our valuable Allied Industry partners we work to bring you a viable and diverse Tradeshow to share industry and product specific information.

Gainesville has been the home of the Florida Beef Cattle Short Course for the past 64 years. Survey responses consistently indicate that our participants prefer the Florida Beef Cattle Short Course to stay in Gainesville. Remaining in Gainesville offers certain advantages for us to deliver the excellent program that you have come to expect. We hope the Alto and Patricia Straughn Extension Professional Development Center location provides a comfortable and professional location, allowing us to provide a cost-effective, valuable learning experience for you.

The Program Committee has worked hard over the years to deliver a premier program at a reasonable cost to our participants. The Florida Beef Cattle Short Course is a self-sustaining program and receives no direct financial support from the UF/IFAS Department of Animal Sciences or UF/IFAS Extension. In as much, the Florida Beef Cattle Short Course has to meet costs associated with speakers' expense, meeting space, refreshment breaks, and material costs. Unfortunately, we have to pass those increased costs on to our participants. Just like the beef cattle industry, our costs of operation continue to increase in all facets.

Thank you for choosing to attend the 2016 Florida Beef Cattle Short Course. We hope that the program meets your expectations and provides you with valuable information to impact your beef cattle enterprise.

Best Regards,

Matt Hersom

Chair, 2016 Florida Beef Cattle Short Course

Florida Beef Cattle Short Course
UF

65th Annual Florida Beef Cattle Short Course

May 4 – 6, 2016

Presented by

Department of Animal Sciences

Institute of Food and Agricultural Sciences

University of Florida, Gainesville, Florida

2016 Florida Beef Short Course Committee

Matt Hersom, Chair
Chad Carr
Max Irsik
Joel McQuagge
Todd Thrift
Jerry Wasdin

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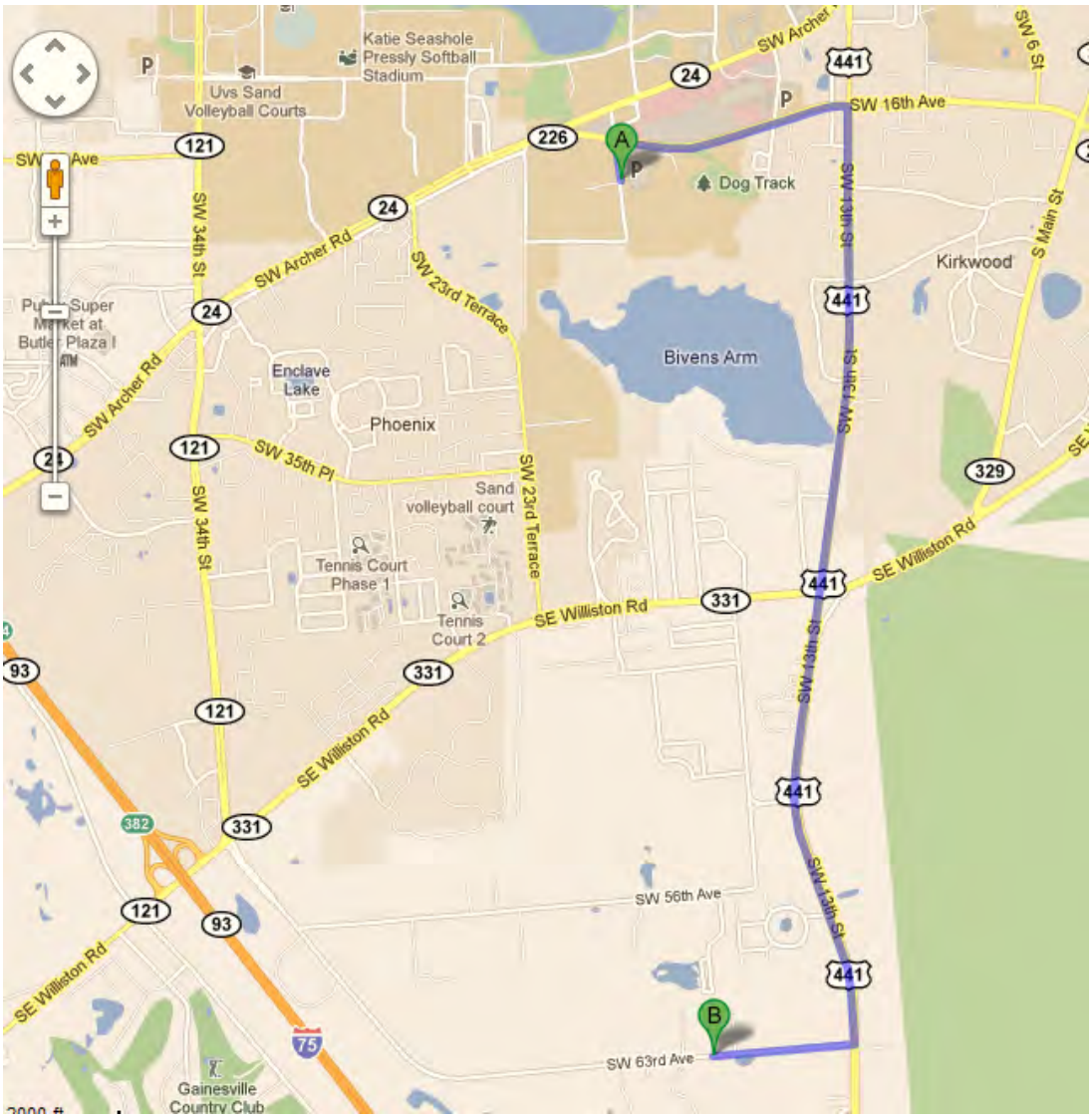
Florida Beef Cattle Short Course
UF

Directions

From the Alto and Patricia Straughn IFAS Extension Professional Development Center

2142 Shealy Drive Gainesville, Florida 32611

to the UF Horse Teaching Unit



- **Head north on Shealy Dr. to SW 16th Ave. (0.1mi)**
- **Turn right onto SW 16th Ave/Florida 24A. (0.7 mi)**
- **Turn right onto US – 441 S/SW 13th St. (2.9 mi)**
- **Turn right onto SW 63rd Ave. (0.4 mi)**

(Destination will be on the right).

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Please visit our webpage-page @ http://animal.ifas.ufl.edu/beef_extension/index.shtml

Allied Industry Trade Show

UF/IFAS Horse Teaching Unit

May 4-6, 2016

Exhibitors and Sponsors

Welcome!

EXHIBITOR
Adams Ranch, Inc.
Zachary Adams
PO Box 12909
Fort Pierce, Florida 34972
Telephone: 772-461-6321
Email: deonnaadamsranch@gmail.com

EXHIBITOR
AgriLabs, LTD.
Dana Ankerstar
2652 Datura Street
Sarasota, Florida 34239
Telephone: 941-928-1820
Email: dankerstar@agrilabs.com

SPONSOR & EXHIBITOR
Alltech
Brent Lawrence
350 Davenport Drive
Thomasville, Georgia 31792
Telephone: 229-225-1212
Email: blawerence@alltech.com

EXHIBITOR
Animal Health International
Richard Hopper
5875 SW 6th Pl
Ocala, Florida 34474
Telephone: 407-709-9712
Email: richard.hopper@animalhealthinternational.com

EXHIBITOR
Boehringer Ingelheim
Caroline Feagle
6370 NW 52nd Court
Chiefland, Florida 32626
Telephone: 352-895-0350
Email: caroline.feagle@boehringer-ingelheim.com

EXHIBITOR
Carden & Associates, Inc.
Fred Simons
60 Fourth Street SW
Winter Haven, Florida 33880
Telephone: 863-291-3505
Email: fsimons@cardeninsurance.com

EXHIBITOR
Cargill Animal Nutrition
Frank Dola
6730 SE 135th Avenue
Morriston, Florida 32668
Email: Pete_Dola@cargill.com

EXHIBITOR
Central States Enterprises, LLC
Tim Heatherman
PO Box 2331
Lake City, Florida 32056
Telephone: 386-755-7443
Email: tim@cse-lc.com

EXHIBITOR
Chipola Cattle Equipment and Consulting
3519 Caverns Road
Marianna, Florida 32446
Telephone: 850-209-2690
Email: amajr@ufl.edu

EXHIBITOR
Datamars
Chad Johnson
PO Box 1088
Chiefland, Florida 32644
Telephone: 352-535-5320
Email: chad.johnson@datamars.comm

SPONSOR & EXHIBITOR
Farm Credit of Florida
Zak Seymour
12300 NW US Highway 441
Alachua, Florida 32615
Telephone: 386-462-7643
Email: zseymour@farmcreditfl.com

SPONSOR
Fresh from Florida
Florida Department of Agriculture and Consumer Services
Christopher Denmark
407 South Calhoun Street
Tallahassee, Florida 32399
Email: Christopher.Denmark@freshfromflorida.com

EXHIBITOR
Furst-McNess Company
Ted LaDue
3830 NW Brown Road
Wellborn, Florida 32094
Telephone: 800-562-0480
Email: ted.ladue@mcness.com

EXHIBITOR
Genex Cooperative, Inc.
Earl Jones, Jr.
PO Box 497
Trenton, Florida 32693
Telephone: 352-494-6780
Email: littleearljones@aol.com

EXHIBITOR
Graham Livestock Systems
Stan Graham
4355 Barwick Road
Quitman, Georgia 31643
Telephone: 229-224-5002
Email: grahamlivestocksystems@gmail.com

SPONSOR
Helena Chemical
Ross Woodward
PO Box 428
Alachua, Florida 32616
Telephone: 386-462-4157
Email: woodwardr@helenachemical.com

EXHIBITOR
Merck Animal Health
Greg Woodard
12940 Tom Gallagher Road
Dover, Florida 33527
Telephone: 813-918-2712
Email: gregory.woodard@merck.com

EXHIBITOR
Merial, Ltd
James Stice
PO Box 460
Highland City, Florida 33846
Telephone: 863-640-3843
Email: James.Stice@Merial.com

EXHIBITOR
Micronutrients
Larry Howard
202 Sunnymead Drive
Valdosta, Georgia 31605
Telephone: 229-560-0274
Email: ljhoward202@aol.com

EXHIBITOR
MWI Veterinary Supply
Travis Wiygul
16241 NE 60th Street
Williston, Florida 32696
Telephone: 352-427-6116
Email: twiygul@mwianimalhealth.com

EXHIBITOR
Norbrook, Inc.
Tim Best
9401 Indian Creek Pkwy
Overland Park, Kansas 66210
Telephone: 913-599-5777
Email: tbest@norbrookinc.com

EXHIBITOR
Select Sire Power
Steve Furrow
Telephone: 540-520-4804
Parker Capparelli
Telephone: 352-262-1393
David McAuley
Telephone: 863-634-9733
2623 Carolina Springs Road
Rocky Mount, Virginia 24151
Email: sfurrow@selectsirepower.com

EXHIBITOR
SMI Beef Supply
Jared Prescott
1700 NW 127th Terrace
Okeechobee, Florida 34972
Telephone: 863-368-1013
Email: jprescott@southeastmilk.org

EXHIBITOR
Southern States Cooperative
Jeff Powell
201 Turtle Pond Road
Bainbridge, Georgia 39819
Telephone: (229) 366-1169
Email: jeff.powell@sscoop.com

EXHIBITOR
Sparr Building and Farm Supply
Cody Hensley
PO Box 298
Sparr, Florida 32192
Telephone: 352-427-8970
Email: codyh@sparrbuilding.com

EXHIBITOR
Sunbelt Ag Expo
Chip Blalock
290 Harper Blvd Suite G
Moultrie, Georgia 31788
Telephone: 229-985-1968
Email: chip@sunbeltexpo.com

EXHIBITOR
Tru-Test, Inc.
Michael Johnson
528 Grant Rd
Mineral Wells, Texas 76067
Telephone: 940-327-8020
Email: jsims@tru-test.com

EXHIBITOR
Westway Feed Products, LLC
Terry Weaver
PO Box 2447
Lake Placid, Florida 33862
Telephone: 863-840-0935
Email: terryw@westwayfeed.com

EXHIBITOR
Y-TEX Corporation
Evan Clark
PO Box 601
Carnesville, Georgia 30521
Telephone: 706-424-3242
Email: eclark@agri-sales.com

SPONSOR & EXHIBITOR
Zoetis
Heath Graham
22844 West Old Providence Road
Alachua, Florida 32615
Telephone: 386-853-0954
Email: heath.graham@zoetis.com

Thank you for your continued support!

"Staying Current to Stay in Business"

Wednesday May 4

1:00 Welcome
1:15 Cattlemen Comments – Erik Jacobsen
1:30 Market Outlook – Stan Bevers, Texas A&M University
2:15 Modern Ag in a Facebook Culture – Gary Sides, Zoetis
3:00 Break
3:30 Understanding the Use of GMO's in Agriculture – Kevin Folta, University of Florida
4:15 Issues Beef Producers Should Know – Ashley Hughes, Florida Beef Council
5:00 Chevrolet, Cadillacs, Cows, and Consumers – Todd Thrift, University of Florida
5:45 Reception

Thursday, May 5

8:30 Impact of Disease on the Beef Production Chain – Max Irsik, University of Florida
9:15 Key Performance Target Indicators – Stan Bevers, Texas A&M University
10:00 Break
10:30 Forages, Grazing, and Supplementation – Making it Work– Kim Mullenix, Auburn University
11:15 Cattle Management Issues that Need to Be Addressed – Matt Hersom, University of Florida

12:15 Leave for Lunch ***(Afternoon session to be held at the Horse Teaching Unit, see the map in your proceedings manual)***

Afternoon Trade Show and Demonstrations – topics subject to change

1:30 Disease Pathology – Symptoms and tissue collection procedures for diagnosis.
2:30 Break
2:45 Feedstuffs – Characteristics and Applications, What are You Getting Out of Your Hay
3:45 Break
4:00 What Happens When She Eats That Pasture Management
5:00 Adjourn
6:00 Steak Out

Friday, May 6

8:30 Gainesville Research Update
9:00 Can We Select for RFI in Heifers – Lisa Kriese-Anderson, Auburn University
9:45 Range Cattle REC Research Update
10:15 Break
10:45 Beef Cattle Improvement in the Genomics Era – Raluca Mateescu, University of Florida
11:30 North Florida REC Research Update
12:00 *Wrap and Adjourn*

Thank you for your continued support!!!

Program Participants

Stan Bevers
Texas A&M
Telephone: 940-552-9941 ext. 231
Email: Stan.Bevers@ag.tamu.edu

Chad Carr
UF/IFAS Department of Animal Sciences
Telephone: 352-392-2454
Email: chadcarr@ufl.edu

Jose Dubeux
UF/IFAS North Florida Research & Education Center
Telephone: 850-526-1618
Email: dubeux@ufl.edu

Kevin Folta
UF/IFAS Horticultural Sciences Department
Telephone: 352-273-4812
Email: kflota@ufl.edu

Matt Hersom
UF/IFAS Department of Animal Sciences
Telephone: 352-392-2390
Email: hersom@ufl.edu

Ashley Hughes
Florida Beef Council
Telephone: 407-846-4557
Email: Ashley@floridacattlemen.org

Max Irsik
UF/College of Veterinary Medicine
Telephone: 352-294-4349
Email: irsikm@ufl.edu

Erik Jacobsen
President of the Florida Cattlemen's Association
Telephone: 407-846-8025
Email: ejacobsen@DeseretRanches.com

Dwain Johnson
UF/IFAS Department of Animal Sciences
Telephone: 352-392-1922
Email: dwainj@ufl.edu

Lisa Kriese-Anderson
College of Agriculture, Auburn University
Telephone: 334-844-1561
Email: kriesla@auburn.edu

Raluca Mateescu
UF/IFAS Department of Animal Sciences
Telephone: 352-392-2367
Email: raluca@ufl.edu

Joel McQuagge
UF/IFAS Department of Animal Sciences
Telephone: 352-392-6363
Email: mcquagge@ufl.edu

Kim Mullenix
Department of Animal Sciences, Auburn University
Telephone: 334-844-1546
Email: mullemk@auburn.edu

Gary Sides
Zoetis
Telephone: 970-520-5963
Email: Gary.sides@zoetis.com

Thrift, Todd
UF/IFAS, Department of Animal Sciences
Telephone: 352-392-8597
Email: tathrift@ufl.edu

Wasdin, Jerry
UF/IFAS, Department of Animal Sciences
Telephone: 352-392-1120
Email: jwas@ufl.edu

Speakers Biographies

65th Annual Florida Beef Cattle Short Course

Stan J. Bevers
Texas A&M, AgriLife Extension Service, Vernon, TX
Mr. Bevers is a Professor and Extension Economist for the Texas A&M AgriLife Extension Service, headquartered in Vernon, Texas. He received his B.S. in Agricultural Education (1982) from Cameron University in Lawton, Oklahoma and his M.S. in Agricultural Economics (1989) from Texas A&M University in College Station, Texas.

Upon arriving in the Texas Rolling Plains in 1989, Bevers became part of a national effort to evaluate and standardize how beef cow-calf operations were evaluated from both a production and financial standpoint. This effort resulted in what's known today as Beef Cow-calf SPA. Bevers has personally conducted or been involved in the SPA analysis of over 350 herds located from Texas to Montana. Furthering this effort, he has developed Key Performance Indicators for cow-calf operations to measure their efficiency. He is considered the leading expert on cow-calf ranch analyses in the United States. Within Texas, he analyzes and advises ranchers though his Extension position. Outside of Texas, he works with ranchers as a professional consultant.

He and his wife, Tina, have two children; Dana who lives with them and Jana who is married to Jonathan Ramirez and lives in Goree, Texas. They have two children. All of them are involved in the family farming and ranching operation in Knox County, Texas.

Raoul Boughton
UF/IFAS Range Cattle Research and Education Center, Ona, FL
Raoul is Australian and came to the US in 2000 to do his Ph.D. with Dr. Schoech at the University of Memphis, with a focus on wildlife endocrinology and immunology. He spent ~ 10 years working on disease, stress and immune function in the Threatened Florida Scrub-Jay. Through his interest in ecological immunology he began to study disease and parasites in other systems and then began to work on livestock-wildlife interactions, which are intricately linked to environmental conditions of the range.

Dr. Boughton's program focuses on directed research and extension in rangeland habitat management techniques, wildlife demography and diseases, and cattle health and resource availability on rangelands of Florida. Our goal is to promote the conservation, maintenance, and improvement of rangelands to support diverse ecosystem functions, with an emphasis on wildlife.

Jose Dubeux
UF/IFAS North Florida Research and Education Center, Marianna FL
Dr. Jose Dubeux joined the North Florida Research and Education Center (NFREC) – Marianna in September, 2013. He received his Bachelor's degree in Agronomy from Universidade Federal Rural de Pernambuco (1990), his MS in Animal Science from the same University (1995), and his PhD in Agronomy from the University of Florida (2005). His appointment is 70% research and 30% extension. Dr. Dubeux has expertise in pasture/forage management, with focus in nutrient cycling in forage production systems. His focus will be to reduce off-farm inputs in forage production systems of Florida, targeting specifically reduction of N fertilizer application by establishing warm- and cool-season grass-legume mixtures. Dr. Dubeux will also address in his program the carbon footprint of cattle production

systems in Florida, assessing C storage and greenhouse gas emissions. Long-term goal is to reduce fossil fuel inputs from fertilizer and equipment and to increase sustainability of cattle production systems.

Kevin M. Folta
UF/IFAS Horticultural Sciences Department, Gainesville, FL

Kevin Folta is a Professor in and Chair of the Horticultural Sciences Department at the University of Florida, Gainesville. He got his Ph.D. in Molecular Biology from University of Illinois at Chicago in 1998, and he has worked at the University of Wisconsin before settling in at University of Florida. Dr. Folta researches the functional genomics of small fruit crops, the plant transformation, the genetic basis of flavors, and studies at photomorphogenesis and flowering. He has also written many publications and edited books, most recently was the 2011 Genetics, Genomics, and Breeding of Berries. Dr. Folta received the NSF CAREER Award, an HHMI Mentoring Award and was recognized as "University of Florida Foundation Research Professor" in 2010.

Matt Hersom
UF/IFAS Department of Animal Sciences, Gainesville, FL

Dr. Matt Hersom is an Associate Professor and Extension Beef Cattle Specialist at the University of Florida. His specific area of emphasis includes development of strategic nutritional and supplementation programs to optimize beef cattle performance utilizing forage and roughage based diets and evaluation of calf production and growing practices to improve animal performance in integrated beef production systems. Extension areas address expanding education experiences in beef cattle nutrition, implementation of optimal supplementation strategies for Florida cow-calf production, and development of increased pasture and forage utilization and management.

Ashley Hughes
Florida Beef Council

Ashley Hughes attended the University of Florida where she obtained her Bachelor's degree in 2006 in Food and Resource Economics with a focus in Food Marketing, as well as a Master's degree in 2008 in Animal Science with a focus in beef cattle nutrition and subtropical forages. Upon graduating with her MS degree, Ashley moved to Georgia to become the Director of Industry Information for the Georgia Beef Board and Georgia Cattlemen's Association. She remained in Georgia for over two years before returning to Florida in 2011 to begin work as the Director of Marketing and Promotion for the Florida Beef Council and Florida Cattlemen's Association where her primary goals are to promote and educate about beef and the beef cattle industry.

Max Irsik
UF/IFAS College of Veterinary Medicine, Gainesville, FL

Dr. Irsik's primary mission is providing support for the beef cattle industry within the state of Florida. This involves working with county faculty and other university specialists providing technical information and consultation to producers regarding health and management of beef cattle. Research interests are focused toward reproductive efficiency of beef herds, calf health, computer applications for beef producers and the association of animal health and economics in beef cattle production.

Erik Jacobson
President of the Florida Cattlemen's Association, St. Cloud, FL

Erik Jacobsen is President of the Cattle Division for AgReserves, Inc. and General Manager of its Flagship cattle operation - Deseret Ranches of Florida. He is responsible for the company's cattle operations throughout North America including ranching and feeding operations.

Erik started working at Deseret Ranches in 1986 as a cattle foreman, before leaving for Smithfield Foods (SFD) where he worked in various management positions, including General Manager, from 1995 to 2006. He returned to Deseret Ranches of Florida as the General Manager in 2006.

An active member of the Florida cattle industry, Erik currently serves as President of the Florida Cattlemen's Association. He also has served as Brevard County Cattlemen's President and in various committees with the National Cattlemen's Association.

Erik is a graduate of the University of Florida where he earned a Bachelor of Science in Animal Science, and of Brigham Young University where he earned his MBA. Originally from Lakeland, Fla., Erik and his wife Renee have been married since 1990 and have six children.

Lisa Kriese-Anderson
College of Agriculture, Auburn University, Auburn, AL
Dr. Lisa Kriese-Anderson joined the faculty at Auburn University in 1993 with a 75% Extension, 25% research appointment with an emphasis on beef cattle breeding. Currently, she serves as the team coordinator for the Animal Science and Forages Extension Team of regional agents, county coordinators and specialists. While at Auburn, Kriese-Anderson has been involved with several major extension programs including Beef Quality Assurance Education, Master Cattle Producers Program, Alabama Pasture to Rail, and Alabama BCIA Bull Testing Program. She is also co-chair of Ag Discovery Adventure initiated in 2012, which is a one-day event targeted for urban and suburban people wanting to understand how their food is produced. Kriese-Anderson research interests lie in the area of beef efficiency and how that impacts both reproduction and carcass quality. She serves as an undergraduate advisor to 35 to 40 Animal Science Students, is an Auburn University Block and Bridle Club advisor and coordinates the Auburn University Academic Quadrathlon.

Raluca Mateescu
UF/IFAS Department of Animal Sciences, Gainesville, FL
Dr. Raluca Mateescu is an Associate Professor of Quantitative Genetics & Genomics in the Department of Animal Sciences at the University of Florida. Her research interests focus on identification of genetic markers associated with economically important traits in beef cattle. Special interest is given to development of genetic tools to improve nutritional and health value of beef and understanding the genetic mechanism of thermotolerance in Bos indicus influenced beef cattle. The molecular information generated through this research could lead to identification of molecular DNA markers to be incorporated into breeding decisions. Dr. Mateescu joined the faculty at Florida in 2014 after serving on the Animal Science faculty at Oklahoma State University for 7 years. She received a B.S. degree in Molecular Biology and Genetics from Bucharest University, Romania and received her M.S and Ph.D. in Animal Breeding and Genetics from Cornell University.

Kim Mullenix
Department of Animal Sciences, Auburn University, Auburn, AL
Kim Mullenix is an Extension Specialist and Assistant Professor in the Department of Animal Sciences at Auburn University. Her academic appointment is 75% Extension and 25% research. Kim began her academic career at Auburn University in 2004 as an undergraduate student in Animal Sciences. She completed her B.S. in Animal Sciences (Magna Laude) in 2008, and a M.S. in Ruminant Nutrition in 2010. Mullenix received her Ph.D. in Agronomy (Forage Management) with a minor in Agricultural Education and Communication in 2013 from the University of Florida. The focus of her Extension and research programs is the development of systems management recommendations for cattle producers through the use of improved forage management and supplementation strategies. Currently, Mullenix

works to develop educational curriculum and programming in this area as part of her role with the Alabama Cooperative Extension Animal Science and Forage Team. Since 2014, she has worked to increase the availability of web-based decision tools for cattlemen within the state. Additionally, she works with a team of beef-forage researchers to implement forage-based cattle production evaluations at Auburn University outlying research units. Mullenix is the lead project investigator or co-investigator on active beef cattle research projects at the following stations: Wiregrass Research and Extension Center, EV Smith Research Center, Blackbelt Research and Extension Center, and Tennessee Valley Research and Extension Center.

Gary Sides
Zoetis

Gary is a beef cattle nutritionist on the Zoetis technical services team. He has been with Zoetis (formerly Pfizer Animal Health) since 2003. Dr. Sides has extensive beef industry experience, compiling more than 30 years working with organizations such as Intervet, Cargill Animal Nutrition, Moorman Manufacturing Company, Texas A&M and Utah State University. Sides' professional affiliations include the American Registry of Professional Animal Scientists and the American Society of Animal Science. He has coauthored numerous papers and technical bulletins on estrus synchronization, feedlot growth promotion, effects of anti-microbials on feedlot health and performance, and parasite control in beef cattle, among other topics.

Sides earned his doctorate in ruminant physiology and nutrition from the University of Wyoming in 1980 and both his B.S. (animal science) and M.S. (beef cattle nutrition) from New Mexico State University. Gary grew up working on family farms and ranches in New Mexico. He currently lives in Sterling, Colorado, with his wife Coleen. They are the parents of four sons and the grandparents of two.

Todd Thrift
UF/IFAS Department of Animal Sciences, Gainesville, FL

Dr. Todd Thrift received his B.S at the University of Kentucky in Animal Science, an M.S. at Oklahoma State University in Ruminant Nutrition, and a Ph.D. at Texas A&M University in Physiology of Reproduction. Dr. Thrift has a 70% teaching, 30% extension position in Beef Cattle Management. His teaching appointment has him teaching Cow/Calf Management, Beef Cattle Nutrition, and Stocker/Feedlot Management. His extension appointment has him focusing as a Beef Quality Assurance Coordinator and with the National Animal I.D. Prior to coming to the University of Florida; Dr. Thrift worked for Texas A&M University, as a beef cattle specialist for five years.

Making Sense out of the Cattle/Beef Market

Stan Bevers
Professor & Ext. Economist
Texas A&M AgriLife Extension Service
Vernon, Texas

2016 Florida Beef Cattle Short Course
Gainesville, Florida
May 4, 2016

TEXAS A&M AGRILIFE EXTENSION

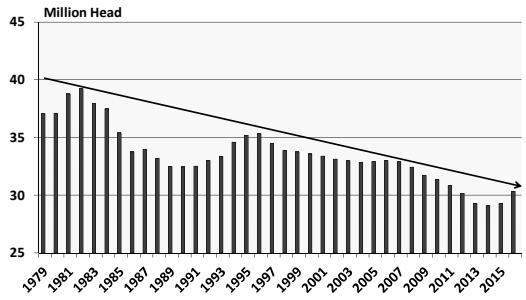
"Experts often possess more data than judgement."

Mr. Colin Powell
Former US Secretary of State
Retired Four Star General, US Army
Statesman and author

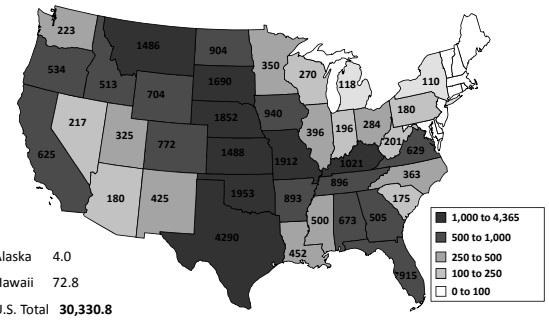
30,000 Foot View of the Industry

U.S. Beef Cow Inventory

January 1

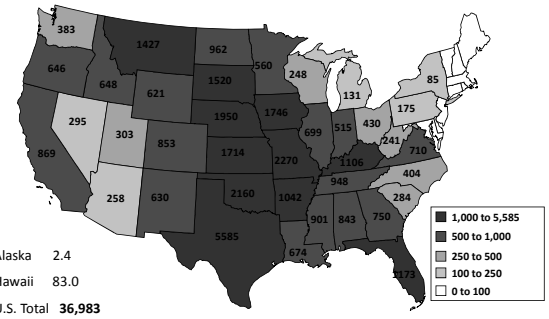


BEEF COWS THAT HAVE CALVED
JANUARY 1, 2016
(1000 Head)



Alaska 4.0
Hawaii 72.8
U.S. Total **30,330.8**

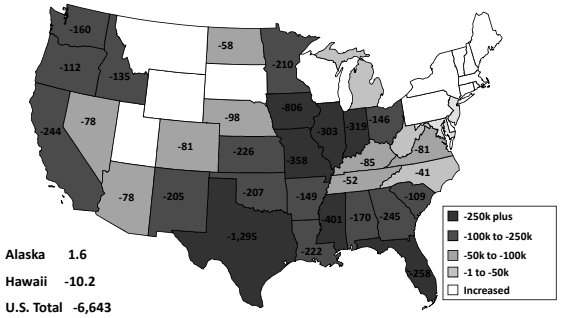
BEEF COWS THAT HAVE CALVED
JANUARY 1, 1980
(1000 Head)



Alaska 2.4
Hawaii 83.0
U.S. Total **36,983**

CHANGE IN BEEF COW INVENTORY

JANUARY 1, 1980 TO JANUARY 1, 2016
(1000 Head)

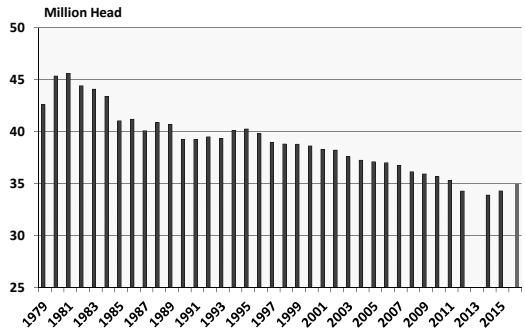


Alaska 1.6

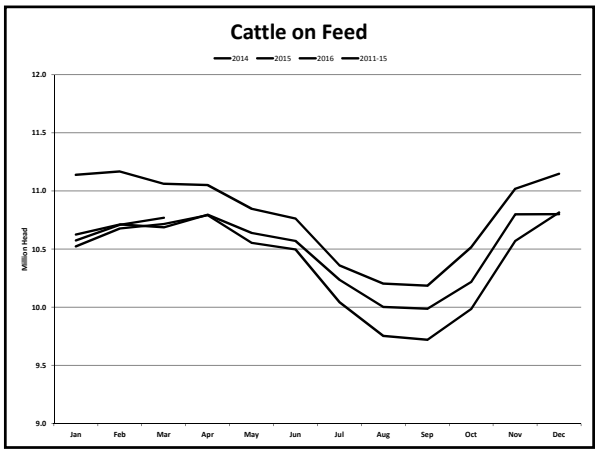
Hawaii -10.2

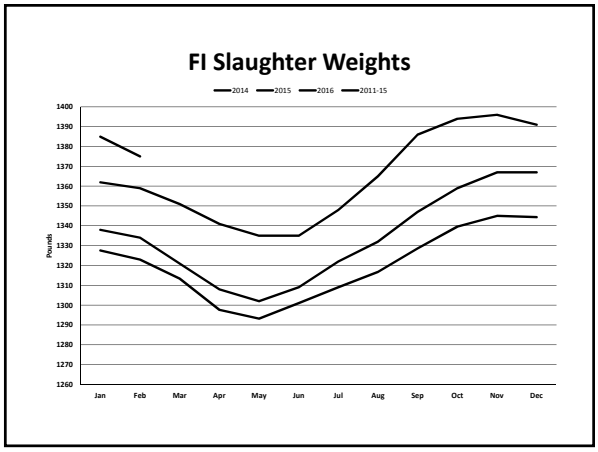
U.S. Total -6,643

U.S. Calf Crop



So Then, What Happened to Lower Feedlot Numbers and Being Current?

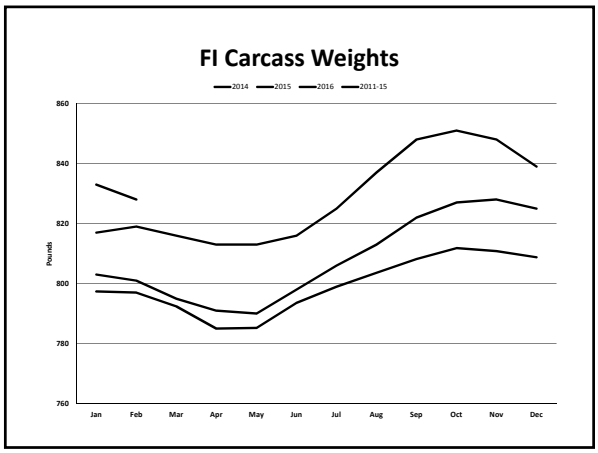


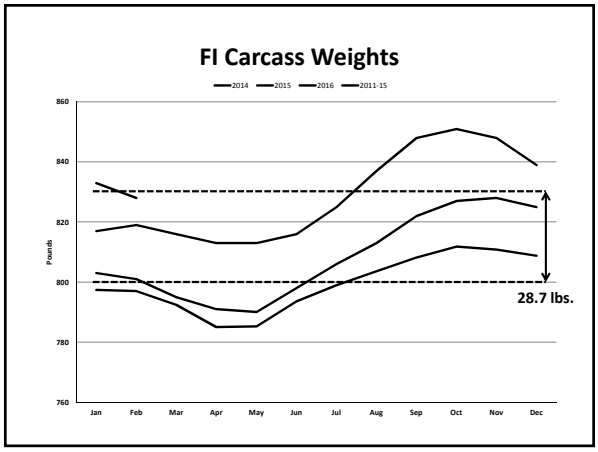


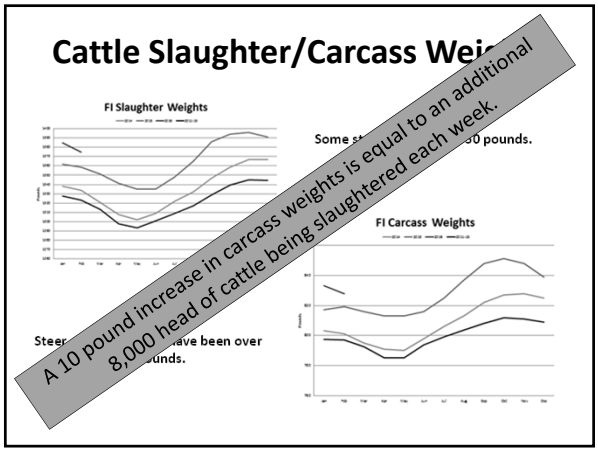
Daily Livestock Report,

November 12, 2015

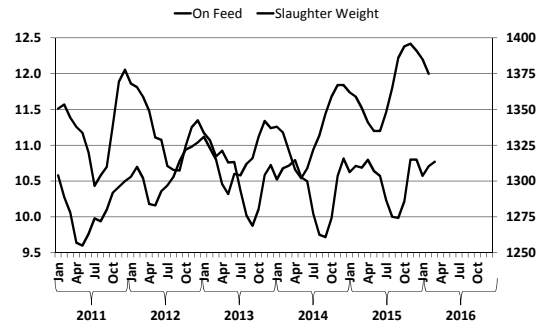
		8/2/2015		9/6/2015		10/4/2015		11/8/2015	
		Live Wt.	Price $/cwt	Live Wt.	Price $/cwt	Live Wt.	Price $/cwt	Live Wt.	Price $/cwt
5 Mkt Ave	Steers	1435	147.37	1459	141.75	1498	117.71	1489	130.41
	Heifers	1267	147.73	1290	142.53	1309	119.81	1321	131.99
KS	Steers	1375	147.02	1371	142.97	1419	120.14	1436	133.49
	Heifers	1228	147.14	1240	143.00	1246	121.94	1275	133.37
IA-S. Minn	Steers	1458	147.15	1484	140.78	1543	116.28	1511	129.39
	Heifers	1270	147.26	1293	140.97	1361	117.30	1311	129.54
TX-OK-NM	Steers	1321	147.00	1422	143.00	1403	121.31	1363	133.85
	Heifers	1185	147.30	1150	143.00	1320	120.00	1228	133.17
NE	Steers	1446	147.63	1461	142.58	1513	117.06	1470	129.58
	Heifers	1304	148.09	1319	142.69	1335	119.46	1375	132.57


FI Carcass Weights
2014
2015
2016
2011-15
860
840
820
800
780
760
Pounds
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec


FI Carcass Weights
2014
2015
2016
2011-15
860
840
820
800
780
760
Pounds
28.7 lbs.
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec


Cattle Slaughter/Carcass Wei
FI Slaughter Weights
FI Carcass Weights
A 10 pound increase in carcass weights is equal to an additional 8,000 head of cattle being slaughtered each week.

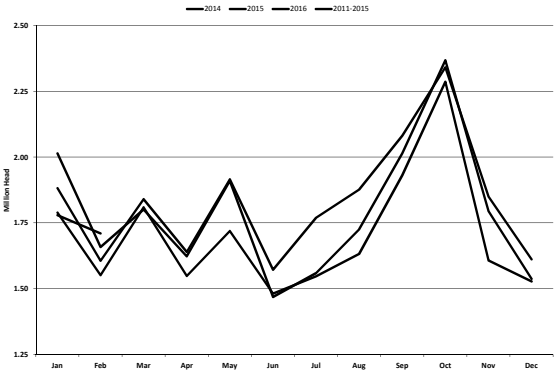
On Feed Inventories & Slaughter Weights

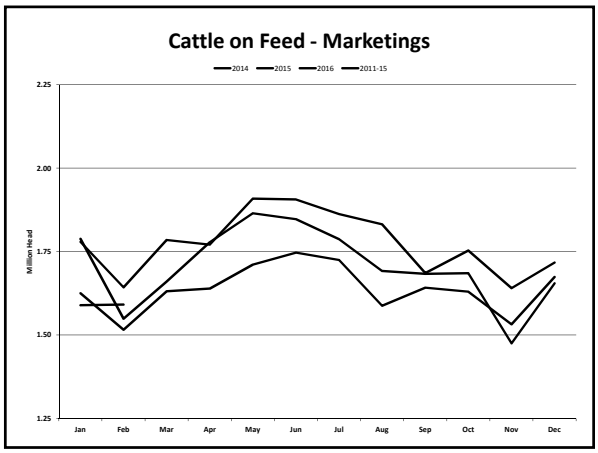


What Happened to Lower Feedlot Numbers and Being Current?

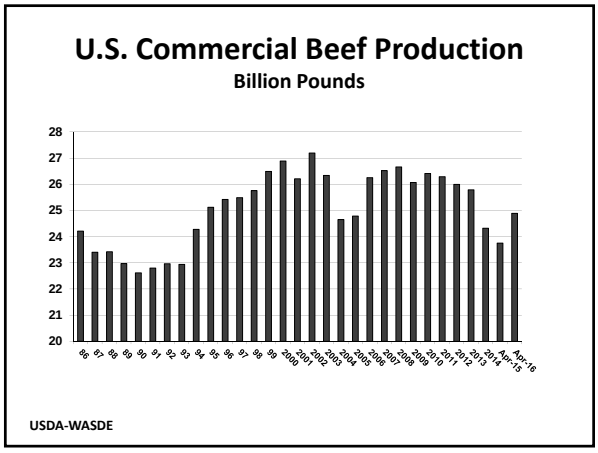
- It's not a loss until you sell
- Renegotiation of bank loans
- Cost of gains were cheap in the MW
- Cost to maintain a high occupancy rate

Cattle on Feed - Placements



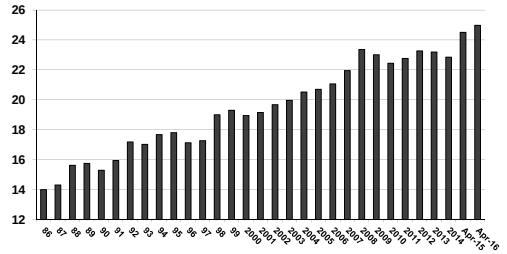


Total Meat Supplies



U.S. Commercial Pork Production

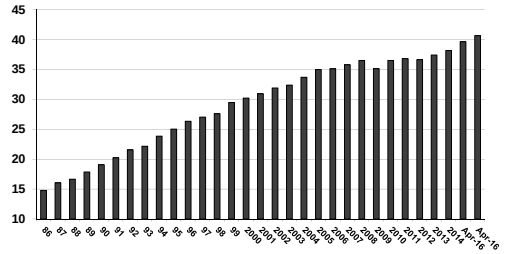
Billion Pounds



USDA-WASDE

U.S. F.I. Broiler Production

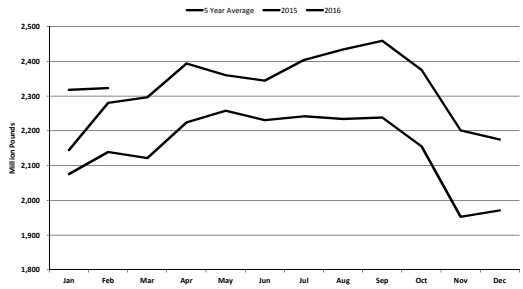
Billion Pounds



USDA-WASDE

Red Meat and Poultry in Cold Storage

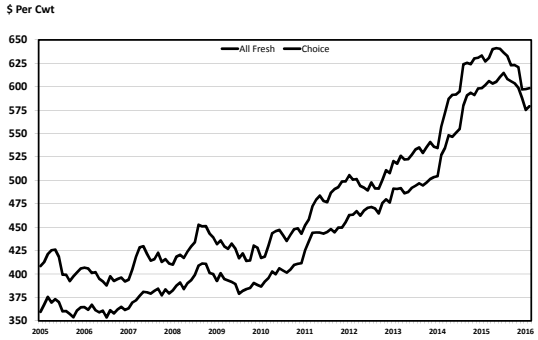
Combined in Refrigerated Warehouses



USDA-NASS

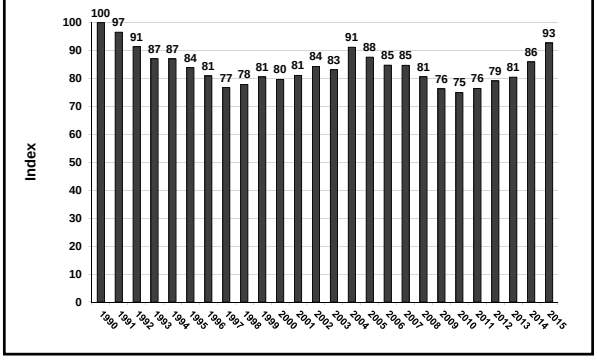
Demand for Beef

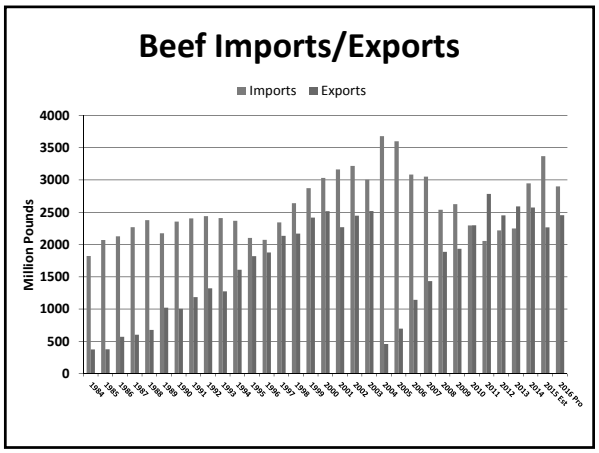
Retail Beef Prices (Monthly)

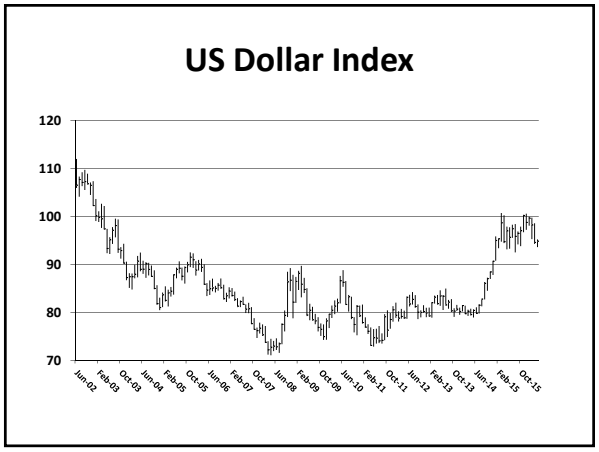


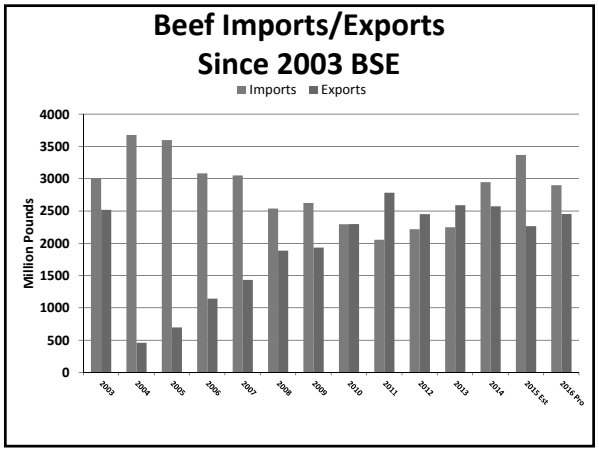
Annual Retail All Fresh Beef Domestic Demand Index

1990-2015




Beef Imports/Exports
Imports
Exports
Million Pounds
4000
3500
3000
2500
2000
1500
1000
500
0
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015 Est
2016 Pro

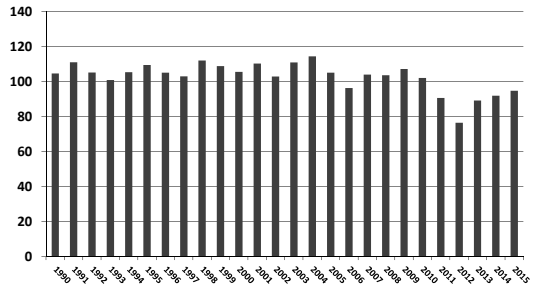

US Dollar Index
120
110
100
90
80
70
Jun-02
Feb-03
Oct-03
Jun-04
Feb-05
Oct-05
Jun-06
Feb-07
Oct-07
Jun-08
Feb-09
Oct-09
Jun-10
Feb-11
Oct-11
Jun-12
Feb-13
Oct-13
Jun-14
Feb-15
Oct-15


Beef Imports/Exports
Since 2003 BSE
Imports
Exports
Million Pounds
4000
3500
3000
2500
2000
1500
1000
500
0
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015 Est
2016 Pro

Feed Costs

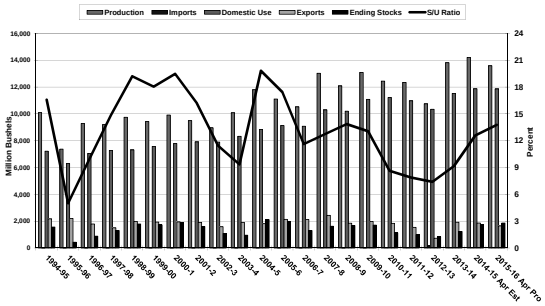
US Hay Stocks (on Dec. 1)

Million tons



US Corn Supply & Demand

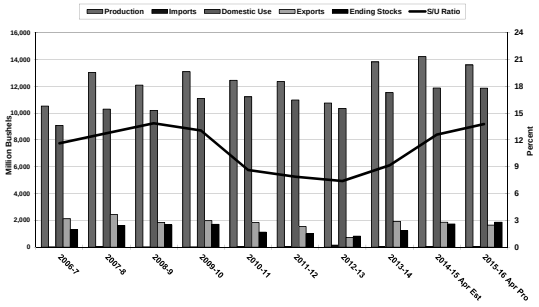
Ten Year Average = 1.418; 2015/16 Projections = 1.862



As of April 12, 2016, USDA-WAOB

US Corn Supply & Demand

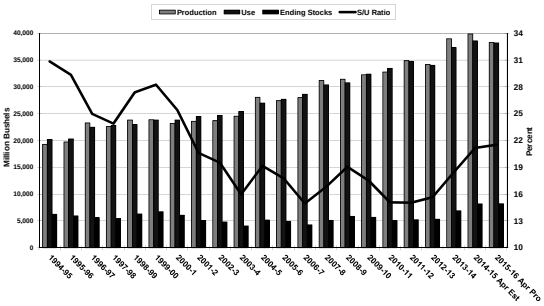
Ten Year Average = 1.418; 2015/16 Projections = 1.862



As of April 12, 2016, USDA-WAOB

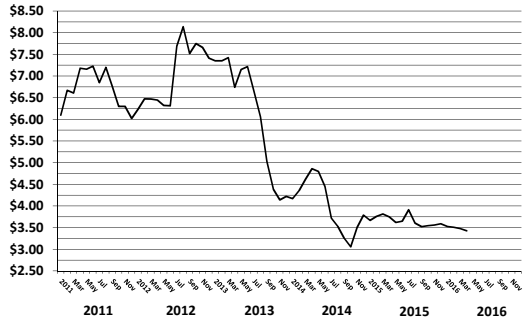
World Corn Supply & Demand

Ten Year Average = 5.653; 2015/16 Projections = 8.224



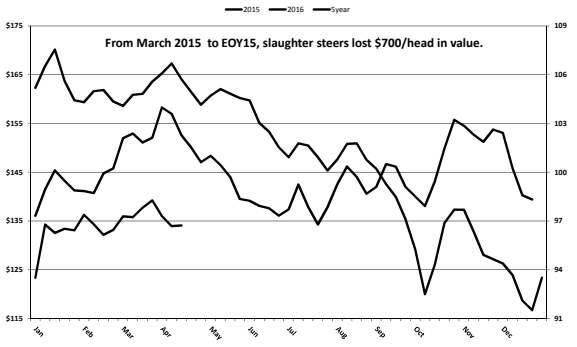
As of April 12, 2016, USDA-WAOB

Cash Corn Price



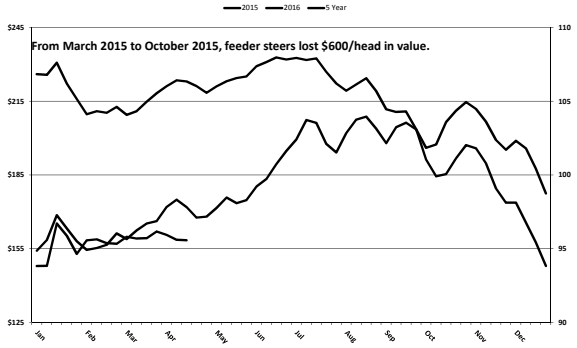
Cattle & Beef Prices

Slaughter Steer Prices

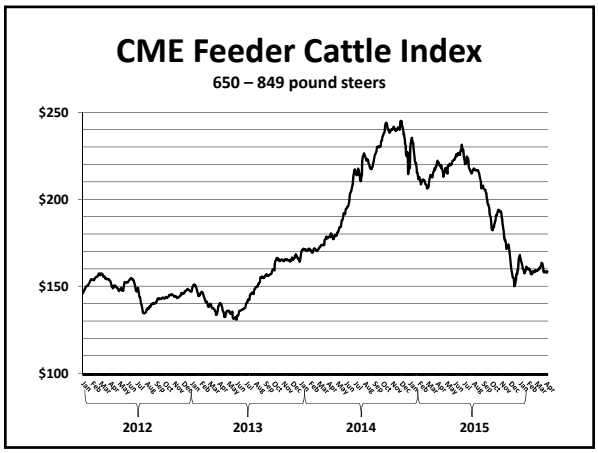


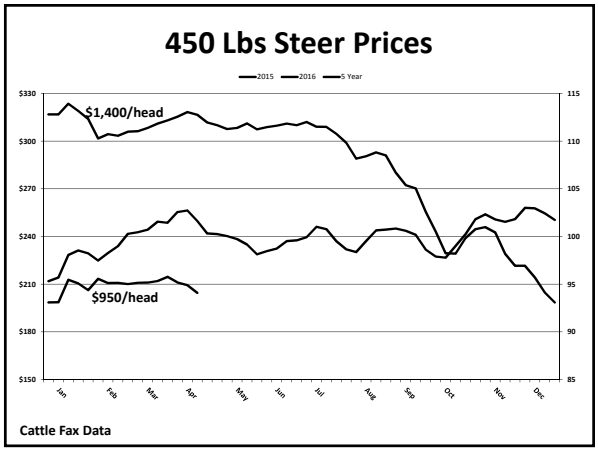
Cattle Fax Data

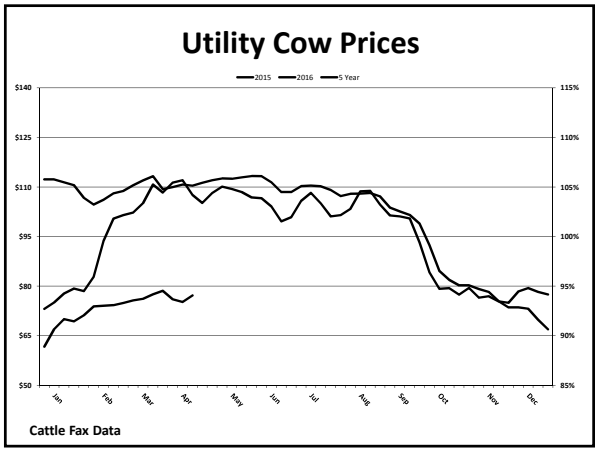
750 Lbs Steer Prices



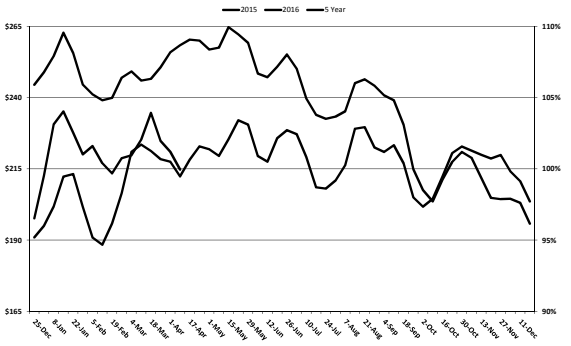
Cattle Fax Data


CME Feeder Cattle Index
650 – 849 pound steers
$250
$200
$150
$100
2012
2013
2014
2015


450 Lbs Steer Prices
2015
2016
5 Year
$1,400/head
$950/head
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Cattle Fax Data

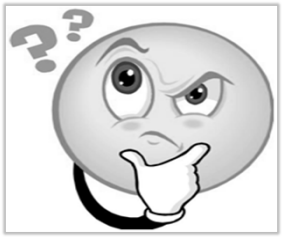

Utility Cow Prices
2015
2016
5 Year
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Cattle Fax Data

Boxed Beef Prices

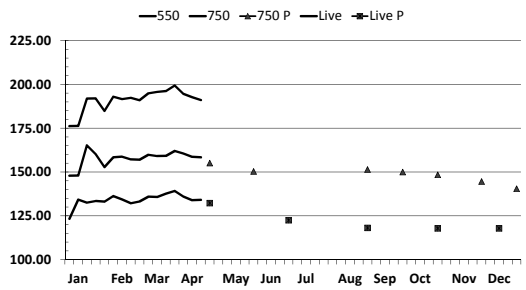


Cattle Fax Data

What Does All of This Mean to You?

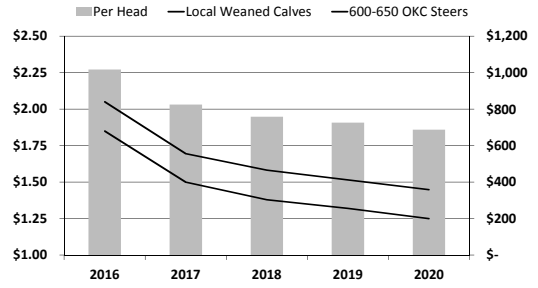


2016 Actual/Futures Prices

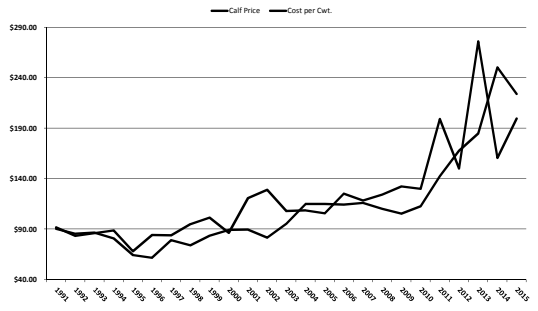


Cattle Price Projections

USDA 2016 Agricultural Outlook Conference
Long Term Projections



Calf Price Received versus Cost of Production



Summary

- Peak prices in 2014.
- Expected prices to slowly decline beginning in 2015;
  - However, October through March was very problematic.
  - Beef market continues to work itself out of this
- Feed (corn & hay) should be plentiful.
- Beef demand continues to be strong
- Beef exports being hampered by strength of the US dollar.
- Longer term, expect lower prices for the next three years; question is where is the bottom?

Questions/Comments

Stan Bevers
Texas AgriLife Extension Service
940 552-9941 ext. 231
s-bevers@tamu.edu
http://agrisk.tamu.edu

TEXAS A&M AGRILIFE EXTENSION

Modern Ag in a Facebook Culture

G. Sides, Beef Cattle Nutritionist[1]

[1]Zoetis, Sterling, CO

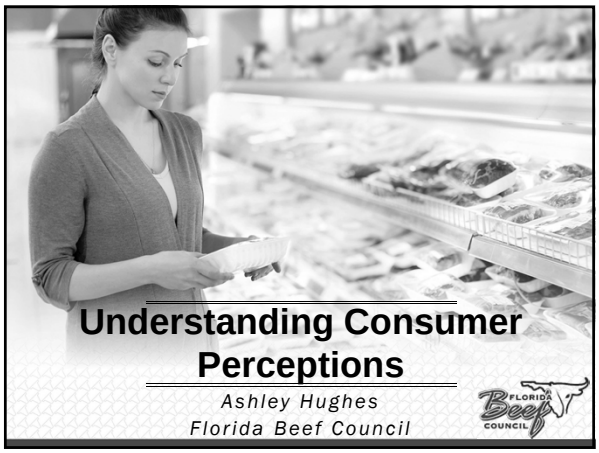
Notes:

Understanding the Use of GMO's in Agriculture

K. Folta, Professor and Chair[1]

[1]Horticultural Sciences Department, University of Florida, Gainesville, FL

Notes:



Understanding Consumer Perceptions

Ashley Hughes
Florida Beef Council

Today's Goal

To provide a base understanding of consumer perceptions and realities of beef production, as well as opportunities for how we can communicate messages around specific issues with the right level of transparency.

- Marketing Claims
- Factory Farming
- Antibiotics
- Hormones

Who's heard...

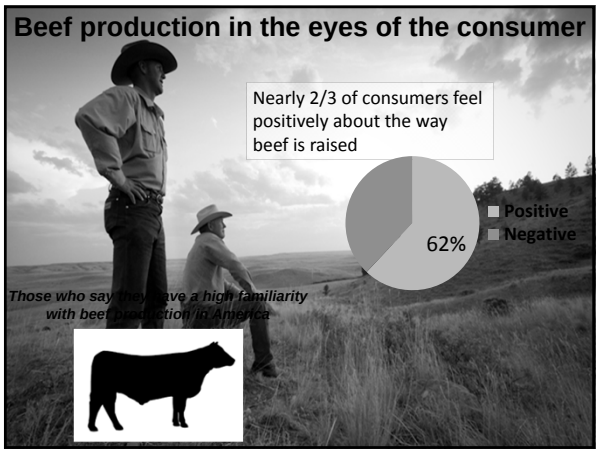
The Evolving Consumer

Consumers

What do they know?
What do they think?
What do they want?

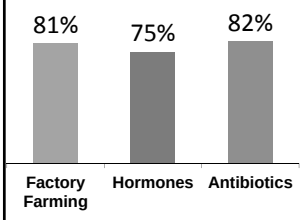
(More importantly)
How do they FEEL about beef?

Beef production in the eyes of the consumer



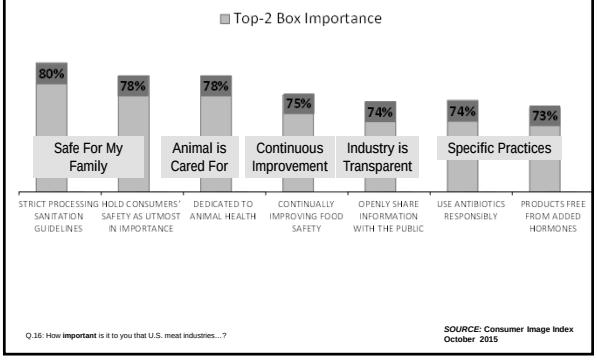
Common Issues

At least Somewhat Concerned



"I have heard rumors of cows being mistreated in many locations prior to the process of killing them and packaging their meat as beef. While I believe this rumor is mostly false, if there is such abuse, it has to stop!"

Importance in the Eyes of the Consumer



Q.16: How **important** is it to you that U.S. meat industries…?

***SOURCE:* Consumer Image Index October 2015**

New Factors at Point of Purchase

The Consumer Value Driver Plate

Source: Deloitte Food Value Equation Survey 2015, Deloitte Analysis

Consumer Insights

Marketing claims that focus on the positive rise to the top.

*I'm looking for descriptions that **sound like they taste good**. I am swayed by adjectives like **cured, grass-fed, local**; I will admit I don't really know what these specifically mean, but they imply to me that the beef was **thoughtfully prepared**."*
– Male, 26

Locally Grown

Image Association with Claims

Rank	Conventionally Raised	Naturally Raised	Grass Fed	Local
#1	75%	74%	67%	66%
#2	49%	53%	77%	46%
#3	47%	57%	67%	
#4	33%		37%	39%
#5	25%	35%		39%

Phrase Association with Claims

Rank	Conventionally Raised	Naturally Raised	Grass Fed	Local
#1	Cattle can be given hormones (47%)	Cattle are mostly free to roam (59%)	Natural (57%)	**High quality (46%)**
#2	Cattle can be given antibiotics (46%)	Cattle are humanely raised (54%)	Cattle are mostly free to roam (55%)	Cattle are humanely raised (41%)
#3	Readily Available (45%)	Safe to eat (48%)	**High quality (43%)**	Cattle are traceable to the source (39%)
#4	Cattle can be given vaccines (33%)	**High quality (45%)**	Safe to eat (43%)	Natural (39%)
#5	Cattle may be fed animal by-products (31%)	Good Source of Protein (35%)	Cattle are humanely raised (41%)	Delicious (35%)

Q120. When you hear CLAIM which of the following words or statements do you associate with this claim?

What is Quality?

*"Beef should be **well marbled and dry aged**. I look for a deep **red** color and a thin crust when **searing**. Beef should be very **moist** but not so juicy that it leaves a pool of liquid on the plate. **Simple seasoning**, salt a bit of pepper."*
– Male, 27

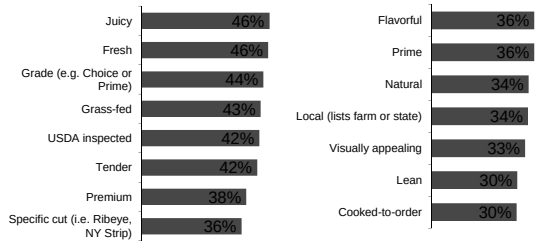
*"I consider the **grade** of the beef as well as if it is **organic**. I prefer ground **sirloin** burgers and tenderloin or sirloin for steaks. The beef should have a **fresh** smell to it and look freshly prepared/butchered."*
– Female 32

*"**Nothing treated** or done with the cow (chemicals, preservatives, etc.) **Juicy** and cuts like butter. **Not greasy** in any way."*
– Male, 21

Q110. How do you define "quality" when it comes to the beef that you eat, such as steaks and burgers?

Product and quality characteristics dominate "high quality" beef to consumers along with origin information

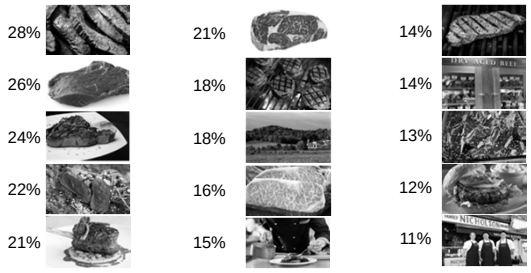
Descriptors for High Quality



Q130. Which of these words or phrases are markers of high quality when it comes to beef items?

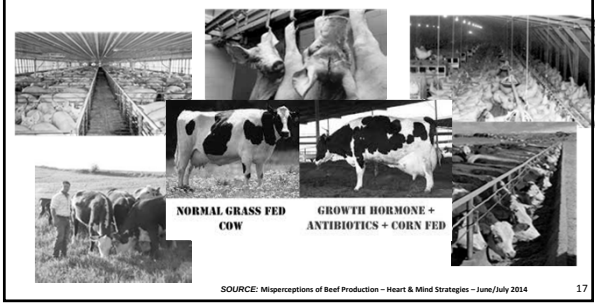
Product characteristics dominate the images consumers associate with "high quality"

Image Association



Consumer Insights

Factory Farming Perceptions

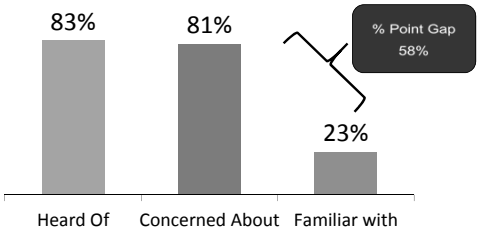


SOURCE: Misperceptions of Beef Production – Heart & Mind Strategies – June/July 2014 17

Perception

While familiarity with factory farming is low, consumer concerns and awareness are high.

The Term Factory Farming



SOURCE: Misperceptions of Beef Production – Heart & Mind Strategies – June/July 2014

Reality

- Most **unique and complex** lifecycle of any food
- Takes **2-3 years** to bring beef from farm to fork
- **913,246 farms and ranches** with cattle - down ~5% since 2007
- More than **90% of those cattle operations are family or individually** owned/operated
- Average cattle herd is **less than 50 animals**

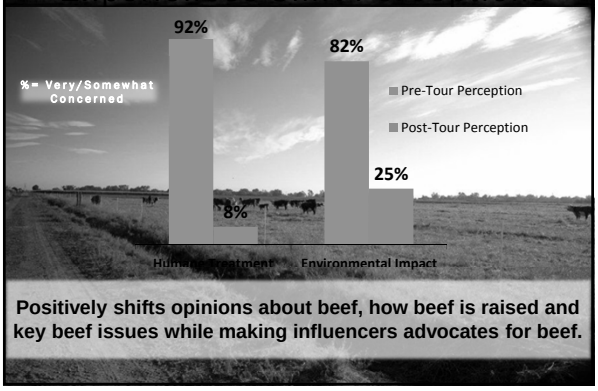



Reality

Consumers do NOT understand what is involved with raising cattle

- BMPs
- Habitat/Wildlife Management
- Water
- Social Responsibility
- Animal Care/BQA
- Sustainability

Opportunity: In-person Experiences Shift Perceptions



Positively shifts opinions about beef, how beef is raised and key beef issues while making influencers advocates for beef.

Opportunity

Farm to Fork Tours




Consumer Insights

Antibiotic use is common in mainstream media

Top Food Companies Moving Away From Overuse of Antibiotics on Industrial Farms

The White House
Office of the Press Secretary

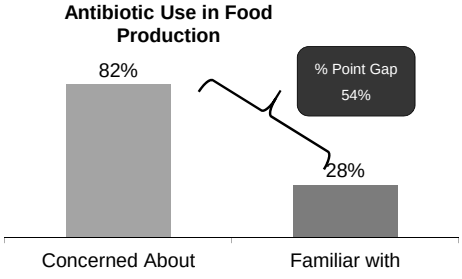
For Immediate Release March 27, 2015

FACT SHEET: Obama Administration Releases National Action Plan to Combat Antibiotic-Resistant Bacteria

npr WAMFE news arts & life music programs

Taking Cues From Human Nutrition To Reduce Antibiotic Use In Livestock

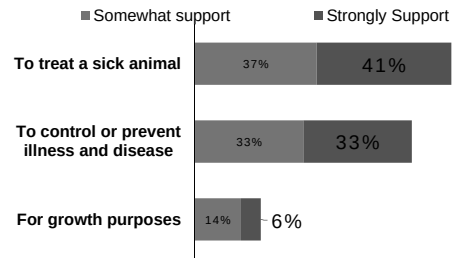
...But familiarity is low



SOURCE: Antibiotic Resistance – Heart & Mind Strategies – October/December 2014

Perception

Support or oppose the use of antibiotics in raising animals for food?



SOURCE: Antibiotic Research – Heart & Mind Strategies – October/December 2014

Reality

We use antibiotics for three reasons in the livestock industry:

1. **To treat sick animals:** Animals, just like people in all types of families and homes, get sick. Without appropriate antibiotic treatment, animal welfare could suffer.
2. **To prevent and control disease:** Human and animal health treatment differs. In humans, doctors often treat the individual. In farm animals, veterinarians often treat the herd, as well as the individual. Preventing and controlling the spread of disease is critical to keeping animals safe and healthy.
3. *To promote growth: By the end of 2016, antibiotics that are medically important in human medicine will no longer be used for growth purposes, in accordance with FDA Guidance 209 and 213.*

Opportunities

Proactively inform the public using a tiered approach:

Why
- Reasons why cattle require antibiotic treatment
- Human benefits associated with healthy livestock/cattle and food supply

How
- Rigorous methods and precise, research-based application
- Collaborative and responsible process (everyone has a vested interest)
- Rarity of antibiotic resistance

Impact
- Healthy, safe and sustainable food supply for consumers

SOURCE: Antibiotic Resistance – Heart & Mind Strategies – October/December 2014

Consumer Insights

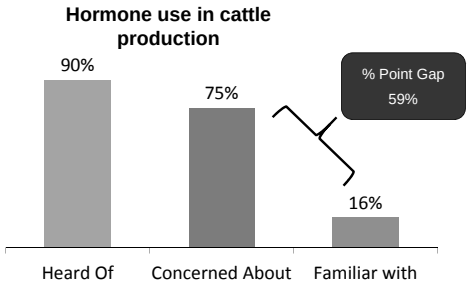
Not all consumers want to know about beef production specifics, such as hormones

WHY???

Other industry practices are brought to the consumers attention

"The description of how the pellet works makes me feel bad for the animals."

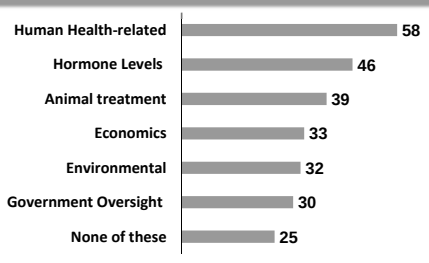
Keeping with the trend, consumer concern and awareness are high but familiarity is low.



SOURCE: Growth Promotant Research– IPSOS– November 2014 – February 2015

Perception

Topics desired to increase consumer comfort about hormones



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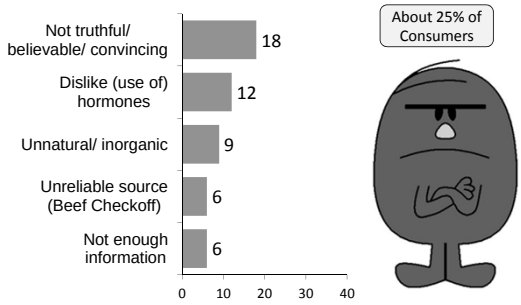
Reality

…Still some consumers do not accept the use of hormones



About 25% of Consumers

SOURCE: Growth Promotant Research– IPSOS– November 2014 – February 2015

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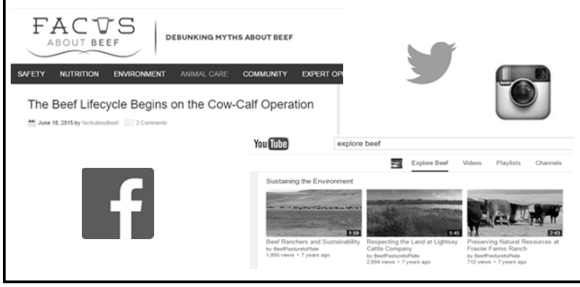
Consumer Insights

Online is the vehicle for Millennials who want to learn more about beef.



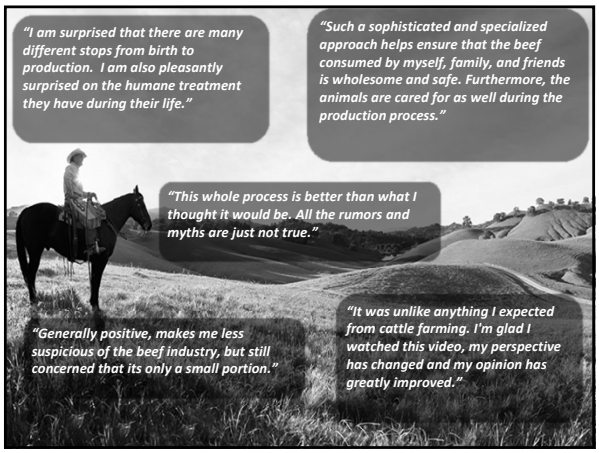
Total Production Resonates Most

Total Production

=

Post Production Concern Level

Treatment	GMOs
Conditions	Hormones
Diet	Antibiotics



Opportunities

Bring the entire beef lifecycle to life wherever possible – strong visual support, such as in-person or video, work best

Incorporate all the people involved in the process including family and other credible parties when possible (e.g. vets)

Show what is actually happening throughout the process (show hormone implant, space in pens for room to move, etc.)

While respondents are looking for transparency and show a lack of knowledge about beef production, the slaughter process makes them itchy

Place content where Millennials are looking (online)

SOURCE: Misperceptions of Beef Production – Heart & Mind Strategies – June/July 2014

Consumer Demand Opportunity

Need involvement from every partner in the beef supply chain to reach consumers and provide the facts about beef production with targeted messages to appeal to their perceptions and the methods by which they form their beliefs.

Understanding Consumer Perceptions

Ashley Hughes
Florida Beef Council

Chevrolets, Cadillacs, Cows, and Consumers?

T. Thrift, Associate Professor[1]

[1]Department of Animal Sciences, University of Florida, Gainesville, FL

Notes:

The Impact of Disease Nutrition and Management on the Beef Production Chain

M. Irsik, DVM, MAB, Beef Cattle Extension Veterinarian[1]

[1]University of Florida College of Veterinary Medicine, Gainesville, FL

Animal health and nutrition can have significant impacts on beef cattle herds. If the nutrition, health or husbandry of the herd is compromised there will be adverse consequences with accompanying economic losses. The number one health concern in beef cattle production is respiratory disease commonly referred to as BRD or Bovine respiratory disease. The number one production concern for cow calf herds is reproductive efficiency. The beef industry has come a long way in understanding the various pathogens, nutritional, environmental, husbandry and genetic factors associated with disease and production loss. This knowledge is utilized in developing improved vaccines, treatments, nutrition programs and management options. However, the reality is that the incidence of BRD and other diseases within the cattle industry has not changed or has changed only slightly. The explanations for lack of improvement are not entirely clear but probably include, intense production, lack of efficient methods for disease prevention, animal movement and transport, genetic susceptibility, selection for production traits with less concern for health traits, a market system for beef cattle which combines enhanced pathogen exposure with collateral stress and production cost constraints. While new approaches hold promise, the beef industry could reduce losses associated with disease and improper nutrition by applying current knowledge regarding; adequate nutrition for the entire herd, management of dams during parturition, optimum heifer development, low stress handling, weaning, transport, preconditioning programs, ranch biosecurity and comprehensive herd health programs. With beef producers working with their herd's veterinarian, nutritionist and other industry professionals as a team utilizing the expertise within that team toward management of the herd. While it is beyond the scope of this paper to address all of the health management and nutrition programs which have an impact on beef production, selected health concerns and associated production losses will be discussed for cow-calf production, backgrounding and the fed cattle phase.

Cow Calf Production

In beef cattle production, animal health and life time performance enhancements begin at the cow calf level. It is at the cow calf level that perhaps the greatest impact can be attained in improving health and production of the beef herd. The 2007 USDA national animal health survey, (NAHMS) for cow calf producers indicated that the major cause of sickness and death for calves less than three weeks of age were birth related and weather. For calves older than three weeks of age the major cause for sickness and death was associated with respiratory disease and digestive disorders.

Adequate prepartum nutrition is important in ensuring; normal fetal growth, calf survivability and growth, postpartum breeding efficiency and a short calving interval. Dietary restrictions to the cow during pregnancy and post calving can have a negative impact on the health and performance of her progeny in both the short term and in total life time performance. Feed costs typically represent the single largest cost for cow calf producers. Based on data from cow calf operations located in the mid-west, total feed cost which included pasture and non-pasture were 48% of total costs in 2014 and 49% of total costs for the time period of 2009-2013 average. During this three-year period total annual feed cost averaged $491 per head, with a range from $209 to $793 per head.[12]

Calf health begins at conception and is affected during embryo and fetal development. In utero infections may result in failure of conception, early embryonic death, abortion, stillbirths, or the birth of weak calves

that often die. The proportion of abortions caused by infections is not known, but approximately 90% of abortions in which the cause is determined are due to infection. Cows can contract infectious agents by many routes; through the respiratory tract, mouth, vagina, or from insect bites. Some infectious agents may be carried into the reproductive tract with semen or embryo transfer fluids.[8] Most of the organisms known to cause placental and fetal disease may also cause disease or infection of the newborn. However, infections of the new born contracted in utero are uncommon compared with infections contracted after parturition. In cattle, these infectious agents include but are not limited to, *Brucella abortus*, *Leptospira*, E. *coli, Streptococci, Aspergillus, Campylobacter, Trichomonas foetus* and IBR and BVD viruses.[8]

There are several infectious diseases which can cause abortion and impaired fertility in the cow and may be associated with disease in the calf. The most common reproductive diseases of beef cattle in the U.S are, Bovine herpes virus-1 (BHV-1), Bovine virus diarrhea (BVDV), *Campylobacteriosis*, *Leptospirosis* and *Trichomoniasis*.

Bovine herpes virus-1 (BHV-1), may terminate pregnancy at any stage of gestation and may contribute to neonatal losses in calves from susceptible dams. The use of intramuscular modified live vaccine at the correct time of the production cycle provides protection against respiratory signs and abortion in cattle. It does not prevent latent infections. Achieving successful immunization against IBR while avoiding complications requires proper timing of administration and handling of vaccine. Vaccination at the time of breeding with intramuscular modified live IBR vaccine may significantly decrease the conception rate in susceptible cattle. Failure of a single injection of a modified live IBR agent to immunize may be due to improper handling, storage or administration. Declining immunity against IBR may be stimulated by natural infection, reactivation of latent virus, or the administration of a modified-live vaccine. The annual use of intramuscular modified live IBR products may be unnecessary to attain herd immunity and protection from abortion.[9,10] Because modified live products must replicate (cause infection) to stimulate immunity, caution should always be used in planning the herd vaccination program to avoid exposure of susceptible non-vaccinated animals. The use of killed IBR vaccines has increased because of safety concerns that may be related to modified live vaccines. However, modified live vaccines invoke a longer and often greater degree of immune response than killed viral vaccines.[16] There is some concern about the use of modified live BHV-1 vaccines in pregnant cattle. Sprott evaluated the use of a MLV BHV-1 vaccine in pregnant cattle previously immunized with chemically altered vaccines prior to breeding. There were no differences in the pregnancy rate or abortion rate between MLV and killed vaccine vaccinated animals. The conclusion was that under field conditions one injection of either chemically altered BHV-1, or modified live BHV-1 virus vaccine given to previously vaccinated beef replacement heifers did not increase the incidence of fetal loss above expected spontaneous rates.[17]

Bovine virus diarrhea (BVDV) is distributed worldwide. The main concern for the beef breeding herd regarding BVDV is fetal infection resulting in abortion, the development of congenital defects or the development of persistently infected animals that are a constant source of infective virus. The virus has the ability to cross the placenta in susceptible pregnant cattle and infect the fetus. If this occurs before the sixth month of pregnancy, fetal losses or immunotolerance may result. Fetal infection during the last month of pregnancy usually results in the birth of an immune seropositive health calf. It is believed that optimum protection of the breeding herd depends on active immunization with a modified live BVD virus vaccine prior to breeding.[11] For replacement heifers, in order to insure a response the vaccine should be administered two or more times between weaning and breeding with the final injection given no sooner than thirty days prior to breeding. The long duration of immunity and the cross protection between BVDV serotypes following the use of modified live vaccines makes them ideal for use in breeding herds. Vaccination of cows against BVDV is usually performed in combination with BHV-1 virus vaccine.

Campylobacteriosis, (Vibriosis), is a venereal disease of cattle characterized by temporary infertility and sometimes abortion. Immunization provides protection for a high reproductive rate. Effective

immunization using an oil adjuvanted vaccine requires a sensitizing dose followed by a second dose one month prior to breeding followed with annual boosters approximately one month prior to breeding.[9] Immunization of bulls has been shown to be of value in preventing the carrier state.[9] Vaccination of beef cows and heifers against campylobacteriosis is commonly performed in combination with a five-way leptospirosis vaccine. Both should be administered pre-breeding which can be a logistical concern for cow calf producers.

Leptospirosis has been reported to be the most commonly reported disease causing abortion in beef cattle. Vaccination every twelve months in closed herds and every six months in endemic areas is protective. Vaccination of bulls with booster injections prior to breeding season is important due to the ability of bulls to venerally transmit the disease. Vaccination may also aid in reducing the incidence of shedding the organism through the urine. A five-way Leptospirosis vaccine is often utilized in combination with campylobacter. Both should be administered prior to the onset of breeding.

Reproductive losses due to *Tritrichomonas foetus* results primarily in delayed fertility but may also be associated with abortion, pyometra and reduced calving rates. Infected animals gradually develop an immune response that allows them to remain pregnant and eventually eliminate the infection in four to seven months. Bulls are the primary source for the disease and once infected are considered to be permanently infected. A licensed vaccine is available which is reported to help the vaccinated female eliminate the organism and infection in a more rapid manner. Vaccination of bulls appears to have no application in the control of the disease. Vaccination against Trichomoniasis has been recommended by some for controlling the disease in infected or high-risk herds.

Because infectious disease processes can have an effect on bovine pregnancy, the status of the immune response of a pregnant cow and infectious diseases that cause abortion or infertility are important. The successful outcome of pregnancy requires the dam to have and the fetus to develop a functional immune system and each must tolerate the other. During pregnancy the dam must protect the fetus from maternal infections and not reject the fetus. The fetus must develop the ability to recognize self from non-self and not respond to antigens from the dam. The dam must develop and provide high quality colostrum. The calf must consume colostrum in sufficient quantity soon after birth to enhance survival and optimize life time performance. It has been well established that there is a nonspecific immunosuppression of the dam and an increased susceptibility to infection during pregnancy.[8] The mechanism that accounts for this immunosuppression involves both T and B cells. Antibody production by B cells is active against infectious agents in pregnant animals. The T cells function of phagocytosis of virus infected cells appears to be the immune compartment most affected during pregnancy.[8] During pregnancy there is an increase in suppressor T cells which results in a decreased response to T-cell dependent antigens (viruses). Also endotoxins, excreted by bacteria, may cause an endotoxemia which can stimulate prostaglandin synthesis in a variety of tissues. Prostaglandins are leutolytic, cause regression of the corpus luteum and a decrease in progesterone which can lead to fetal loss or an abortion.[8] The immune depression in the cow is controlled by progesterone, the hormone of pregnancy. The suppressed immune response in pregnant cows can be partially controlled with proper nutrition and appropriately timed vaccination programs.

Reproductive efficiency is a major determinant of profit in beef cattle enterprise. Reproductive efficiency is affected by numerous factors. An Australian study evaluated calf death losses in tropically adapted beef cattle. Some of the significant findings were, heifer calves were half as likely to die Odds Ratio, (OR .57) as bull calves during the first week of life. Twins, which are associated with lighter birth weights and increased incidence of dystocia were ~ 7 to 10 time more likely to die than were single-born calves. The rate of twinning was <1% of all calves born.[36] Culling of twin calving cows was considered unlikely to be beneficial for improving herd reproductive performance because of the very low incidence of twinning cows with repeating twin pregnancies. Low birth weight calves, which are often associated with reduced vigor and reduced colostrum intake when compared to calves weighing 85 pounds or greater

were strongly associated with an increased mortality rate (OR range depending upon birth wt. 1.56-2.12). Calves with birth weights less than 70 lbs. had a significantly increased risk of death, OR~5-9 within the first month of life. It was noted that the heaviest calves also had an increased risk for mortality compared to lighter calves. The increased risk of death for heavier calves was associated with calves which were assisted at birth. Young cows ≤ 4 yrs. had a higher percentage of low birth weight calves. These light weight calves had an increased risk for mortality 2 to 6 times greater than calves born to mature 5-7 year-old cows which had weaned a calf the previous year. Generally, the increased risk of calf mortality associated with younger cows was highest for maiden cows or young cows that had calved but had not successfully reared a calf (2.3-2.3). For all older cow-aged groups, cows that failed to rear a calf the previous year also tended to have an elevated risk for calf mortality relative to older cows that had successfully reared a calf previously, ranging from 2.7 in < 4 year old cows, to 2.1 in 5-7 year old cows, to 1.49 in 7+ year old cows.

In the Australian study, the majority of calf mortalities occurred before calves were first gathered for branding and vaccinating. In calves surviving to first gather, calves identified with horn scurs and dehorned at first work had a significantly higher risk (0R 8) of mortality compared to polled calves. The Canadian Veterinary Medical association has recommended that when dehorning is required it should occur via disbudding at <1 week of age in dairy, or at < 8 weeks of age in beef cattle to reduce the incidence of serious infection. Guidelines from the American Association of Bovine Practioners recommends both castration and dehorning be done at the youngest age prudent. Both procedures may be performed as early as first 24 hours of life.[37] It is further recommended that horns should be removed before the horn base grows larger than 1 inch in diameter.[37] In the Australian study, death after dehorning, (2.1% of dehorned calves) was the second most common reason listed for death, the most frequent reason for death was listed as unknown.[36]

No bull calves were castrated during the study therefore the risk of mortality from castration could not be determined. The effects of calving difficulty on calf mortality could not be estimated accurately because actual calving was rarely observed or assisted. However, it was noted that the death loss for assisted calves was high supporting the objective of avoiding heavy-birthweight calves. In extensive Australian production systems, Brahmans are a preferred breed partially because of the maternal ability to produce smaller calves which reduces the likelihood of dystocia related deaths where there is limited calving supervision. However, one concern for Brahman cows is the incidence of bottle teats which was associated with increased calf mortality. Because of the climactic similarities between Florida and parts of Australia as well as the influence of Brahman genetics within the Florida herd, the Australian study is quite applicable to Florida beef production systems.

The period of time around parturition has a significant impact on reproductive efficiency. The process of parturition can be a traumatic and hazardous event in the life of a calf. Parturition is initiated by a rise in fetal cortisol followed by a course of endocrine events in the dam that lead to; uterine contraction, dilation of the cervix, delivery of the fetus and finally expulsion of the placenta. Many different factors can disrupt the fetal or maternal systems involved with parturition and result in dystocia. Dystocia is one of the major causes for calf death and a loss of reproductive efficiency in the herd. Factors causing dystocia may include pelvic dimension of the dam, calf size, calf presentation and maternal factors such as weak labor, insufficient dilation of the cervix and uterine torsion. The most common cause of dystocia is feto-pelvic disproportion which is a mismatch in dam pelvic size and calf weight.[33]

Once a calf is born, one of the most important determinants of its survivability and immunocompetence is the timely consumption of high quality colostrum.[9,13] A calf's initially acquired immunity relies upon absorbing immunoglobulins found in the colostrum with its ability to absorb these macromolecules declining rapidly during the first 12 hr. after birth.[31]

Providing milk to the calf is perhaps the most important and obvious maternal behavior. Cows will typically suckle their calf within the first few hours after birth, this latency to nurse is longer in dairy cows after birth than it is in beef cows.[31] Latency is usually longer in primiparous than multiparous, likely because of the difficulties that some primiparous animals have in accepting their calves.[32] This latency period to first nurse is an important issue in cattle management. Dystocia resulting in poor newborn calf vitality and an increase in the time period before nursing may be a major cause of failure of passive transfer (FPT). Dystocia can lead to a cascade of behavioral and physiological responses which may have implications for calf vitality as well as long term health and productivity. Consumption of colostrum in calves with fetal distress can be reduced by up to 74% during the first 12 hours of life. Severe acidosis in calves which have experienced a difficult birth has been found to reduce colostrum intake by 52% and serum IgG concentration by 35%. Acidosis in the newborn calf can occur due to premature rupture of the umbilical vessels due to prolonged labor or forced extraction.

Following a normal delivery, a calf will be standing within 32 ± 20 minutes and will be nursing within 60 ± 27 minutes. A calf which is assisted during deliver will often be, anorexic, weak and slow. Calves born with assisted deliveries will generally be standing within 90 ± 78 minutes and be nursing within 138 ± 100 minutes. Intervention strategies should be in place to mitigate the effects of pain and trauma on the health and survival of the newborn calf. Ninety percent of calf losses are attributed to a delay in the dam receiving assistance or to the difficulty and time required to remove the calf. Knowing when intervention is required and when to call for professional veterinary assistance can greatly increase the calf's chance of survival.[30] Signs of reduced viability of the neonate, including peripheral edema, scleral hemorrhages, cyanosis of the mucous membranes or reduced responsiveness to stimulation are indications that intervention is required.[35] Monitoring calving cows and assisting their calves at deliver and after deliver are important considerations for a producer.

After a calf has suckled and absorbed colostrum, the half-life of IgG received through the colostrum is approximately twenty days. By one hundred days of age, 97% of the maternal antibody received by the calf through colostrum is gone. Colostral leukocytes are also absorbed from colostrum and are also able to affect immune function.[14] Other important components of colostrum include growth factors, hormones, cytokines and non-specific antimicrobial factors.[13] Adequate colostrum consumption by a calf has a significant impact on the future health and performance of that calf. Calves identified as having failure of passive transfer were at greater risk (OR 3.2) of mortality from birth to weaning and were also at greater risk for feedlot respiratory morbidity (OR 3.1). Lower calf weaning weights are also observed in calves identified as having failure of passive transfer due to higher morbidity during the first 28 days of life which resulted in weaning weights being 35 pounds lower than expected.[20]

The response to vaccination by a young calf is affected by both its passive immune status i.e. absorbed maternal antibody and by the specific antigens in question.[9] The two key components required for successful immunization are efficacious vaccines and immunocompetent animals. Both killed and live vaccines are in use and the advantages of one are usually the disadvantages of the other. Modified live vaccine attributes are, strong, long lasting antibody response achieved with fewer doses, less reliance on adjuvants, stimulation of interferon production and stimulation of the cell mediated immune responses. Some advantages of the killed vaccines are, they are more stable in storage and are unlikely to cause disease due to residual virulence or reversion. It is generally recommended that calves receive at least one, preferably two modified live four way viral vaccines against the four common viral components associated with BRD prior to weaning. Studies have shown that a single dose of a MLV virus vaccine containing BVDV, BHV-1, and BRSV administered to calves at 3.5 to 4 months of age induced humoral and cellular immune responses against the vaccine viruses and protected those calves from a BHV-1 challenge for 6 months after vaccination.[21] If a killed vaccine is utilized, a calf should receive two doses of that vaccine within the labeled time interval prior to weaning. The ability of residual maternal antibodies to influence the immune response in young calves remains controversial and requires

continuing research. Immunological dogma that passively acquired maternal antibodies can inhibit the immune responses in calves appears to be somewhat true for the humoral immune response but not true for cell mediated immunity.[21,22,23]

BRD is an infectious respiratory disease of cattle with a multitude of causes including stress and possible viral or parasitic infections that suppress the host immune system, allowing bacteria to rapidly reproduce in the upper respiratory tract. Bacteria identified in calves suffering from BRD include *Mannheimia haemolytica, Pasteurella multocida, Histophilus somnus* and *Mycoplasma bovis*. *Mannheimia haemolytica* is considered to be the predominant bacterial pathogen associated with BRD.[18] For cow calf producers BRD is a calf health problem. Two of the viruses that are associated with reproductive failure in beef cows, BHV-1 and BVDV are also associated with respiratory disease. Two other common respiratory viruses, Parainfluenza-3 virus PI3) and Bovine Respiratory Syncytial Virus (BRSV) have been isolated in pneumonic calves and are not considered to be associated with reproductive failure but are associated with respiratory disease in young calves. All four viruses, BHV-1, BVDV, PI-3, and BRSV, are immunosuppressive and create damage to the respiratory tract epithelium allowing commensal bacteria access to the lower respiratory tract and the potential to create active infection. The leading causes of death for beef calves greater than 3 weeks of ages is respiratory disease.[30] Woolums reported on the incidence of BRD in cow calf operations in the Plains and Eastern states. Bovine respiratory disease had been detected in ≥1 calf in 21% of operations; ≥1 calf was treated for BRD and ≥ 1 calf died because of BRD in 89.2% of the plains states and 46.6% of Eastern states operations in which calf BRD was detected. Detection of BRD in calves was significantly associated with larger herd size, detection of BRD in cows and diarrhea in calves. Calving season length was associated with BRD in calves in Plains states but not Eastern states. Cumulative incidence of BRD treatment was negatively associated with large herd size and examination of cows to detect pregnancy. Incidence of BRD was positively associated with calving during the winter, introduction of calves from an outside source, offering a supplemental feed to calves and use of an estrous cycle synchronization program for cows.[7] Bovine respiratory disease is the most important and costly disease condition encountered by stocker and feeder operations accounting for over 50% of the deaths.[41] The highest incidence of death associated with BRD occurs in recently weaned calves that have recently arrived at a feedlot.[40] Seventy five percent of calves that die from BRD are sick with 2 weeks of feedlot arrival.[40] The relative risk that cattle entering a feedlot would die of a respiratory tract disorder increased significantly from 1 in 1994 to 1.46 in 1999.[41] The highest incidence of death associated with BRD occurs in recently weaned calves that have arrived in feedlots. In one study 75% of calves that died of BRD were sick within two weeks of feedlot arrival.[30] The U.S. feedlot industry estimates an annual loss as high as one billion dollars due to loss of production, increased labor expenses, drug costs and death because of bovine respiratory disease. Fulton and colleagues estimated that producers lose $41.00 per head for 1 treatment, $58 per calf for 2 treatments and $291 per calf for 3 or more treatments for BRD.[19]

It is a common recommendation by veterinarians to vaccinate calves against respiratory pathogens. Vaccinating calves while on the cow and/or at weaning are important management considerations for the beef herd. In order to help minimize the effects of respiratory disease within the beef production chain, preconditioning programs should be instituted at the earliest point of intervention, the breeding cow herd. Preconditioning programs generally prepare the weaned calf to meet the health challenges occurring when; the calf comes in contact with other cattle, the calf is placed in an environment facilitating transmission such as trucking over long distances and or overcrowding in the markets, the calf is exposed to environmental conditions such as dust, humidity, environmental temperature extremes, nutrition changes, all singularly or combined predispose the calf to increased BRD risk.[45]

Currently in the U.S. there are licensed and commercially available viral vaccines for BHV-1, BVDV, Pi-3 and BRVS. The bacterial pathogens associated with commercial vaccines include *Mannheimia haemolytica, Pasteurella multocida, Histophilus somni,* and *Mycoplasma bovis.* Proper immunity to the

viral and bacterial pathogens is important because they have been identified by isolation and serology in commingled post-weaned calves purchased at auction markets. Many respiratory viral vaccines are available for the prevention of bovine respiratory disease. Each vaccine has unique characteristic such as antigen content, virus strains(s) and presence or absence of adjuvant. Vaccination against common respiratory tract pathogens has been the primary emphasis of BRD prevention. Recommendations regarding what age of calf to vaccinate, with what vaccines, with which type of vaccine varies greatly. Vaccination strategies that require the primary vaccination to be given at approximately 60 days of age, may have to contend with the effects of maternally derived antibody on vaccine response. There is mounting evidence that an immune response to viral antigens can be stimulated in calves with detectable antigen specific maternally derived antibodies.[39],[43,44] Studies have revealed a more rapid anamnestic response to revaccination with an MLV BHV-1 vaccine when the initial vaccination was administered to calves that had detectable virus specific maternally derived antibodies. Calves vaccinated prior to weaning against IBR, BVD, BRSV, PI-3 and two bacterial pathogens *Mannheimia* and *Pasteurella* were compared to control or non-vaccinated calves. Vaccinated calves seroconverted with an active immune response regardless of the age they were vaccinated prior to weaning when compared to controls.[39] Treatment costs were lower for vaccinates vs controls.[39] The mean mortality rate was higher in control non vaccinated calves than calves vaccinated at 2 and 6 months of age. However, there was no difference in feedlot performance and carcass value between the vaccinated and control groups.[39] In another study, calves inoculated with viral and bacterial antigens associated with BRD were only 0.68 times as likely to be treated for BRD as were unvaccinated controls.[38] Calves vaccinated and conditioned on the farm for 30 days after weaning were only 0.22 times as likely to be treated for BRD as were control calves.[39] Fulton evaluated pre- arrival vaccination programs and feed lot performance for retained ownership calves, and re-affirmed that post weaning calves with increased immunity to viral and bacterial pathogens measured by antibody titer after vaccination perform better in the feedlot and have less clinical disease caused by the BRD pathogens and provide greater economic return to the owner.

The most obvious economic losses resulting from BRD are medicine costs and death loss. In the Texas A&M ranch to rail summary reports for the years 1992 through 2000, medical costs for calves becoming sick ranged from $20.76 to $37.00 per head. The economic losses due to an animal dying can be significant. The cost associated with an animal dying is calculated by multiplying the purchase price per head by the percentage death loss. For a set of calves experiencing a 5% death loss, the economic value in calves dying from a load calves weighing 550 lbs. could amount to approximately $5,600, before freight, medicine, opportunity cost, and lost performance of other pen mates is determined.

The more challenging loss to determine financially is the loss in production due to sick calves. The difference in average daily gain (ADG) between calves that remain healthy and those that suffered from BRD can be quite significant. In receiving studies ranging from 28-42 days in length, differences in ADG of 0.31 to 0.50 lb. per day have been reported.[46,47] Calves requiring two or more courses of therapy experienced even greater losses in daily gain as compared to calves requiring only one treatment. In a study conducted by Van Donkersgoed et al. calves which were never sick gained 2.75 lbs. per day, while those treated once for BRD gained 2.62 lbs. per day and those treated with two or more courses of therapy gained 1.54 lbs. per head per day.[49] In an Oklahoma receiving study, calves that did not become ill gained 2.32 lbs. per day during a 42-day trial, while those treated once or more than once gained 2.17 and 1.83 lbs. per day. A 90-day Canadian trial showed that calves experiencing an episode of BRD gained 0.39 lb. per day less than those remaining healthy, while those treated two or more times gained 0.73 lbs. less per day. In a 150-day feedlot finishing study, researchers found that steers never treated for BRD, gained 0.09 to 0.4 lbs. more per day than steers treated once or more than once respectively. Differences in ADG between treated and untreated cattle may persist until close out, however the difference in ADG tends to narrow as days on feed increases.

Clinical illness is clearly associated with increased production costs and has been estimated to cost the beef industry $500 million dollars per year. However subclinical illness also leads to increased costs of production while simultaneously causing reduced performance and carcass value. With current technology it is not possible to identify all sick calves. It has been estimated that for every calf pulled from its pen for treatment there are likely two calves that experience subclinical illness. In a Nebraska report, lungs were examined at slaughter for the presence or absence of pulmonary lesions. Average daily of gain of calves with pulmonary lesions at slaughter was reduced by 0.17 lbs. per day during the 273-day feeding period.[49] They found that 78% of calves that had been treated had pulmonary lesions at slaughter, while 68% of those untreated were also found to have lung lesions. Bryant reported that the presence of lung lesions at slaughter was associated with decreases in ADG ranging from 0.073 to 0.65 lbs per day. Researchers at Oklahoma State University reported that steers without pulmonary lesions at slaughter gained 3.48 lbs per day during a 150 day feeding period. Steers with inactive pulmonary lesions gained 3.15 lbs per day, while those with active pulmonary lesions gained only 2.57 lbs per day. Among the steers never diagnosed as sick, 37% had respiratory tract lesions at slaughter. Of those diagnosed as sick 48% had lung lesions. In a study following heifers from backgrounding thru full feeding and then slaughtered, 66% of heifers never treated for BRD graded choice, 59% treated once graded choice, and 41% of those treated more than once graded choice.

Identifying cattle suffering from BRD and applying appropriate treatment(s) in order to minimize the effects of BRD on fed cattle is challenging. The use of clinical signs or treatment records for classifying BRD may have limitations. Sub clinically infected cattle are often not identified as suffering from BRD. At slaughter the presence of lung lesions is a common method of determining current or previous respiratory lung infections. Not all cattle with lung lesions associated with BRD will have clinical symptoms and not all cattle with BRD will have detectable lung lesions at slaughter.[5,6] Subclinical respiratory tract infections may produce permanent lung damage and have associated negative effects on growth and carcass traits. An integrated approach involving a continuation and expansion of preventive health-care measures in the cow-calf segment of the beef industry is advocated to improve health and economic outcomes for the cow-calf, feedlot and packer segments of the industry.[39]

Stocker and Fed Cattle

The fed cattle industry continues to evolve due to the economic risks associated with feeding cattle. Ownership of fed cattle is changing, partially due to economic constraints and historical returns associated with different sections of beef production. In 2011, yards with less than 8,000 head on feed sourced a majority of their animals from sale barns while yards with a capacity over 8,000 sourced their cattle from cattle buyers and backgrounders. There is an increasing percentage in the overall number of cattle on feed owned by the feedlot rather than by individual cattlemen. Nearly 60% of cattle on feed were owned by the feedlot in 2011, compared with about 25% of cattle in 1994.[24]

In order to mitigate some of the economic risk of fed cattle, feedyard operators are increasingly concerned with the health and health programs for new arrivals. Bovine respiratory disease (BRD) is the costliest feedlot disease in the United States. Incidence rates have been reported to average 14% for fed cattle.[1] Estimates of losses associated with BRD have been placed at over one billion dollars annually while prevention and treatment costs are estimated at over three billion dollars annually.[2]

The percentage of feedlot operators that considered pre-arrival processing practices to be either extremely or very effective has increased.[24] There is an increased emphasis on the timing of vaccination on new arrivals and the use of metaphylaxsis on incoming cattle. The procedures that cattle feeders felt were important or very important for cattle prior to arrival at the yard are; introduction to a feed bunk, respiratory vaccines administered at least 2 weeks prior to weaning and at weaning, calves weaned at least 4 weeks prior to shipping, castrated and dehorned prior to arrival and treated for internal parasites prior to arrival.[24] The average death loss for fed cattle in 2011 was 1.4% of all cattle placed on feed.[24]

Vaccinating calves against the viral respiratory pathogens prior to weaning has an impact on the health and performance of those animal's post weaning.[24]

Feedlot veterinarians whom represented 11,295,000 cattle on feed in the U.S. and Canada participated in a beef cattle health and well-being survey. All participants recommended IBR and BVDV for high risk cattle at processing while 65%, 15 of 23 recommended an additional vaccination against BRSV and 14 against PI-3 virus.[25] Clostridial vaccinations were recommended by 14 (60.87%), 17 (74%) recommended *Mannheimia haemolytica*, and 8 (35%) recommended *Pasteurella multocida* and 5 (22%) recommended *Histophilus somni* vaccinations. Autogenous bacterins were recommended by 39% of participants for high risk cattle. Metaphylaxsis and feed grade antibiotics were recommended by 95% and 52% of respondents for high risk cattle on arrival. For low risk cattle, 4 veterinarians recommended feed grade antibiotics and 16 did not. Past research has shown a decrease in treatment rates for BRD in high risk cattle using various protocols for metaphylaxsis and or use of feed grade antibiotics.[25,26] High risk cattle would include weaned or recently weaned light weight calves, particularly if the incoming calves had not been vaccinated, castrated or dehorned prior to arrival into the yard.

Vaccine recommendations for low risk cattle included all respondents (100%) recommending IBR and 22 (95%) recommending BVDV, while 12 recommended additional vaccinations for BRSV and PI-3. Approximately half (56%) recommended the use of clostridial bacterins in low risk cattle. For the route of administration of parasiticides, 16 (70%) recommended injectable forms only, none preferred oral only, 9% preferred pour on and 22% recommended a combination of administrations.[25] Six veterinarians recommended generic vs. trade-name parasiticides. Feedlot veterinarians recommended starting high risk calves in smaller pens and allowing 13 inches per head of bunk space. Ancillary therapy for treating respiratory disease was recommended by 47% of those surveyed. Vitamin C was recommended (30.4%) twice as often as any other ancillary therapy. Cattle health risk on arrival was influenced by weather patterns, and labor availability. These two influencers were the most important factors identified for predicting feedlot morbidity while the metaphylactic antibiotic, antibiotic therapy, and brand of vaccine were least important. Training of feedlot employees by veterinarians can be critical for the implementation of management recommendations for health and well-being of feeder cattle. All respondents indicated they spent time training feedlot employees on cattle handling, 12 (52%) conducted animal welfare audits at their client's feedlots while 47% did not. Rest after arrival is an important consideration for stressed calves and their response to vaccine. After receiving short hauled cattle defined as less than 8 hours in transit, 52% of survey veterinarians did not require a rest period before processing, 22% required a 6-hour rest period, three a 12-hour rest and four required a 24-hour rest. After receiving long haul cattle, defined as greater than 8 hrs. travel, one veterinarian did not require a rest period, one required 6 hrs. rest, 6 required 12 hrs. rest, and 15 required 24 hours of rest.[25]

Castration and pregnancy management are important health considerations for fed cattle. Surgical castration was recommended more frequently for light weight cattle while banding was recommended for frequently for heavier cattle.[25] For cattle weighing less than 300 lbs. on arrival, surgical castration was recommended by 63% of veterinarians. For cattle weighing between 300 to 500 lbs. on arrival, 43% recommended surgical castration, 13% recommended banding and 43% recommended either banding or surgical castration. For cattle weighing over 500 lbs. on arrival, surgical castration was recommended by 22% and banding was recommended by 56% of respondents and 22% recommended either method.[25] For animals weighing greater than 800 lbs. a majority of the veterinarians recommended castration utilizing the banding technique. Some research has not indicated a significant difference in average daily gain between banding and surgical castration, but regardless of the method the degree of weight loss post castration increases significantly as the age of castration increases and cattle castrated with a band have greater average daily gain on a carcass weight basis compared to surgically castration.[27,28] When castrating bulls using a band, it was recommended by 96% of the survey participants to administer concurrent tetanus antitoxin

To manage pregnancy in newly arrived heifers, 18 (78.26%) of 23 feedlot veterinarians recommended that a producer should pregnancy-check heifers while five did not. Respondents additionally emphasized checking heifers of unknown origin or no management history. Mass abortion protocols were recommended by 8 (35%) veterinarians while 15 (65%) did not recommend mass abortion. Open feedlot heifers returned $40.00 more per head than aborted heifers and $66 more per head than pregnant heifers.

Testing animals for persistent BVDV viral infection (PI) was recommended by 39% of surveyed feedlot veterinarians.[25] The issue that comes about from testing animals for PI is what to do with the animals that test positive. Should these animals be euthanized, sold, fed in quarantine or remain with their pen mates? The feedlot survey respondents indicated that cattle testing positive are either held and fed in quarantine or sold for salvage slaughter.[25] PI positive animals should not be placed back onto the market.

Railed cattle are unthrifty and non-producing animals sold prior to pen mates in order to salvage some monetary value. Slightly less than 4 percent of all cattle placed on feed left the feedlot for non-harvest reasons.[24] Ninety six percent of feedlots sold railers for salvage value, with the most common reason for cattle to be railed was chronic BRD (44%), lameness (48%), and chronic non-performance issues (8%).[25]

Euthanasia is occasionally necessary as part of animal care and husbandry. Feedlot veterinarians use gunshot in a majority of feedlots (87%) with only 13% using a captive bolt. All respondents indicated they had a program in place for the care and handling of non-ambulatory cattle before. The time to wait for clinical improvement before recommending euthanasia in non-ambulatory cattle ranged; 21% recommended euthanasia in less than 24 hours for non-responders, 52% waited from 24 to 48 hours with no improvement before animal euthanasia and 27% would wait 49 to 72 hours with no clinical improvement before animal euthanasia, none waiting longer than 72 hours for signs of clinical improvement before performing euthanasia.[25]

Seven factors related to prediction of morbidity and mortality of feeder cattle were ranked by feedlot veterinarians. The ranking were in order of importance, cattle heath risk, weather patterns, amount and quality or labor, receiving nutrition program, class of antibiotic for metaphylaxsis, class of antibiotic for treatment and the least important being brand of vaccine.[25]

The production system for beef cattle can be associated with numerous stressful events. Understanding these events and how to minimize their impact on beef cattle is important. Beef producers who understand the production chain from conception to consumption understand the importance of herd management, nutrition and timely applications of health protocols. Applying the principles of, animal science, animal care, animal welfare and herd health management with the application of production technologies when appropriate will enhance food production, animal well-being and the safety of beef as a nutritious high quality food.

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TEXAS A&M AGRILIFE EXTENSION

EAG-018
7/15

Key Performance Indicator Targets for Beef Cow-calf Operations

Stan Bevers and David Anderson
Professors & Extension Economists
The Texas A&M University System

The national beef herd is currently expanding from historically low levels. This expansion and the possibility of lower prices provide an excellent opportunity for you to review financial performance measurements that are critical to your operation. These measurements are known as Key Performance Indicators (KPIs) and are based on production and financial data. You can use these KPIs to evaluate different factors that are crucial to the success of your cow-calf operation. They can help any rancher evaluate whether the operation is fulfilling his or her goals. In a sense, they are a report card that can be used to identify weaknesses in a given operation. Below are thirteen KPIs that every rancher should consider as they start the process of restocking their ranch.

It is important that you calculate KPIs correctly and base them on good data. Be honest with yourself. In some instances, ranchers find that their financial recordkeeping isn't as good as it should be. The most accurate KPIs are calculated from financial accrual-adjusted records. Remember that no single KPI assures success. As with a ranch's resources, the ranch manager must balance the use of these indicators. To focus on one KPI, at the expense of another, will not improve the overall performance of the ranch. As an example, increasing the pounds weaned per exposed female does no good if the nutritional base expense indicator is too high. KPIs have to be in balance for overall performance to be excellent. Finally, most ranches are involved in multiple enterprises. The KPI's discussed below are strictly for the cow-calf segment of a ranch.

Target levels for the various KPIs have been identified through analysis of herd data from several sources including hundreds of herds in the Beef Cow-calf SPA and the authors research and experience working with individual ranch owners and managers.

1 Pounds Weaned per Exposed Female – Greater than 460 pounds per Exposed Female

The primary objective for owning breeding beef females is to wean calves. While every rancher has this goal, how they accomplish it over time varies. However, the number of calves weaned and how heavy those calves are serve as an indicator of ranch productivity. From a production standpoint, the pounds of weaned calf per exposed female remains the most important production KPI. To calculate this KPI, divide the total pounds of weaned calves by the total number of exposed breeding females that were intended to be bred. This KPI is a function of

weaning percentage and weaning weights. A high weaning percentage begins with a high pregnancy rate followed by a high calving percentage. While weaning weights are certainly a function of genetics and management, weather and days of age are the most important determinants. To solve low pounds weaned per exposed female, a rancher should look first at reproduction rates, not at increasing weaning weights.

2 Revenue per Breeding Female – Greater than $950 per Breeding Female

For a ranch to record net income, it must sell products and generate revenue. In its simplest form, this KPI is a product of pounds weaned being sold for a competitive price. However, revenue per breeding female also includes other items. First, this KPI would include the gains or losses associated with the sales of culled breeding stock. Second, it should include the annual value change (accrual adjustment) of the weaned calves that are kept in the herd as replacement heifers or replacement bulls. Ideally, this value would be the accumulated expenses of the calves; however, many ranchers may choose to use market value. The target figure of $950 per breeding female is based on accumulated expenses, not market value. If you use the market value approach, the KPI should be higher than $950.

3 Nutrition Base Expense as a Percent of Total Expenses – Between 30.0 and 45.0 Percent

Because reproduction is the the most important factor in ranch productivity, proper herd nutrition is imperative. Yet, no two ranches have exactly the same resources to grow, purchase, and maintain the nutritional base required by the breeding herd. Thus, we need to identify three types of nutritional expense: 1) expenditures for purchasing forage, protein supplement, salt, and minerals; 2) expenses for producing raised feed, such as hay production; 3) costs to maintain and improve grazing for the herd. Those familiar with the Beef Cow-calf SPA analysis will recognize these as the Raised/Purchased Feed Expense and the Grazing Expense. To calculate this KPI, start with the total expense of the ranch including owner labor and depreciation. Then, identify the nutritional costs. Most successful ranchers keep nutritional expenses at 30 to 45 percent of total expenses.

4 Labor and Management Expense as a Percent of Total Revenue – Less than 15 Percent

Labor and management expense can be the most variable cost across beef herds. To calculate this KPI, determine what the total labor and management expense is. If the ranch uses only hired labor and management, this figure is relatively easy to determine. If an owner operates the ranch, he must establish a figure for his labor for this KPI to be comparable. In either case, items such as payroll taxes and employee benefits need to be included. Labor and management costs are higher than most people realize due to the benefits that hired managers receive. To interpret this KPI, the ranch owner should target spending less than $0.15 for labor and management per one dollar of revenue generated.

5 Operating Expense as a Percentage of Total Revenue – Less than 75 Percent

Controlling expenses can be one of the most important exercises for ranch owners and managers. Managers should target operating expenses at less than 75 percent of total revenue. Operating expenses include all expenses except interest and depreciation. If operating expenses are less than 75 percent the ranch's total revenue, the ranch can use the remaining 25 percent to 1) pay interest, 2) hold in escrow to cover depreciation expense, or 3) retain as net income. Clearly, a ranch will suffer a net loss if operating expenses plus interest expense and depreciation is greater than total revenue.

6 Net Income Ratio – Greater than 5 Percent

This ratio corresponds with the fifth KPI. Net Income is calculated as total revenue minus total expenses. This KPI represents that portion of total revenue that is retained as net income. Put another way, a ranch can do four things with total revenue, 1) pay operating expenses, 2) pay interest expenses, 3) place in escrow to account for depreciation expenses, or 4) retain as net income. This KPI records each of the four as a percent of total revenue. This target is to retain greater than 5 percent of the total ranch revenue as net income, while the remaining 95 percent can be used to pay for operating, interest, or depreciation costs.

7 Cost per Cwt. of Weaned Calf – Less than $170.00 per Cwt.

For a ranch manager, the best number to know is what it takes to produce a pound of weaned calf, or in this case, 100 pounds of weaned calves. This KPI incorporates the productivity of the ranch and the total expenses it took to create that productivity. Every ranch has a different set of resources that it uses to create calves. This KPI illustrates how efficiently that manager is using those resources. When calculated correctly, you can compare this figure to other ranchers across the country regardless of the resources that the manager is using.

Industry-wide, this bottom line KPI is where ranchers compete with one another. Further, it is known that the cattle industry is cyclical and calf prices move between high (resulting in financial profits) and low (generating financial losses). This cyclical movement of prices relative to each ranch's cost of production is what encourages specific ranchers, and the cow-calf industry in general, to expand or contract. Given current fundamentals, a cost of less than $170 per cwt. is a target ranchers should shoot for.

8 Current Ratio – Greater than 2.0

Most ranchers have only one significant payday per year. That makes it imperative to have enough liquid assets to combat unforeseen events such as prolonged dry periods. The current ratio KPI reflects a ranch's ability to pay short-term liabilities, but also provides an estimate of its ability to quickly mitigate the impact of short-term unknown events. This indicator is calculated by dividing the ranch's current assets by the liabilities that have to be paid within the year. Current assets can be cash, savings, or any other asset that can be quickly turned into cash. Ranchers should strive to maintain a current ratio greater than 2.0.

9 Total Investment (Market Basis) per Breeding Female – Between $7,500 and $12,500

On most ranches, owned land is the major asset on the balance sheet. Currently, external factors have driven land prices higher. In today's real estate market, ranchers are finding it hard for breeding cows to pay for any land purchase. Furthermore, potential ranch heirs look at the large investment, labor required, and low rate of return, and have to wonder whether it would be better to invest elsewhere. The ranch manager's job is to generate the greatest return on the lowest investment possible. This KPI target range, $7,500 to $12,500, takes into account that some land has already been purchased (or inherited) or that some portion of land the ranch uses is leased. To calculate this KPI, divide the total asset investment from the balance sheet by the beginning fiscal year inventory of breeding females.

10 Debt per Breeding Female – Less than $500 per Breeding Female

Given the low rate of return on assets, most ranches cannot pay for much debt. To illustrate, a target Rate of Return on Assets KPI (Target KPI #13) is greater than 1.5 percent. With interest rates greater than 4.0 percent, it is impractical to purchase assets that will only return 1.5 percent when that interest is costing the ranch 4.0 percent. This example does not take into account cases where the asset improves the ranch efficiency enough to overcome the interest cost. This KPI can vary with some herds able to handle more

debt than others. To calculate this KPI, divide the total debt of the ranch from the balance sheet by the beginning fiscal year inventory of breeding females. In general, successful ranch managers keep the debt per breeding female under $500 each.

11 Equity to Asset Ratio (Market Basis) – Greater than 50 Percent

The equity to asset ratio is the percentage of a ranch the owner owns. To calculate this KPI, divide the net equity by the total assets. Both figures come from a ranch's balance sheet. The opposite image of this KPI is the debt to asset ratio that shows the percentage of the ranch owned by others, such as a lender. Few lenders will want to finance a ranch if they already own more than 50 percent of it. This being the case, you should strive to own more than half of the assets. The type of ranch assets you own will influence whether you can get financing. For example, if your share is made up of land you own, a lender may find it easier to lend money against an equity to asset ratio of less than half.

12 Asset Turnover Ratio (Cost Basis) – Greater than 15 Percent

Because ranching is such a highly capitalized business, it is vital that the manager generate the greatest possible net income from those assets. The asset turnover ratio illustrates how much those assets are generating (turning). To achieve a KPI target of 15 percent, every dollar of asset making up a particular ranch must generate $0.15. This figure may seem quite low, but it demonstrates the nature of the ranching business. To calculate this KPI, divide the net income by the value of assets from the balance sheet.

13 Rate of Return on Assets (Market Basis) – Greater than 1.5 Percent

Managers depend on the rate of return on assets to evaluate their performance. The manager's charge is to use the ranch's assets to generate positive net income. In this way, ranch managers are like fund managers on Wall Street. The difference, however, is the expected ROA. While the long-term return from Wall Street may be greater than 6.0 percent, the long-term return from breeding beef cows is closer to 0.5 percent. When calculated correctly, the ROA can be compared to any other asset management business including your savings account at the local bank. To calculate this KPI, start with the net income and add to it the interest expenses for the year. Then, divide this figure by the average value of the assets from the balance sheet. In this case, we use the market value basis as opposed to the cost basis of the assets. Successful ranches have an ROA greater than 1.5% over time.

The thirteen KPI's presented here are not the only measures that a ranch should consider. However, these KPI's provide an excellent starting point for evaluating the financial targets a ranching operation should strive for. Remember, each ranch is unique and possibly involved in multiple enterprises that contribute to the financial well-being of the operation. These variations may alter how certain KPIs are viewed.

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New

Key Performance Indicator Targets for Beef Cow-calf Operations

Stan Bevers
Professor & Extension Economist
Texas A&M AgriLife Extension Service
Vernon, Texas

Key Performance Indicators (KPI)

- **Performance Measures of Key Activities happening as a result of your management.**
- **Is management fulfilling the goals of the ownership.**
- **Tracked over time.**

Key Performance Indicators

- **Production KPI follows Beef Cow-calf SPA**
- **Financial KPI's follow Farm Financial Standards Council approach for accrual financial statements.**
- **It is important to calculate them correctly.**

Key Performance Indicators

- Need to balance the use of KPIs.
- To focus on one, at the expense of another, will not improve the overall performance of the ranch.

KPI Targets

- Some are specifically for Cow-calf enterprises, while others cover the entire ranching operation
- Many ranches are involved in multiple enterprises.
  - KPI for all activities
- Targets have been identified through analysis of individual ranches (Cow-calf SPA, Managerial Ranch Accounting, etc.), experience, and research.

13 KPI Targets

- 1 Production KPI
- 8 Financial KPIs
- 4 Integrated KPIs
- There are an unlimited number of "other" KPIs. Each ranch should determine those activities that are critical to your ranch's success and determine the best method to calculate a performance.
- Others are not any less important

Production KPI

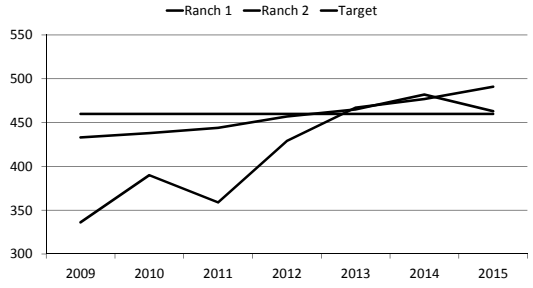
Pounds Weaned per Exposed Female

- 460 pounds per Exposed Female
  - Should be a KPI for any ranch that owns breeding cows with the intent of weaning calves.
  - Product of weaning percentage and weaning weights
  - Total pounds weaned divided by all females that were exposed and intended to be *bred*.

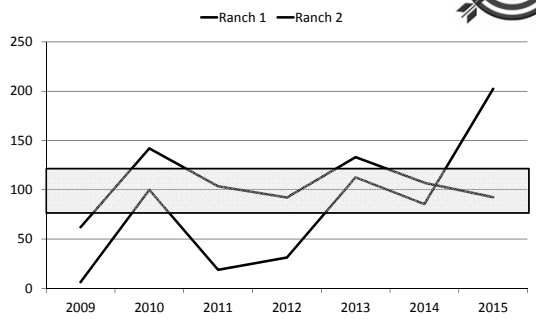
Production KPI

Pounds Weaned per Exposed Female

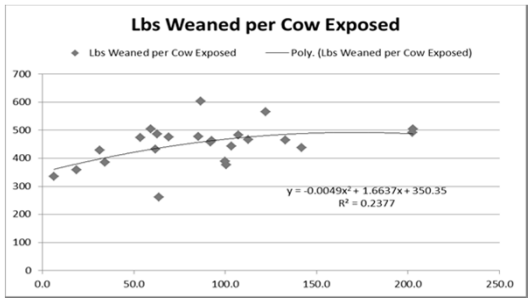
460 pounds per Exposed Female



Percent Normal Rainfall



Percent Normal Rainfall Effect on Pounds Weaned per Cow Exposed



Integrated KPI

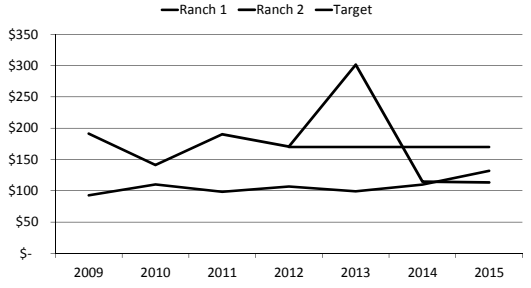
Cost per Cwt. of Weaned Calf

- **Less than $170 per Cwt.**
  - **IMO: The most important number for ranch management**
  - **Incorporates:**
    - **Productivity**
    - **Total expenses it took to get that production**
  - **Every ranch has different resources; this KPI shows how efficiently those resources are being used to create productivity.**
  - **Total expenses (less "other revenue") divided by total pounds weaned.**

Integrated KPI

Cost per Cwt. of Weaned Calf

Less than $170 per Cwt.



Financial KPI

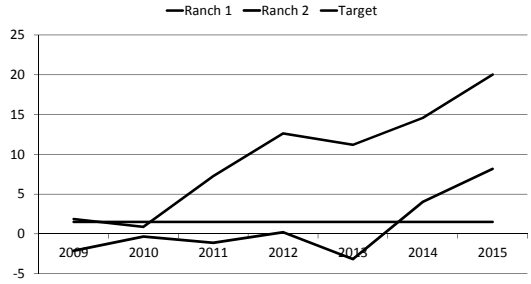
Rate of Return on Assets (Cost Basis)

- Greater than 1.5 percent
  - Bottom line for ranch owners
  - This KPI should be measured over time.
  - Net income (plus interest paid) divided by total assets
  - This is the driving force behind the long-term decline in breeding cow numbers.

Financial KPI

Rate of Return on Assets (Cost Basis)

Greater than 1.5 percent



Integrated KPI

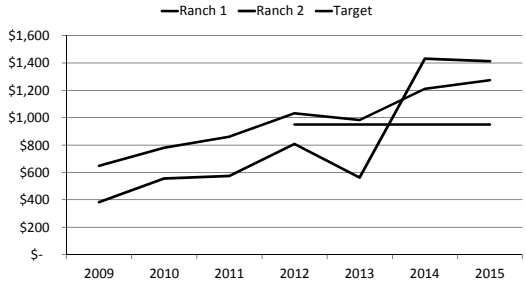
Revenue per Breeding Female

- Greater than $950 per Breeding Female
  - Not just the value of sold weaned calves
  - Total revenue from weaned calf sales, retained calf values, gains/losses on the sales of breeding stock, and the accrual adjustments on inventories.
  - To compare, it should not include *sales from* other ranch enterprises
    - Hay sales
  - This target can and will move.

Integrated KPI

Revenue per Breeding Female

Greater than $950 per Breeding Female



Financial KPI

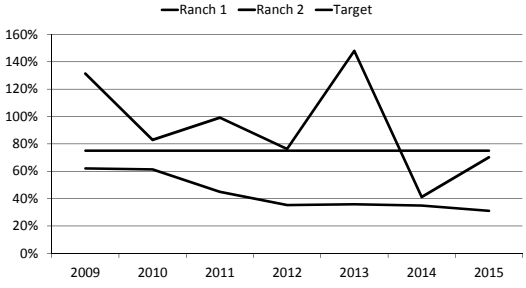
Operating Expense as a Percent of Total Revenue

- **Less than 75 percent of Total Revenue**
  - **Controlling expenses can be one of the most important exercises for ranch management.**
  - **Operating expenses = All expenses except interest and depreciation.**
  - **Given 75 % target, the ranch has 25% of the ranch revenue to**
    1. **Pay interest**
    2. **Escrow depreciation expenses**
    3. **Retain as net income**

Financial KPI

Operating Expense as a Percent of Total Revenue

Less than 75 percent of Total Revenue



Financial KPI

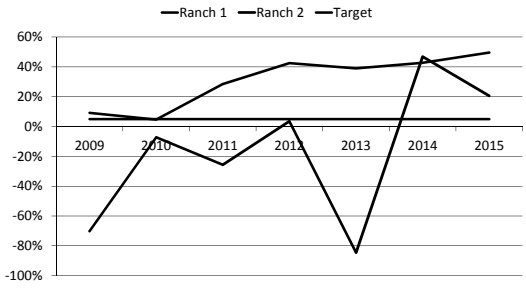
Net Income as a Percent of Total Revenue

- Greater than 5 percent of Total Revenue
  - That portion of total revenue that is being retained as net income.
  - Four things that a ranch can do with revenue:
    1. Pay operating expenses
    2. Pay interest expense
    3. Escrow depreciation expenses
    4. Retain as net income
  - Corresponds with previous KPI

Financial KPI

Net Income as a Percent of Total Revenue

Greater than 5 percent of Total Revenue



Financial KPI

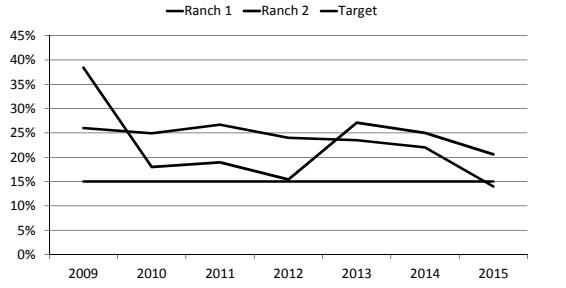
Labor and Management Expense as a Percent of Total Revenue

- Less than 15 percent of Total Revenue
  - One of the most variable expenses
  - Hired Management versus Owned Labor
  - Include salaries, wages, taxes, benefits, and chuck.
  - For every dollar of ranch revenue, the ranch is spending $0.15 of that dollar to pay L&M.
  - Total L&M divided by Total Revenue generated on the ranch

Financial KPI

Labor and Management Expense as a Percent of Total Revenue

Less than 15 percent of Total Revenue



Financial KPI

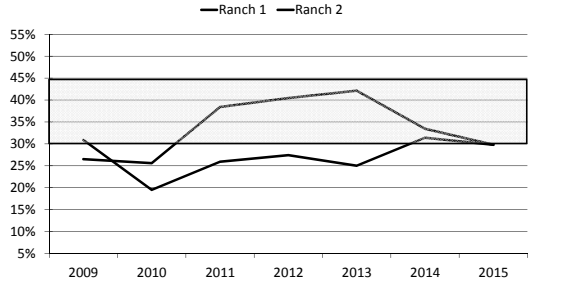
Nutrition Base Expense as a Percent of Total Expenses

- Between 30 and 45 percent of Total Expense
  - Reproduction is the most important factor in ranch productivity, thus, herd nutrition is imperative.
  - No two ranches have the same resources.
  - Identify three types
    - Expenditures for purchased nutrition
    - Expenses associated with raising nutrition
    - Costs associated with grazing
  - These three divided by Total Expense

Financial KPI

Nutrition Base Expense as a Percent of Total Expense

Between 30 and 45 percent of Total Expense



Integrated KPI

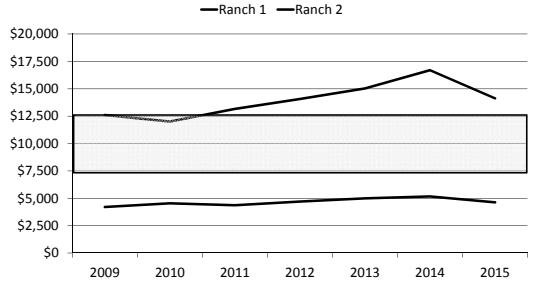
Total Investment (Market Basis) per Breeding Female

- Between $7,500 and $12,500
  - Focus on the Ranch Owner
  - Land is the greatest influencer.
  - Total Assets divided by total number of breeding females as of January 1.
  - Assumes some land is already controlled
  - Demonstrates the real difficulty for beginning ranchers
  - Potential heirs looking at this figure and wondering..

Integrated KPI

Total Investment (Market Basis) per Breeding Female

Between $7,500 and $12,500



Financial KPI

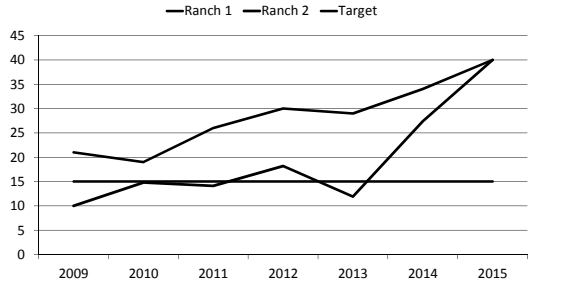
Asset Turnover Ratio (Cost Basis)

- Greater than 15 percent
  - Given the highly capitalized nature of ranching, it is vital for the manager to generate the greatest possible net income.
  - This KPI details how many revenue dollars each dollar of asset is creating.
  - Target: Every dollar of asset is generating $0.15 of revenue.
  - Seems low, but that demonstrates the nature of ranching

Financial KPI

Asset Turnover Ratio (Cost Basis)

Greater than 15 percent



KPI targets I didn't show you

- **Current Ratio**
  - **Greater than 2.0**
- **Debt per Breeding Female**
  - **Less than$500 per female**
- **Equity to Asset Ratio**
  - **Greater than 50%**

KPI targets Not Common to All Ranches

- **Hay Production Cost per Ton**
  - **Less Than $150/ton**
- **Cost of Gain on Small Annual Pasture**
- **Others?**

Key Performance Indicator Targets for Beef Cow-calf Operations

Stan Bevers
Professor & Extension Economist
Texas A&M AgriLife Extension Service
P.O. Box 2159
Vernon, Texas
940 552-9941 ext. 231
s-bevers@tamu.edu
http://agrisk.tamu.edu
Twitter: RollingPlainsAg

Forages, Grazing Management, and Supplementation – Making it Work

K. Mullenix, Assistant Professor[1]

[1]Extension Specialist, Beef Production Systems, Auburn University, Auburn, AL

Focus on Efficiency

As the US beef industry works toward expansion, revisiting the goal of individual herd improvement begins to shine again in the spotlight. Cattle prices have decreased from an all-time high and projections indicate that price premiums will not be as high as recent years in the months ahead. Improving cow herd efficiency and careful management of input costs will become increasingly important to maintain profitability.

There are several measures of efficiency in the cow herd. Perhaps the most common one that comes to mind is the pounds of calf weaned per pound of cow exposed to breeding. We often hear the saying that "you can't manage what you don't measure" when it comes to making the operation more efficient from a reproductive standpoint. Measures of reproductive and feed efficiency are tangible factors that we can track over time to improve efficiency. Maintaining cow herd nutrition can make up over 50% of the total input costs in the operation, leading to the question of how can we improve efficiency with our forage and feed resources. The following provides some insight on factors that can be tracked to increase the efficiency of forage use in our production systems:

Forages and Grazing Management

Improving Productivity – Amount of Quality Forage Production per Unit Land Area

Forage production in Florida is largely dominated by perennial warm-season grasses such as bahiagrass (*Paspalum notatum*), bermudagrass (*Cynodon dactylon*), and to a smaller extent, limpograss (*Hemarthria altissima*). Producing an adequate quantity of high-quality forage to meet animal demand requires the ability to track the following:

Fertility

Burton et al. (1997) evaluated the optimum fertilization levels for Pensacola bahiagrass and observed a linear response in forage production with increasing rates of nitrogen application (50 to 400 lb N/acre). Within this range of responses, the authors noted that at low levels of N application, P and K removal within the system is limited. However, as N application levels increase to 200 lb N/acre, soil reserves of K may begin to be depleted when N-P-K are applied in a 4-2-1 ratio. Depletion of soil reserves may lead to decreased stand persistence over time and overall low productivity of bahiagrass. Certainly an operator must determine what is an economical level of N-P-K application without sacrificing total production system sustainability. In grazing systems, low rates of N application do not cause the removal of much P and K from the system while still garnering a response in yield and productivity. The return of nutrients to the soil profile through manure mineralization and urine decrease the need for yearly P and K application in these systems. In a two year grazing evaluation, Vendramini et al. (2013) observed that at an N fertilization rate of 55 lb N/acre/year, forage production and persistence of Argentine and Tifton 9 bahiagrass was maintained when grazed every 4 wk. These data illustrate that low levels of N application in well-managed grazing systems are a worthwhile investment to improve forage production efficiency. Dual-purpose grazing and hay production systems (higher input) may need to be evaluated more closely on an annual basis to determine if soil P and K levels are adequate to maintain good stand persistence.

Using Pasture Stand Health Indicators

Evaluating overall pasture health is critical to ensuring that forage production potential can be achieved within a given management system. Conducting a visual assessment of pasture health on an annual basis

is necessary to understand where resources can best be allocated to improve pasture productivity. Estimating the relative percentage ground cover of desirable forage species in the stand compared to weeds and bare ground provides a starting point for making management decisions. Frequency of occurrence in the pasture also provides an indicator of the relative distribution of these species, and can help identify the total area affected by undesirable species or areas of overuse. When desirable forage species are not at their best level of productivity, this creates the opportunity for weeds or lower quality forage plants to move into the stand, decreasing production efficiency. When reviewing pasture ratings for the first time, start with soil testing results as an initial step in determining the cause for changes in stand composition. Second, consider other causative factors such as weather, insect or disease pressure, and grazing management (i.e. Overgrazing) and what changes can be made to improve overall stand productivity.

Variety Selection

One step to improving overall forage production potential is to carefully select improved varieties that will meet your production goals. When considering pasture renovation, starting with the right forage species and variety for your operation is critical. Pensacola bahiagrass is the most widely used warm-season perennial grass in FL with well over 2.5 million acres in commercial use as pastures and hayfields (Newman, 2014). It is widely known for its persistence under intensive grazing management. Since its introduction into the US in the 1920s, forage breeding programs in the Southeast have actively developed and released new varieties of bahiagrass that further improve on its resilience in our climatic area. Tifton 9 and TifQuick were both released in the 1980s as varieties with increased forage yield, particularly in the early spring and late fall, compared to Pensacola. Argentine bahiagrass is a more upright growing ecotype known for its high production potential, ability to spread rapidly, and relative cold tolerance compared to other tetraploid types. UF Riata is a more recent release that provides greater early- and late-season growth compared to Pensacola, and was developed for its improved cold tolerance and disease resistance. Limpograss breeding efforts have also released two new varieties since 2014 – KenHy and GibTuck. The release of planting material to producers is currently underway, and relative availability of plant material is increasing. These new lines have superior production characteristics including yield, nutritive value, and good persistence under grazing (Wallau et al., 2015) that may further improve forage production efficiency in FL.

Improving Grazing Season Length – More Grazing Days per Year, Less Hay Feeding Days

Another measure of forage production efficiency is the total number of grazing days per year in the operation. Increasing the number of grazing days per year decreases reliance on stored forage reserves, which can drive up the total cost of production in the operation, especially during the winter months. Indicators of efficient grazing management may include:

Stocking Rate – Number of Animals per Unit Land Area

Stocking rate is one of the most dynamic factors influencing grazing management strategies because it accounts for 1) forage production potential, 2) animal demand and utilization, and 3) time on pasture. Mackowiak et al. (2013) suggested that when bahiagrass pastures are fertilized with low levels of N (50 to 60 lb N/acre), a stocking rate of 3 acres per cow is necessary. However, if higher stocking rates are used, then greater forage production may be needed to support animal demand. Aguiar et al. (2015) noted that stockpiled limpograss in South Florida can be grazed from early October through December at a stocking rate of 1.3 cow-calf pairs/acre when forage production is between 3,500 and 4,000 lb dry matter per acre. These examples illustrate that grazing efficiency may be improved by periodically assessing stocking rate in the operation, and making necessary adjustments based on forage availability and animal demand.

Identify Alternatives – Grazing Days per Unit Land Area

Practices such as stockpiling or overseeding warm-season grass pastures may increase the forage production potential per unit land area, and provide additional grazing days per year. Stockpiling is the

practice of allowing forage to accumulate for a time of later use, typically during the fall for subsequent grazing in the winter months. In South Florida, limpograss is a desirable forage for stockpiling because of its greater herbage production and digestibility during the fall time period compared to bahiagrass and bermudagrass. A recent study in Gainesville showed that GibTuck and KenHy limpograss had greater herbage accumulation and digestibility than Floralta when stockpiled for a period of 8, 12, or 16 weeks (Wallau et al., 2015). Crude protein concentration decreased more rapidly, and indicates that stockpiled limpograss may require additional CP supplementation to adequately maintain animal requirements during this time period. Stockpiled limpograss may provide additional forage for grazing from December through March in South Florida. In North Florida, stockpiled bermudagrass or bahiagrass may be an option for early winter grazing. Research conducted in south Alabama demonstrated the feasibility of using stockpiled Tifton 85 bermudagrass for maintaining lactating beef cattle during the winter months when grazed from November through January (McNamee, 2014). Stockpiled bahiagrass may produce lower forage mass when accumulated for late fall-early winter grazing, and decline in quality is more rapid compared to bermudagrass. Evers et al. 2004 suggested that bermudagrass may be more suited for stockpiling because of these characteristics.

Strategic Supplementation – Optimizing Supplementation to Meet Known Deficiencies

Providing supplemental feeds to beef cattle is often necessary to maintain or increase animal production during certain times of the year. Strategic supplementation of known nutrient deficiencies can improve production efficiency in the herd by:

1) Determining the nutrient requirements of the animals in your herd based on their average weight and stage of production
2) Estimating the amount of nutrients animals will receive from the forage base
3) Comparing #1) and #2) to see if a deficiency exists, and identify supplemental nutrients needed
4) Assessing supplemental nutrients on a cost per pound of nutrient basis.

Understanding changing forage quality throughout the management season enables producers to more accurately assess if and when supplementation strategies are needed. When supplementing grazed forages, having background information on expected changes in forage nutritive value may help create supplementation strategies that change along with animal requirements throughout the season. The use of this approach as opposed to a static or constant supplementation rate may increase animal production efficiency through better (Sechler, 2016).

Implications and Conclusions

Forages represent the main source of nutrition in beef cattle herds in the Southeast. Because of their importance in maintaining herd productivity, measuring plant-animal efficiency can help improve overall herd sustainability. With changing cattle market prices, understanding indicators to improve forage utilization, quality, and supplementation can help provide better management of input costs in southeastern livestock operations.

And remember…You can't manage what you don't measure!

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Cattle Management Issues That Need To Be Addressed

M. Hersom, Associate Professor[1]

[1]Department of Animal Sciences, University of Florida

There are several hot topic that cattle producers should stay abreast of as the year progresses. The Veterinary Feed Directive (VFD) is currently receiving a lot of attention as it will affect how cattle producers manage their animals, how veterinarians interact with cattle owners, and the products available for use on the ranch.

What is the VFD?

The VFD is a federal regulation from the Food and Drug Administration that controls the use of animal drugs. When the VFD was originally created in 1996 two class of drugs were identified over-the counter (OTC) and prescriptions. However no actual prescriptions were required for medicated feeds as that was determined not practical for production purposes so all medicated feeds were deemed as OTC. With the new amendments that went into effect in January 2017 a new category was created VFD drugs with the result of new and increased regulations for animal medicated feeds. The underlying intent of the new VFD rules is to regulate the use of antibiotics in the animal feed industry to preserve the efficacy of the drugs, use the drugs only for therapeutic use, and require the supervision of a veterinarian.

What does the VFD do?

The new amendments make three significant changes to the original VFD rule.

1. Require drug manufactures to alter labels for certain drug products to remove the statement regarding production issues, ie. “increased rate of weight gain”, and only state uses for therapeutic health issues.
2. Changing the designation of some additives from OTC to “medically important” which categorizes them as VFD drugs which increases the regulatory requirements of the additives.
3. Use of VFD additives in feed requires the involvement of a veterinarian to fill out a VFD form before any VFD drug or feed containing a VFD drug can be provided to producer.

Why was the VFD developed?

The main issue that the VFD address is the concern regarding the potential for antibiotic resistance that could be related to increased chronic exposure to the use of antibiotics in feeds. The feeling is that antibiotics should be reserved for the “prevention”, “treatment”, or “control” of diseases. This new mandate removes the ability to use medicated feeds for production purposes to improve animal performance. The terms “prevention”, “treatment”, or “control” of diseases have specific meanings and guidelines that veterinarians will have to ascertain in each situation to warrant the use of VFD drugs. Prevention means that a disease risk must be present and the use prevent infection prior to animals becoming sick/infected. Treatment means that animals are exhibiting signs of disease that can be treated by a VFD additive. Control is invoked when a percentage of the animals are already sick, exhibiting signs of disease and the use of a VFD can decrease the spread of the disease.

Who will the VFD affect?
The VFD as implemented will affect the entire beef cattle production chain and associated industries. The cow-calf, stocker cattle, and feedlot producers will be affected if/when the want to purchase a medicated feed or supplement with a VFD additive included. Feed manufactures and feed retailer will be affected with increased oversight and regulatory paperwork that will be required. Additionally, feed distributors will be required to verify that an animal owner possess a valid VFD form from a licensed veterinarian prior to the sale of a feed or supplement.

How will this affect the cattle owner?
The first regulation an animal owner must meet is to have a valid veterinarian-client-patient relationship. This means that the veterinarian must have worked with the client to ascertain the animal's health status and make clinical judgements about the animal's health status and provide follow-up care. The second regulation is that the veterinarian will have to complete a VFD form that indicates the specific drug that will be administered. There is a list of things that the VFD form must contain that includes (but not limited to): contact information for the veterinarian and client, the premise, expiration date of the VFD, the name of the drug, indications for use, directions for use, and the kind and number of animals. All of this information is indented to make sure that the feed additive is used in an appropriate, safe, and judicious manner, and prevent off-label use of the product. VFDs are species, product specific, and purpose specific (not for production) to prevent off-label use. Once the producer obtains a valid VFD form from the veterinarian it can be taken to a feed/supplement supplier to obtain the feed product for use. Use of the feed product must be in accordance to the directions associated with issuance of the VFD. The last regulation is that copies of all VFD forms must be retained for two years by the producer, veterinarian, and feed supplier.

What products Do and Don't Fall Under the VFD?
Essentially all feed-use antibiotics that the FDA, WHO, and CDC consider medically important to humans are the current target for regulation under the VFD. There is currently one VFD antibiotic approved for use in cattle, tilmicosin (Pulmotil) that is used to control bovine respiratory disease (BRD). Medically important antibiotics that are being used in the cattle industry that will require additional or re-labeling to be compliant with the VFD regulations include:

- Chlortetracycline (Aureomycin, CLTC, Pennchlor)
- Chlortetracycline + Sulfamethazine (Aureo S 700)
- Neomycin + Oxytetracycline (Neo-Terramycin, Neo-Oxy)
- Oxytetracycline (Terramycin, Pennox)
- Tylosin (Tylan)
- Virginiamycin (V-Max)

The VFD's intent is to regulate antibiotics that are important to human medicine, however a number of feed additives are routinely included in animal feeds or supplements. These feed additives that do not pose a threat to human medicine effectiveness will not require a VFD to continue use in animal production. These additives like ionophores and parasite-, insect-control include:

- Amproluim (Corid)
- Bacitracin (Albac, BMD)
- Bambermycin (Gainpro)
- Decoquinate (Deccox)
- Fenbendazole (Safe-Guard)

- Laidlomycin (Cattlyst)
- Lasalocid (Bovatec)
- Melengestrol Acetate (MGA)
- Methoprene (Altosid)
- Monensin (Rumensin)
- Morantel (Rumatel)
- Poloxslene (Bloat Guard)
- Ractopamine (Optaflexx, Actogain)
- Tetraclovinphos (Rabon)

The new regulations for re-labeling and classification of additives will take effect January 2017. The transition to this new environment for regulation is an attempt to maintain the efficacy of antibiotics important for human medicine. It is incumbent upon the beef cattle industry to demonstrate that we can be good stewards of the feed additives that are at our disposal. With increasing pressure from regulatory agencies and the public to eliminate our use of antibiotics in animal production we must protect those that we can use. Adherence to VFD regulations will not make us any more money in the short-term nor will it make our cattle any healthier. What the VFD may do is provide the mechanism for the beef cattle industry to continue to use antibiotics into the future to ensure that we can continue to produce a safe and wholesome protein source for a growing global population.

Information adapted from the following articles:

Griffin, D. "Starting points to help apply new VFD rules". *Progressive Cattlemen* pp 41-43. January, 2016.

Griffin, D. "Learn now which products require a VFD" *Progressive Cattlemen* pp 9-11. April 2016.

Lashment, T. D. "Know the rules created for the Veterinary Feed Directive". *Progressive Cattlemen* pp 8-9. February 2016.

Can We Select for RFI in Heifers?

L. Kriese-Anderson, Associate Professor[1]

[1]Extension Animal Scientist, Auburn University, Auburn AL

Introduction

Cow efficiency has been an important topic of conversation for many years. Ideas, from choosing cows that wean 50% of their weaning weight, using feed conversion ratio or dry matter intake, have been suggested as selection criteria. More recently, ideas of residual feed intake (RFI) or residual ADG have surfaced and some purebred breed associations have adopted these as a measure of efficiency.

However, for all the talk generated concerning efficiency the last 20 years, there is little to no evidence that American beef producers have selected for improved cow efficiency. For the most part, there is no such thing as an average 1100 pound commercial cow in the United States. The commercial cowherd may not be increasing in height, but they are increasing in weight. The continued use of larger EPD bulls, especially for weight and milk traits, have pushed the average commercial cow to larger weights with increased maintenance energy costs due to increased milk production. Matching cow genetics to the environment they produce in has not occurred in most regions of the United States.

The overall goal of a beef cattle producer should be to improve profitability. Because providing feed to animals is a major cost to producers, improving the efficiency of feed utilization would be of significant economic benefit. Efficient feeding programs are designed to provide cattle with the essential nutrients for maintenance and growth with minimal excesses and losses (Nkrumah et al., 2007).

Residual Feed Intake or RFI was first proposed by Koch et al. (1963) in growing beef cattle and is defined as the actual feed intake minus expected feed intake based on maintenance and production requirements. Expected feed intake is calculated by measuring daily feed intake, ADG and metabolic body weight on young, growing animals. RFI then becomes as the remaining residual not accounted for by measurable traits. By definition, RFI is phenotypically independent of its components, ADG and metabolic body weight, allowing for comparison between individuals differing in production during the measurement period. For example, in young animals a majority of their energy resources are devoted to growth and development. In mature cows, feed is utilized for maintenance and lactation. Using RFI as a measure of feed efficiency identifies animals that consume less feed than expected, putting selection pressure directly on feed intake. By incorporating measures of live weight and ADG, RFI tries to account for some of the underlying genetic variation in feed used for maintenance and growth. As a selection tool, the resulting progeny should be more efficient as slaughter animals and in the breeding herd (Arthur et al., 2001a). Therefore, improving feed efficiency using RFI would be beneficial at all levels of the production system. However, this improvement in feed efficiency cannot come with a decrease in reproductive traits.

Research to Date

Research examining the use of RFI as a selection tool began in the late 1990's in Australia. Studies indicate RFI is a moderately heritable trait (Table 1), with most estimates close to 0.40. This suggests if cattle are selected based on post-weaning measures of RFI, genetic progress can be achieved.

Table 1. Estimates of heritability for Residual Feed Intake (RFI)

Study	Breed	Sex	h^2
Koch et al., 1963	British	Both	0.28
Arthur et al., 2001a	Charolais	Bulls	0.39
Arthur et al., 2001b	Angus	Both	0.39
Schenkel et al., 2004	Multiple	Bulls	0.38
Lancaster et al., 2009	Brangus	Heifers	0.47
Crowley et al., 2010	Multiple	Bulls	0.45

The basic model for determining RFI is as follows:

$DMI = \beta_0 + \beta 1(ADG) + \beta_2(MMWT) + RFI$

Where:

DMI= average daily dry matter intake

β_0= regression intercept

β_1= partial regression coefficient of DMI on average daily gain (ADG)

β_2= partial regression coefficient of DMI on metabolic midweight (MMWT). MMWT is calculated as $(\text{Off-test Wt.} - (0.5*\text{ADG}*\text{Days on Feed}))^{0.75}$

RFI = residual feed intake

To be able to determine RFI on cattle, daily individual feed intake must be measured, and cattle must have ad libitum access to feed. Currently, cattle must have daily feed intake measured for 70 days. There are few farms who can measure individual feed intake on large groups of cattle on the farm and there are not very many facilities set up to measure feed intake. Generally, a facility must have GrowSafe® (GrowSafe Systems LTD, Airdrie, AB Canada) or Calan® (American Calan, Northwood, NH) technology. Beef Improvement Federation Guidelines (BIF, 2010) suggest animals be tested beginning no younger than 240 days of age and finish by 390 days of age.

Because of how RFI is calculated, the average RFI value of a contemporary group will be 0. Animals with a negative RFI value are more efficient because they eat less feed than expected based on their maintenance and production requirements. Animals with a positive RFI value are less efficient because they eat more feed than expected based on maintenance and production requirements. Animals with an RFI value around 0 are eating what is expected of them based on maintenance and production requirements.

Also due to the manner RFI is calculated the phenotypic correlations between RFI and ADG and RFI and metabolic body weight are 0. This suggests that regardless of the RFI value, ADG and body weight will be similar. This is one of the advantages of using RFI as a selection tool. Other tools, such as feed

conversion rate, may end up selecting animals with increased growth rates, mature size, and maintenance requirements (Crews, 2005).

However, this does not necessarily mean genetic correlations between RFI and other economically relevant beef cattle traits are zero. Table 2 lists genetic correlations found from various studies. To date, RFI is genetically highly correlated with feed intake. Thus, selection for efficient animals, as determined by RFI, eat less. These same efficient animals will also be leaner. The genetic correlations between weight, ADG and RFI seem to be low. Several studies have shown more efficient heifers, based on RFI, do calve later and Crowley et al. (2011) estimated the genetic correlation between RFI and age at first calving in crossbred heifers to be -0.29.

Table 2. Genetic correlation estimates between Residual Feed Intake and other economically important traits in beef cattle.

Study	Breed	Sex	Trait	Genetic Correlation
Arthur et al., 2001a	Charolais	Bulls	Metabolic Weight	0.32
Arthur et al., 2001b	Angus	Bulls	Metabolic Weight	-0.21
Schenkel et al., 2004	Multiple	Bulls	Metabolic Weight	-0.17
Lancaster et al., 2009	Brangus	Heifers	Metabolic Weight	-0.33
Arthur et al., 2001a	Charolais	Bulls	ADG	-0.10
Schenkel et al., 2004	Multiple	Bulls	ADG	0.01
Arthur et al., 2001a	Charolais	Bulls	Feed Intake	0.79
Arthur et al., 2001b	Angus	Both	Feed Intake	0.69
Lancaster et al., 2009	Brangus	Heifers	Feed Intake	0.60
Schenkel et al., 2004	Multiple	Bulls	Feed Intake	0.81
Arthur et al., 2001b	Angus	Both	Ultrasound 12th rib fat	0.17
Schenkel et al., 2004	Multiple	Bulls	Ultrasound 12th rib fat	0.16
Lancaster et al., 2009	Brangus	Heifers	Ultrasound 12th rib fat	0.36
Arthur et al., 2001b	Angus	Both	Ultrasound REA	0.09
Crowley, et al, 2011	Crossbred	Heifers	Age at first calving	-0.29

As much as efficiency is desired in the Unites Stated beef cowherd, reproduction is still the most economically important trait. Several studies have looked at RFI and subsequent reproduction in heifers. Preliminary studies suggest selecting for RFI may have some effect on reproductive performance. Feed intake trials are conducted post-weaning prior to selection decisions being made. Because there is a large variation in age at puberty, *Bos taurus* cattle tend to be at different stages of sexual development during this time and differences in physiological age may affect RFI results. It appears RFI testing tends to favor later maturing animals that don't have increased energy demands associated with sexual development and activity (Basarab et al., 2011). Therefore, prepubertal animals have lower feed intakes than those undergoing puberty and may be considered more efficient.

Basarab et al. (2011) analyzed the effects of feed efficiency associated with sexual development and activity by identifying when heifers reached puberty relative to the start of the testing period. Feed intake and feeding behaviors revealed heifers that attained puberty near the start of the test consumed more feed, spent more time at the bunk in feeding event duration and head-down behaviors, but removed their head from the bunk or went to the bunk less frequently than heifers reaching puberty near the end of the test. Additionally, pre-pubertal heifers had 4% to 7% improved feed efficiency given equal growth, body size,

and body composition compared to post-pubertal heifers. These results suggest later maturing animals will be favored when predicting RFI from a mixture of pre- and post-pubertal animals.

Since later maturing animals tend to be more efficient at the time of testing, long term selection for efficient RFI heifers may affect herd reproductive performance, specifically age at puberty. However, some authors suggest a delay in puberty and conception may continue throughout the cow's lifetime, but will not affect herd fertility (Arthur et al, 2005b; Basarab et al., 2007). According to Crowley et al. (2011), a delay in onset of puberty is biologically possible because the partitioning of energy among animals differing in RFI may be altered. Efficient RFI heifers may partition more energy toward growth and away from reproductive function. Efficient RFI females tend to conceive later and calve later than high RFI females, most likely attributed to a delay in first estrus (Arthur et al., 2005b; Basarab et al., 2007; Donoghue et al., 2011). However, several studies report selection for post-weaning RFI does not have any effect on pregnancy rates, calving rates, and maternal productivity (Arthur et al., 2005; Basarab et al., 2007; Donoghue et al., 2011; Shaffer et al., 2011).

Auburn Residual Feed intake Heifer Study

Daily feed intake and performance measures of growth and body composition have been measured on 262 Brangus replacement heifers from two purebred Southeastern Brangus breeders. Heifers were delivered to the Auburn University Beef Cattle Evaluation Center (AUBEC) during 2014 and 2015. Table 3 provides the number of heifers and time of year daily feed intake was measured on these heifers.

Table 3. Number of heifers measured for daily feed intake and time of year

	Number of Heifers		
Trial	Farm 1	Farm 2	Birthdate Range
June to Sept 2014	34	39	Sept thru Nov 2013
Dec. 2014 to March 2015	28	51	Jan. thru April 2014
June to September 2015	46	0	Sept thru Oct 2014
July to October 2015	0	34	Sept thru Nov 2014
Sept to Dec 2015	30	0	Oct 2014 thru Jan 2015
Total	138	124	

AUBEC has eight pens, each containing 12 Calan® gates (American Calan, Northwood, NH) for a 96 head capacity. Each pen of heifers had indoor and outdoor access. Each pen was 20' x 30' inside and 60' x 300' outside. Two pens share an automatic water trough.

Heifers were transported post-weaning to the AUBEC on 18-wheel cattle trucks from their farm of origin. Upon arrival, heifers were randomly unloaded into one of the eight pens and given access to hay and water. Heifers were allowed to rest a minimum of 8 hours prior to processing. At processing, heifers were weighed and measured for hip height. Heifers were then placed in pens according to hip height and weight to minimize establishment of pecking order.

Heifers were trained to their individual Calan® gates during a 21 day acclimation period. Initially, heifers were fed 2% of their body weight of the diet in Table 4 which was formulated to be 2.47 Mcal ME/(kg DM) according to BIF Guidelines (BIF, 2010). Following the adaptation period, the heifers underwent a 70 day intake trial to measure daily feed intake and growth performance. Heifers were fed

twice a day ad libitum amounts of the diet in Table 4. Heifers were fed such that one to two pounds of feed were left in their bunks at each feeding. Feed refusals were weighed and recorded each morning. Heifers were weighed and measured for hip height every 14 days. Carcass ultrasound measurements of 12th rib fat, longissimus dorsi area and percent intramuscular fat were taken by a UCG certified ultrasound technician within 7 days of the test completion.

Table 4. Diet ingredients and nutritional composition of diet fed to Brangus heifers

Ingredient (as fed)	Value, %
Cracked Corn	13.75
Soyhull pellets	20.00
Dried distillers grain	5.00
Corn gluten pellets	22.50
Cottonseed hull pellets	15.00
Alfalfa meal	5.00
Mineral	2.50
Potassium chloride	0.10
Cottonseed hulls	10.00
Molasses	6.00
Nutrient Analysis (DM)	
CP, %	13.40
NDF, %	44.10
NE_m	0.70
NE_g	1.42
ME, Mcal/kg DM	2.47

Residual feed intake was determined for each heifer that completed the 70 day feed intake trial by farm and trial. Heifers were given an RFI classification based on their RFI value. Heifers with an RFI value one standard deviation below the mean (mean = 0 in each case) were classified as low or efficient RFI heifers. Heifers with RFI values one standard deviation above the mean were classified as high or inefficient heifers. The heifers less than one standard deviation above or below the mean were classified as medium or average RFI heifers.

Heifers were sired by 45 different Brangus sires. There were 43 heifers classified as low or efficient RFI heifers, 186 classified as medium or average RFI heifers and 35 classified as high or inefficient RFI heifers. Table 5 contains simple averages of performance traits measured on the heifers. The data was additionally analyzed looking at farm of origin, RFI classification and sire for differences in on-test weight, off-test weight, ADG, and dry matter feed intake. To date, calving date records have been received on 53 of the heifers in the earliest trials. Calving data has also been analyzed looking for differences between RFI classification and calving date.

Table 5. Simple averages of performance traits by heifer RFI classification

	Heifer RFI Classification		
Trait	Low (Efficient), n=43	Medium, n=186	High (Inefficient), n=35
No. Sires Represented	22	40	17
On-Test Wt., lbs.	699	679	688
On-Test Ht., in.	46.4	45.5	45.9
Test ADG, lbs/day	3.02	3.11	2.97
Off-Test Wt., lbs.	913	899	899
Off-Test Ht., in.	49.3	48.5	48.7
Off-Test WDA	2.5	2.5	2.4
Final Frame Score	6.2	5.8	5.8
DM Feed Intake, lbs.	1422	1655	1948

As expected RFI values were significantly affected by RFI classification (Table 6). Remember RFI is the actual dry matter pounds of feed eaten minus the expected dry matter pound of feed per day. The medium RFI classified heifers ate what was expected. Low or efficient RFI heifers ate 3.66 lbs/day less than expected based on their size and growth, while high or inefficient heifers ate 3.96 lbs/day more based on their size and growth. RFI classification was not a significant source of variation for on-test or off-test weight. As expected, RFI classification was also not a significant source of variation for ADG. RFI classification was significant for dry matter feed intake. Low RFI heifers ate 459 and 240 pound less over the 70 day trial than the high and medium RFI heifers, respectively. The medium RFI classified heifers also ate 218 pound less than the high RFI classified heifers.

Table 6. Least Squares Means of performance traits by heifer RFI classification

	Heifer RFI Classification		
Trait	Low (Efficient), n=43	Medium, n=186	High (Inefficient), n=35
RFI, lbs feed/day	-3.66^{a}	-0.02^{b}	3.96^{c}
On-Test Wt., lbs.	692	678	662
Test ADG, lbs/day	3.23	3.25	3.04
Off-Test Wt., lbs.	919	909	876
DM Feed Intake, lbs.	1455^{c}	1696^{b}	1914^{a}
Rows with differing superscripts are significantly different ($P<0.05$)			

Sire of the heifer was significant source of variation for all traits analyzed. This is expected since all the traits analyzed are moderately heritable. More heifer numbers are needed to find actual differences among sires. To date, most sires have heifers classified as low and medium or medium and high RFI heifers.

Also as expected farm and trial were significant sources of variation for all traits except RFI. Different management and feed resources affected the incoming weights on heifers. Farm 1 consistently had higher incoming weights leading to higher off-test weights. Additionally, because heifers from Farm 1 were heavier, they also ate more feed.

Current research suggests low classified RFI females calve later in the calving season than high classified RFI females. Because of the potential concerns between long-term selection for RFI and reproductive function, calving data from 53 heifers previously tested for RFI as heifers in 2014 was analyzed. There were no significant differences between age at first calving and RFI classification. High RFI classified

heifers calved at 686 days of age (22.9 mo.), while medium and low classified heifers calved at (717 and 707 days of age; 23.9 and 23.5 mo., respectively). All heifers calved before two years of age and therefore, age at first calving does not appear to be of concern at this time in this study. However, calving age must continue to be monitored.

Conclusions

Residual feed intake is a moderately heritable trait independent of growth and size that can be placed in the set of tools to select beef cattle for efficiency. It is quite evident that efficient cattle eat significantly less leading to lower operational costs in the cowherd. However, feed intake, the critical component for measuring residual feed intake, is not easy to measure both due to time and facilities. Studies continue to show heifers can be selected for RFI without change in growth parameters. Studies able to incorporate female fertility have shown efficient RFI heifers calve later in the calving season. To date, this trend has not been seen in Brangus heifers measured at Auburn University. However, this must be continued to be monitored. Effective selection may be to select potential replacement heifers ±0.5 standard deviations from the mean and eliminate both tails of the distribution.

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Beef Cattle Improvement in the Genomics Era

R. Mateescu, Associate Professor[1]

[1]University of Florida, Gainesville, FL

Selection of cattle has been practiced for centuries using a variety of methods and tools. Early selection was based on visual observations and later on measured phenotypic traits. Development of statistical methods along with computational advances allowed handling of large data sets and the estimation of breeding values of cattle, known as Expected Progeny Differences (EPD). Widespread use of EPDs in the seedstock and commercial beef sectors resulted in great increases in the genetic propensity of beef cattle for a variety of traits including calving ease, growth and carcass composition.

Estimating EPDs for animals in a population is data-driven and the accuracy of an individual EPD is based on the amount of information available at the time when it is estimated. For this reason, young unproven bulls have EPDs with low accuracy, indicating lower reliability and high potential to change as additional data is collected on the bull. As more data become available, particularly progeny information, the accuracy of the bull's EPD increases, therefore greater reliability and smaller range within which the EPD can change with additional information. Given that commercial bull buyers could not wait for more information on the bull and the associated increase in accuracy, tools that could increase the accuracy of yearling bull EPD would be advantageous.

The sequencing of the cattle genome was followed by a revolution in genotyping offered by high-density SNP chips. The associated reduction in genotyping cost allows for large number of individuals to be genotyped across the entire genome and opportunity for the development of genomic selection as outlined by Meuwissen et al. (2001). The development of DNA tests for traits with information already available can enhance the accuracy of those genetic evaluations if the DNA information is seamlessly integrated into existing genetic prediction infrastructures and used to augment other sources of information. The increase in accuracy will be most pronounced in young animals with no recorded progeny, and, hence, has high value for selection of replacement animals. The magnitude of the increase in accuracy depends on available records on relatives, heritability and the portion of heritable variation accounted for by the tests (Thallman *et al.* 2009). Many traits of interest in selection programs, such as birthweight, weaning weight, ultrasound carcass scans or scrotal size can be measured on young animals before a selection decision is made. However, there are other traits which are measured later in life, expensive or difficult to record (i.e., carcass traits, meat quality or feed efficiency) and EPDs for these traits have low accuracy because individual performance or progeny records are not available.

The advantage of genomic selection over traditional methods is greatest where traditional methods are difficult to implement (Meuwissen and Goddard, 1996) – traits recorded late in life or after the selection candidate dies, traits difficult or expensive to record, traits expressed in only one sex. In genomic selection, a reference population is genotyped and recorded for the trait in order to estimate the effect of all SNPs on the high-density SNP chip. The selection candidates are then genotyped and using the estimated SNP effect from the reference population, the genomic EBV (GEBV) are estimated for selection candidates.

In beef cattle, it is necessary to generate training populations with a sufficient number of animals with high-density genotypes and key phenotypes, and the number of animals needed is larger for traits with low heritability. Even more importantly, for genomic selection to have an impact in the beef industry, accurate (i.e. reliable) GEBV across breeds or in multi-breed populations are required. GEBVs estimate from prediction equations derived in one breed have considerably lower accuracy of prediction when

applied to other breeds (de Roos *et al*. 2009) or in multi-breed beef populations (Weber *et al*. 2011). Therefore, what is currently available for the Angus breed has little value in other *Bos taurus* breeds and is even less likely to be useful in *Bos indicus* breeds. High accuracy genomic-enhanced EPDs will provide beef cattle breeders with the opportunity to increase the rate of gain by selecting their own bulls. Because the natural service will likely continue to dominate in the commercial field, the impact of genomics will likely be realized through increased accuracy in selecting young bulls and also in allowing targeted matching of genetics with production-marketing systems. To capitalize on this technology, the development of sufficiently large training populations, particularly on difficult or expensive to measure traits is needed.

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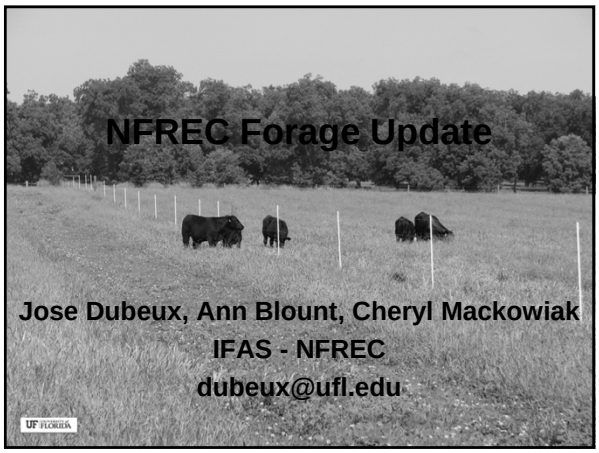
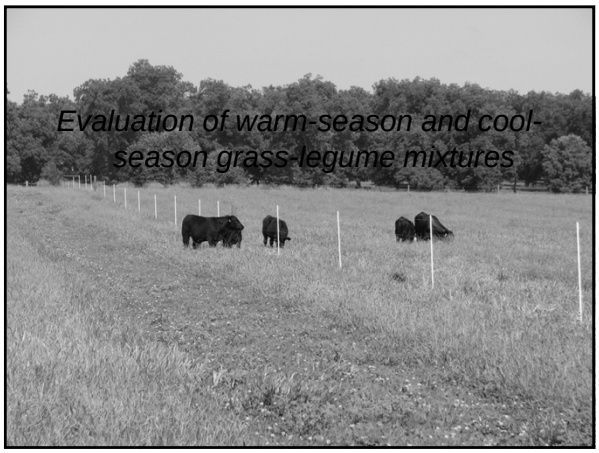


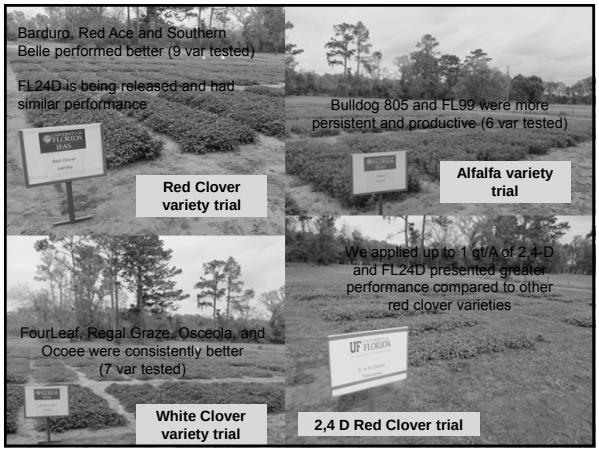
General Program Objectives

To develop strategies to reduce off-farm inputs and increase sustainability of forage production systems in Florida

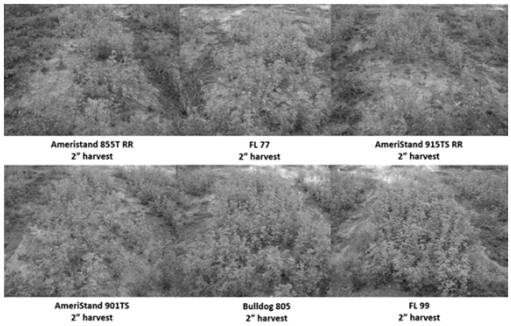
Specific Program Objectives

- *Evaluation of warm-season and cool-season grass-legume mixtures*
- *Assess ecosystem services provided by grasslands*
- *Nutrient management and water quality*
- *Strategies to reduce cattle feeding costs during the cool-season in North Florida*





Alfalfa



Alfalfa varieties after two years of harvests at UF/IFAS – NFREC, Marianna, FL. Photo credit: Jose Dubeux

Legumes with reseeding potential

Ball, Berseem, Balansa, Crimson clovers (all mixed with ryegrass) Marianna and GNV

Ball clover/ryegrass; seed rates/deferment period Marianna

Grass/legume mixtures

Treatments	Total DMY	Clover DMY	Ryegrass DMY
	lb/ac	lb/ac	lb/ac
Ryegrass-Balansa Clover	1550 b	420 b	1040 b
Ryegrass-Ball Clover	2090 b	540 b	1490 b
Ryegrass-Berseem Clover	2030 b	1530 a	480 b
Ryegrass-Crimson Clover	4090 a	1990 a	1960 a
Unfertilized Annual Ryegrass	870 c	---	850 b
SE	247	201	173
P	< 0.0001	<0.0001	0.0006

Data from NFREC-Marianna

Grass/legume mixtures

Treatments	Total N Yield	Ndfa	N Fixation
	lb/ac	%	lb/ac
Ryegrass-Balansa Clover	26 b	98 a	12 c
Ryegrass-Ball Clover	36 b	67 c	10 c
Ryegrass-Berseem Clover	44 a	86 b	32 b
Ryegrass-Crimson Clover	78 ab	95 a	46 a
Unfertilized Annual Ryegrass	10 c	---	---
SE	6	2	4
P	< 0.0001	< 0.0001	< 0.0001

Data from NFREC-Marianna

Seed rate ball clover

Treatments	Ball Clover	Clover DMY	Ndfa[£]	Nfix[€]
	%	lb DM/acre	%	lb/acre
2 lb/acre	32 b	634 b	95 a	16 b
4 lb/acre	47 a	996 a	97 a	24 a
6 lb/acre	46 a	1039 a	94 a	25 a
SE	7	214	1	4
P	0.0262	0.0210	0.5380	0.0378

[£]Ndfa is N derived from atmosphere
[€]Nfix is N fixed contained in the shoot

Rhizoma peanut variety trial Marianna, FL

Rhizoma peanut preliminary results from Marianna, FL - 2014

Cultivar	CP (%)	IVOMD (%)
Arblick	17 a	74 a
Arbrook	13 e	67 b
Ecoturf	17 ab	74 a
Florigraze	14 de	73 a
Latitude 34	15 bcd	74 a
UF Peace	16 abc	73 a
UF Tito	14 cde	73 a
SE	0.4	1

Means within the same column followed by the same letters are not different (P >

Rhizoma peanut preliminary results from Marianna, FL - 2014

Cultivar	DM Yield (lb/A)	BNF (lb N/A)	Root + Rhizome mass (lb/A)
Arblick	6700 abc	163 ab	14688 ab
Arbrook	9140 a	135 abc	15517 ab
Ecoturf	6410 bc	138 abc	20460 a
Florigraze	5360 c	98 c	9580 b
Latitude 34	5600 c	112 bc	19114 ab
UF Peace	8250 ab	174 a	15629 ab
UF Tito	8540 ab	173 a	14193 ab
SE	580	14	2370

Means within the same column followed by the same letters are not different (P > 0.05)

On-farm trials – Grass/legume mixtures – FDACS (4 trials)



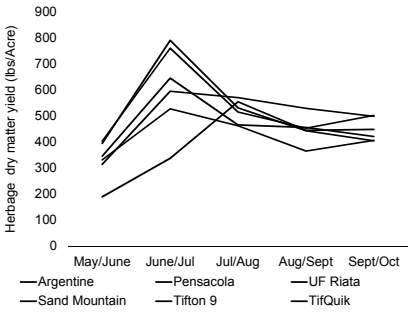

Arachis on bahiagrass (and T-85)

- *A. hypogea (Tufrunner 727)*
- *A. Glabrata (Florigraze and Ecoturf)*
- *A. pintoi (Amarillo)*

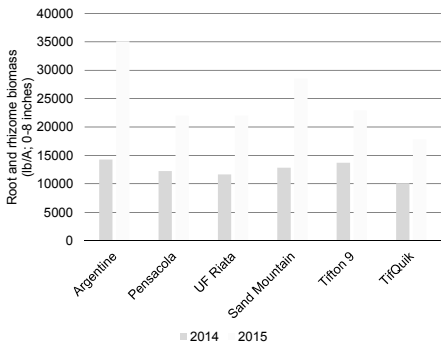


Nitrogen budget grass/legume mixtures

Bahiagrass varieties under low-N input



Bahiagrass varieties under low-N input



On-farm trials – Perennial peanut

- Two establishment methods x two PP varieties
- Four locations in Florida

On-farm results – Marianna, FL

Establishment of rhizoma peanut cultivars in North Florida. Data collected 16 months after planting

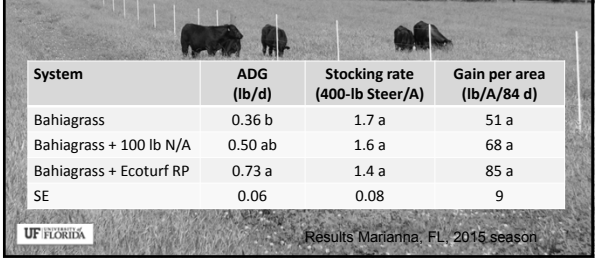
Cultivar	Soil cover (%)	RP cover (%)	RP height (cm)
Ecoturf	97 a	95 a	7.2 a
Florigraze	95 a	81 b	6.3 b
SE	0.6	3	0.3

Means within the same column followed by the same letter are not different (P > 0.05)

UF UNIVERSITY of FLORIDA

Strip-planting RP into bahiagrass pastures might be an option

PRELIMINARY RESULTS

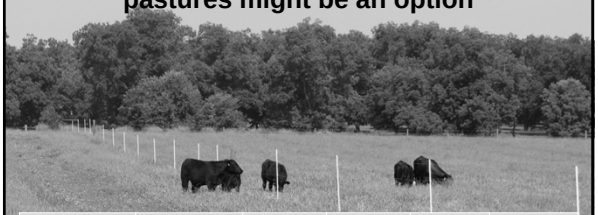


System	ADG (lb/d)	Stocking rate (400-lb Steer/A)	Gain per area (lb/A/84 d)
Bahiagrass	0.36 b	1.7 a	51 a
Bahiagrass + 100 lb N/A	0.50 ab	1.6 a	68 a
Bahiagrass + Ecoturf RP	0.73 a	1.4 a	85 a
SE	0.06	0.08	9

UF FLORIDA

Results Marianna, FL, 2015 season

Strip-planting RP into bahiagrass pastures might be an option



System	Establishment cost (US$/acre)	ADG (lbs/steer/d)	SR (Steer/acre)	Gain/150 d (lbs/acre)	US$/season
Bahiagrass	300	0.36	1.5	81	162
Bahiagrass + RP	450	0.73	1.5	164	328

**Assuming US$300/acre to establish bahiagrass, US$600/acre for rhizoma peanut, 500-lb steer, and US$2.00/lb.; establishment cost may vary with amounts and costs of inputs; In the Bahiagrass + RP mixture we assumed that 50% of the area would be planted with each species.*

Manipulating plant species composition and livestock grazing to enhance ecosystem services in southeastern grasslands

USDA NIFA

United States Department of Agriculture
National Institute of Food and Agriculture

System approach

Warm-season **Cool-season**

Nutrient Management and Water Quality

Situation:

Producers want more economical forage production with less fertilizer losses to the environment.

Overview:

- Hay fertilizer inputs >> grazing fertilizer inputs.
- Fertilizer can be over 25% of hay production costs.
- Enhanced efficiency fertilizers (EEFs; controlled- and slow-release) may help hay producers.
- Perennial grass may lessen fertilizer leaching from row crop land via sod-based rotation (SBR).

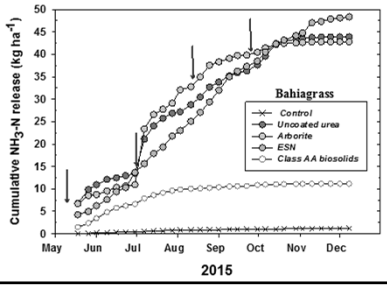
Activities:

- Coated (urease inhibitor and polymer coated) urea are being compared with uncoated urea and Class AA biosolids as nitrogen sources in hay fields.
- Subsoils (~20 ft deep) are being tested for leached nutrients from SBR, hay fields, grazing, and row crop lands.

Outcomes:

- Coatings did not affect long-term ammonia emissions (polymer coating had less initial loss).
- Bahiagrass included in a crop rotation (cotton-peanut) as a 2-year SBR, decreased subsoil nitrates up to 50%.

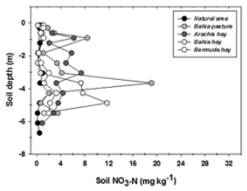
EEFs: ammonia emission estimates, using traps…

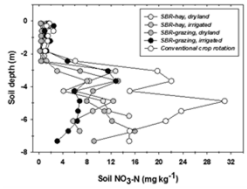


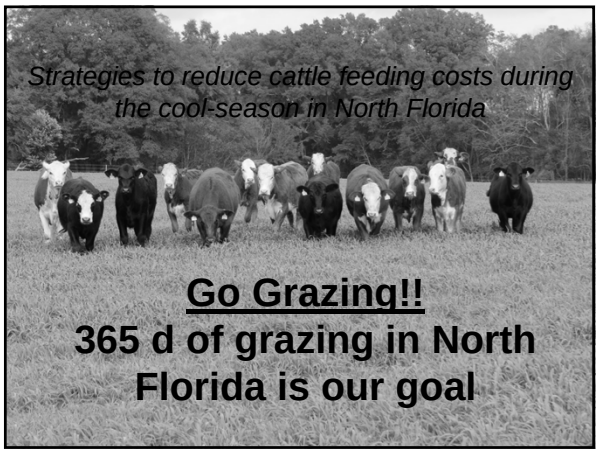
Arborite® = urease inhibitor
ESN® = polymer coated urea

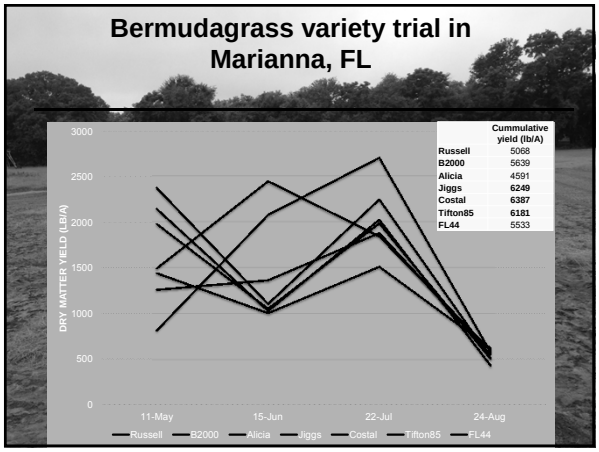
Red arrows = 80 lbs N/A application following clipping, except for biosolids (one 2-ton application in May).

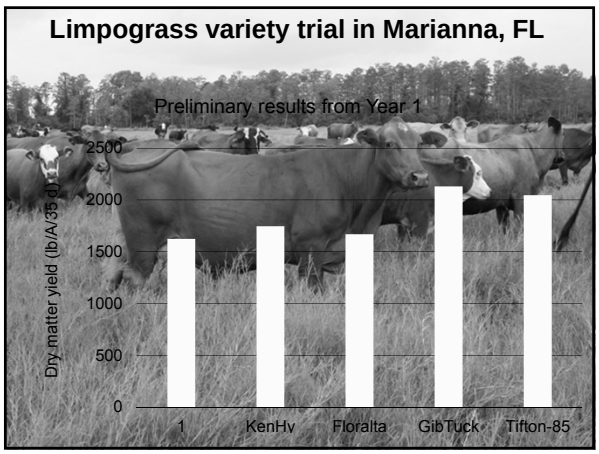
Soil nitrates under pasture, hay, and SBR (hay and pasture)…






Strategies to reduce cattle feeding costs during the cool-season in North Florida
Go Grazing!!
365 d of grazing in North Florida is our goal


Bermudagrass variety trial in Marianna, FL
DRY MATTER YIELD (LB/A)
3000
2500
2000
1500
1000
500
0
11-May
15-Jun
22-Jul
24-Aug
Russell
B2000
Alicia
Jiggs
Costal
Tifton85
FL44
Cummulative yield (lb/A)
Russell 5068
B2000 5639
Alicia 4591
Jiggs 6249
Costal 6387
Tifton85 6181
FL44 5533


Limpograss variety trial in Marianna, FL
Preliminary results from Year 1
Dry matter yield (lb/A/35 d)
2500
2000
1500
1000
500
0
1
KenHy
Floralta
GibTuck
Tifton-85

Stretching the grazing season with cool-season forage mixtures

	Small grain/annual ryegrass mixture		
	Rye/ ryegrass	Oat/ ryegrass	Triticale/ ryegrass
Average Daily Gain (lbs./day)	1.7	2.1	2.1
Stocking rate (steers*/acre/112 d)	1.8	1.8	1.7
Gain per area (lbs./acre)	343	423	400

Dubeux, 2014

Other strategies we are trying:

- Spring and early Fall planting dates with black oats and other cool-season forages
- Stockpiling – Limpograss and Bermudagrass

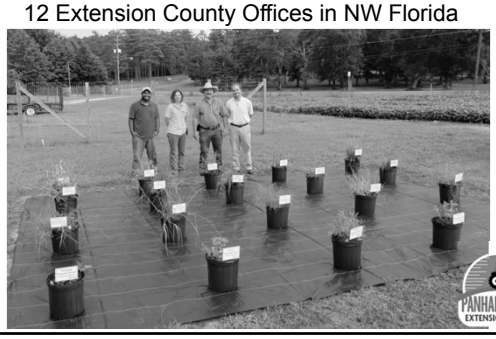
Results coming next year!!

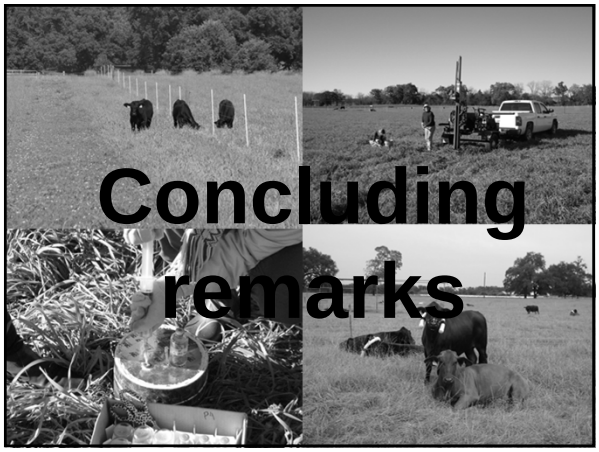
Extension Program

Field days, tours, seminars, web-delivered educational materials, growers magazines, EDIS, in service training, clientele contact, and on-farm projects

Forage Gardens Project

12 Extension County Offices in NW Florida





Take Home Messages

- We are developing grass-legume based livestock production systems
- We expect to reduce N inputs from fertilizer and increase cattle gains
- Extending the grazing season using strategic forages will reduce feeding cost
- Valuation of ecosystem services might bring another avenue of income for cattle producers


Thank you
dubeux@ufl.edu