Department of Animal Sciences

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

Welcome to the 2011 Florida Beef Cattle Short Course:

The 2011 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 59 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. However, remaining in Gainesville also brings increased cost of delivering the program because of our limited choices in venues to hold the Florida Beef Cattle Short Course. Anyone who has attended the Florida Beef Cattle Short Course for a number of years has noticed the increase in hotel room charge at the Hilton. The room charge is only one indicator of the increased cost of doing business in Gainesville.

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 rental at the hotel, 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 2011 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, 2011 Florida Beef Cattle Short Course

60th Annual Florida Beef Cattle Short Course

May 4 – 6, 2011

Presented by

Department of Animal Sciences

Cooperative Extension Service

Institute of Food and Agricultural Sciences

University of Florida, Gainesville, Florida

2011 Florida Beef Short Course Committee

Matt Hersom, Chair

John Arthington
Chad Carr
Max Irsik
Dwain Johnson
Cliff Lamb
Joel McQuagge
Todd Thrift
Mark Warren
Jerry Wasdin
Lindsey Wiggins
Tim Wilson

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Please visit our web –page @ http://www.animal.ifas.ufl.edu/extension/beef/pubs_beefreports.shtml

Allied Industry Trade Show & Reception

Hilton University of Florida Conference Center

May 4, 2011 @ 5:00pm

Exhibitors and Sponsors

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

Alltech (Sponsor)
Brent Lawrence
350 Davenport Drive
Thomasville, Georgia 31792
Telephone: 229-225-1212
Email: blawrence@alltech.com

American Angus Association
David Gazda
1985 Morton Road
Athens, Georgia 30605
Telephone: 706-227-9098
Email: dgazda@angus.org

American Simmental Association
Jeremie Ruble
3550 Kenesaw Dr. #6
Lexington, Kentucky 40515
Telephone: 406-581-7940
Email: jruble@simmgene.com

Bayer Animal Health
Alan Davis
1875 West Socrum Loop Road
Lakeland, Florida 33810
Telephone: 863-860-4755
Email: alan.davis@bayer.com

Boehringer Ingelheim
Carlton Taylor
9875 Hancock Road
Lakeland, Florida 33810
Telephone: 863-781-1146
Email: calrton.taylor@boehringer-ingelheim.com

Central Life Sciences (Sponsor)
Rick Short
PO Box 65
Romance, Arkansas 72136
Telephone: 501-765-5746
Email: rshort@central.com

Central States Enterprises, LLC
Todd Harvey
PO Box 2331
Lake City, Florida 32056
Telephone: 386-755-7443
Fax: 386-755-7444
Email: todd@cse-lc.com

Destron Fearing
Chad Johnson
PO Box 730
Williston, Florida 32696
Telephone: 352-535-5320
Fax: 352-528-2510
Email: cjohnson@destronfearing.com

Farm Credit
Ron O'Connor
PO Box 8009
Lakeland, Florida 33802
Telephone: 863-862-4117
Fax: 863-688-9364
Email: Marketing@FarmCreditCFL.com

Farm Credit (Sponsor)
Torie Hardee
12300 NW US Highway 441
Alachua, Florida 32615
Telephone: 386-462-4201
Email: Vhardee@FarmCreditFL.com

George H. Odiorne Insurance Agency, Inc.
Jeffrey Rush
PO Box 830
Brandon, Florida 33509
Telephone: 813-982-3794
Fax: 813-685-1823
Email: jrush@odiorneinsurance.com

Gold Standard Labs Chris McClure 205 West 4th Street, Suite 103 Hereford, TX 79045 Telephone: 806-363-1700 Fax: 806-363-1702 Email: chris@bvd-pi.com	**Novus International** Marty Andersen 20 Research Park Drive St. Charles, Missouri 63304 Telephone: 608-558-6180 Email: Martin.Andersen@novusint.com
IDEXX Laboratories Neal Odom 201 15th Street Wellington, Texas 79095 Telephone: 806-447-0974 Email: neal-odom@idexx.com	**Pfizer Animal Health** Heath Graham 22844 Old Providence Road Alachua, Florida 32615 Central & South Florida Telephone: 386-853-0954 Email: heath.graham@pfizer.com
IDEXX Laboratories (Sponsor) Neal Odom 201 15th Street Wellington, TX 79095 Telephone: 806-447-0974 Email: neal-odom@idexx.com	**Pfizer Animal Health (Sponsor)** Heath Graham 22844 Old Providence Road Alachua, Florida 32615 Central & South Florida Telephone: 386-853-0954 Email: heath.graham@pfizer.com
Intervet/Schering-Plough Animal Health Greg Woodard 12940 Tom Gallagher Road Dover, Florida 33527 Telephone: 813-918-2712 Fax: 813-759-1956 Email: gregory.woodard@sp.intervet.com	**Smokey Mtn Cattle** David Bryant 6600 Eureka Road NW Cleveland, Tennessee 37312 Mobile: 423-255-1089 Email: david@smokymtncattle.com
Lakeland Nutrition Group, LLC Bob Simon PO Box 1608 Eaton Park, Florida 33840 Telephone: 800-682-4995 Email: bob@lngfeeds.com	**Stockman Solutions, LLC** Travis Wiygul PO Box 730 Williston, Florida 32696 Telephone: 352-427-6116 Email: travmo75@aol.com
Merial, Ltd. Bret Myers PO Box 70 San Antonio, Florida 33576 Telephone: 863-634-9837 Email: bret.meyers@merial.com	**SweetPro Feeds** Jerry Shoop PO Box 204 Balm, Florida 33503 Telephone: 813-310-7757 Fax: 813-633-0874 Email: jlshoop@netzero.com
Novartis Animal Health Steve Coop PO Box 2020 Crystal River, Florida 34423 Telephone: 352-516-6680 Fax: 352-795-5646 Email: steve.coop@novartis.com	**TRU-TEST** Jason Jones Tammy Parish 528 Grant Road Mineral Wells, Texas 76067 Telephone: 940-327-8020 Fax: 940-327-8048 Email: tparish@tru-test.com Email: jjones@tru-test.com

Water LiveStock Wayne Shewchuk 438 NE English Ivy Trail Pinetta, Florida 32350 Telephone: 678-283-2395 Email: wshewchuk@waterls.com	**Y-TEX Corporation** Jack Simms 1825 Big Horn Avenue Cody, Wyoming 82414 Telephone: 888-600-9839 Email: jacksimms@agri-sales.com
Westway Feed Products, LLC Terry Weaver PO Box 2447 Lake Placid, Florida 33862 Telephone: 863-840-0935 Fax: 863-465-5856 Email: Terryw@westway.com	**Thank you for supporting the 60th Annual Florida Beef Cattle Short Course!**

Agenda

60th Annual Florida Beef Cattle Short Course		
Addressing Cow Herd Management and Business Issues		
Wednesday, May 4, 2011 **PM Session**		
12:00	Registration (Hilton UF Conference Center)	
Beef Enterprise Issues		
Presiding: *Dr. Matt Hersom*, Department of Animal Sciences, UF/IFAS, Gainesville, FL		
1:00	**Welcome**	*Dr. Geoff Dahl*, Chair, Department of Animal Sciences, UF/IFAS, Gainesville, FL
1:15	**Cattlemen's Comments**	*Mr. Jim Strickland*, President, Florida Cattlemen's Assoc., Myakka City, FL
1:30	**Market Outlook**	*Dr. Nevil Speer,* Western Kentucky University, Bowling Green, KY
2:15	**The Economy of Corn**	*Dr. Nevil Speer,* Western Kentucky University, Bowling Green, KY
3:00	**Refreshment Break**	**Pfizer Animal Health: Gold Sponsor**
3:30	**Championing the Beef Industry**	*Dr. Betsy Booren,* American Meat Institute
4:15	**60 years of Beef Cattle Short Course History**	*Drs. Alvin Warnick & Todd Thrift,* Department of Animal Sciences, UF/IFAS, Gainesville FL
5:00	**Allied Industry Trade Show & Reception**	Multiple companies will have exhibits and representatives to answer your questions. Hors d' oeuvres provided compliments of the exhibitors. A cash bar is available for your enjoyment.
Thursday, May 5, 2011 **AM Session**		
Cow Herd Management Decisions		
Presiding: *Dr. Todd Thrift*, Department of Animal Sciences, UF/IFAS, Gainesville, FL		
8:30	**Implications of Selection for RFI in the Cow Herd**	*Dr. G. Cliff Lamb,* University of Florida, UF/IFAS, North Florida REC, Marianna, FL
9:15	**Real-life Implementation of Controlled Breeding Season**	*Dr. Tom Troxel,* University of Arkansas, Little Rock, AR

10:00	**Refreshment Break**	**Alltech Animal Health: Silver Sponsor** **IDEXX: Silver Sponsor**
10:30	**Economic Evaluation of Cow Culling vs. Replacement Heifers**	*Dr. Curt Lacy,* University of Georgia, Tifton, GA
11:15	**Management of Florida Cow Herd Issues**	*Producer Panel*
12:00	**Leave for Lunch at UF/IFAS Horse Teaching Unit**	Sponsored by ***Farm Credit of Florida***
PM Session		
Management Issues for the Cow Herd		
Presiding: *Mr. Joel McQuagge*, Department of Animal Sciences, UF/IFAS, Gainesville, FL		
1:30	**Handling Cows Correctly**	*Dr. Todd Thrift*, Department of Animal Sciences, UF/IFAS, Gainesville, FL
2:15	**Mineral Management**	*Dr. John Arthington*, University of Florida, UF/IFAS, Range Cattle REC, Ona, FL
	Permanent Animal Identification	*Dr. Todd Thrift*, Department. of Animal Sciences, UF/IFAS, Gainesville, FL
	Co-Product Feeds	*Dr. Lawton Stewart*, University of Georgia, Athens, GA
3:30	**Refreshment Break**	Sponsored by ***Helena Chemical***
3:45	**Pasture Forages**	*Dr. Joao Vendramini*, University of Florida, UF/IFAS, Range Cattle REC, Ona, FL
	Value and Comparison of Hays	*Dr. Matt Hersom,* Department. of Animal Sciences, UF/IFAS, Gainesville, FL
	Pasture Pest Management	*Mr. Mark Warren*, Flagler Co. Extension, *Dr. Jay Ferrell*, Department of Agronomy, UF/IFAS, Gainesville, FL
5:00	**Adjourn**	
6:00	**Cattlemen's Steak-Out**	Horse Teaching Unit
Friday, May 6, 2011 **AM Session**		
Cattle Health Technologies and Management		
Presiding: *Presiding: Ms. Lindsey Wiggins, IFAS Extension, Hendry County., FL*		
8:30	**Impact of 50 Years of Beef Technologies**	*Dr. Matt Hersom*, Department. of Animal Sciences, UF/IFAS, Gainesville, FL
9:15	**Applied Management for Fly Control**	*Dr. Phil Kaufman,* Department. of Entomology and Nematology, UF/IFAS, Gainesville, FL

10:00	**Refreshment Break**	**Central Life Sciences: Silver Sponsor**
10:30	**Applied Management of Internal Parasites**	*Dr. Tom Craig,* Texas A&M University, College Station, TX
11:15	**Dealing with Toxic Weeds**	*Dr. Jay Ferrell*, Department of Agronomy, UF/IFAS, Gainesville, FL
12:00	**Adjourn - Thanks for Attending!**	

Program Participants

Arthington, John
Professor and Center Director
University of Florida/IFAS
Range Cattle Research & Education Center
3401 Experiment Station
Ona, FL 33865-9706
Telephone: 863-735-1314 Ext. 202
Email: jarath@ufl.edu

Booren, Betsy
Director, Scientific Affairs
American Meat Institute
AMI Foundation
1150 Connecticut Ave, NW 12th Floor
Washington, DC 20036
Telephone: 202-587-4249
Email: bbooren@meatami.com

Craig, Tom
Professor
College of Veterinary Medicine
Department of Veterinary Pathology
Texas A&M University
College Station, TX
Telephone: 979-845-9191
Email: tcraig@cvm.tamu.edu

Dahl, Geoffrey E.
Professor and Chair
University of Florida
Department of Animal Sciences
PO Box 110910
Gainesville, FL 32611-0910
Telephone: 352-392-1981
Email: gdahl@ufl.edu

Ferrell, Jay
Associate Professor
Extension Weed Specialist
University of Florida/IFAS
Agronomy Department
PO Box 110500
Gainesville, FL 32611
Telephone: 352-392-7512
Email: jferrell@ufl.edu

Hersom, Matt
Associate Professor
Extension Beef Cattle Specialist
University of Florida/IFAS
Department of Animal Sciences
PO Box 110910
Gainesville, FL 32611-0910
Telephone: 352-392-2390
Email: hersom@ufl.edu

Kaufman, Phillip
Assistant Professor of Veterinary Entomology
University of Florida/IFAS
Department of Entomology and Nematology
PO Box 110620
Gainesville, FL 32611
Telephone: 352-273-3975
Email: pkaufman@ufl.edu

Lacy, Curt
Associate Professor
Extension Economist-Livestock
Department of Agricultural & Applied Economics
The University of Georgia
PO Box 1209, RDC
Tifton, GA 31793
Telephone: 229-386-3512
Email: clacy@uga.edu

Lamb, Cliff
Professor and Coordinator
University of Florida/IFAS
North Florida Research and Education Center
3925 Highway 71
Marianna, FL 32446-7906
Telephone: 850-482-1356
Email: glamb@ufl.edu

Speer, Nevil
Professor
Department of Agriculture
Western Kentucky University
1906 College Heights Blvd. # 41066
Bowling Green, KY 42101
Telephone: 270-745-5959
Email: nevil.speer@wku.edu

Stewart, Lawton
Assistant Professor
Extension Animal Scientist
The University of Georgia
Department of Animal and Dairy Science
425 river Rd
Athens, GA 30602
Telephone: 706-542-2771
Email: lawtons@uga.edu

Strickland, Jim
President
Florida Cattlemen's Association
PO Box 421929
Kissimmee, FL 34742
Telephone: 407-846-6221
Email: email@stricklandranch.com

Thrift, Todd
Associate Professor
Department of Animal Sciences
Extension Beef Cattle Specialist
University of Florida/IFAS
Department of Animal Sciences
PO Box 110910
Gainesville, FL 32611-0910
Telephone: 352-392-8597
Email: tathrift@ufl.edu

Troxel, Tom
Professor and Associate Department Head
Department of Animal Science
University of Arkansas
Little Rock, AR 72204
Telephone: 501-671-2188
Email: ttroxel@uaex.edu

Vendramini, Joao
Assistant Professor
Forage Specialist
University of Florida/IFAS
Range Cattle Research & Education Center
3401 Experiment Station
Ona, FL 33865
Telephone: 863-735-1314
Email: jv@ufl.edu

Warnick, Alvin
Professor Emeritus
University of Florida/IFAS
Department of Animal Sciences
PO Box 110910
Gainesville, FL 32611

Warren, Mark
Agricultural Extension Agent I, Flagler County
University of Florida/IFAS
150 Sawgrass Rd
Bunnell, FL 32110
Telephone: 386-437-7464
Email: mwwarren@ufl.edu

Wiggins, Lindsey
Agricultural Extension Agent I, Hendry County
University of Florida/IFAS
1085 Pratt Blvd
PO Box 68, LaBelle, FL 33975
Telephone: 863-674-4092
Email: horse1@ufl.edu

Speakers Biographies

60th Annual Florida Beef Cattle Short Course

John Arthington *UF/IFAS, Range Cattle Research & Education Center, Ona, FL*
Dr. John Arthington received his B.S. from Purdue University in West Lafayette, Indiana and his PhD. from Kansas State University, Manhattan, Kansas. He currently is a Professor in the Department of Animal Sciences at the University of Florida. He began at the University of Florida in 1998. He was appointed Center Director at the Range Cattle Research and Education Center in Ona, Florida in 2005. He is a member of the American Society of Animal Science, American Dairy Association and the American Registry of Professional Animal Sciences.

Betsy Booren *American Meat Institute, Washington, DC*
Dr. Betsy Booren joined the American Meat Institute (AMI) in January 2009 and serves as the director of scientific affairs within the AMI Foundation. Dr. Booren's responsibilities include coordinating research activities for the AMI Foundation and responding to the technical and scientific needs of AMI members. She is also the staff liaison to the AMI Scientific Affairs Advisory Committee. Dr. Booren received her Ph.D. in Food Science and Technology from Texas A&M University, M.S. in Animal Science from the University of Nebraska, and a B.S. in Food Science from Michigan State University.

Tom Craig *College of Veterinary Medicine, Texas A & M, College Station , TX*
Dr. Thomas Craig received his Ph.D. from Texas A & M University and DMV from Colorado State University. He was a military veterinarian in Europe and spent 7 years in a mixed veterinary practice in the US and New Zealand. Dr. Craig is currently a Professor in Veterinary Pathology at the College of Veterinary Medicine at Texas A & M University. Dr. Craig's primary interest is in the epidemiology and control of internal parasites of grazing animals, including improved diagnostics, evaluation of and sustainable use of anthelmintics. Anthelmintic resistance is an increasing problem. Identifying the problem before it occurs by looking at both the worm and the hosts are important aspects of this research. Research in arthropod borne protozoan infections including pathogenesis and the epidemiology of parasites of man and domesticated animals is also something he does. Dr. Craig serves as the Director of the Parasitology Diagnostic Laboratory and as a consultant.

Geoff Dahl *Professor & Chair, UF/IFAS, Depart. of Animal Sciences, Gainesville, FL*
Dr. Geoff Dahl received a B.S. degree from the University of Massachusetts and a Ph.D. from Michigan State University in East Lansing, Michigan, both in animal science. He joined the University of Florida as Professor and Department Chair, 2006. Dr. Dahl conducts applied and basic research with direct impact on animal production and health. Specifically, his program focuses on understanding the physiological impact of management interventions at various

stages of the lactation cycle, in an attempt to harness that knowledge to optimize cow health and performance. The fundamental aspects of Dr. Dahl's research have led to applications in other agriculturally important species including sheep, goats and pigs.

Jay Ferrell *UF/ IFAS, Depart. of Agronomy, Gainesville, FL*

Dr. Jay Ferrell is an Associate Professor in the Department of Agronomy at the University of Florida. He received his M.A. from the University of Kentucky and his Ph.D. from The University of Georgia. The focus of his Extension and Research programs include: weed management in agronomic crops, weed management in pastures, weed management programs for industrial sites, and the environmental fate of aminopyralid.

Matt Hersom *UF/ IFAS, Depart. of Animal Sciences, Gainesville , FL*

Dr. Matt Hersom is an Associate Professor and Extension Beef Cattle Specialist at the University of Florida. Dr. Hersom received his B.S. and M.S. at the Iowa State University in Animal Science and Animal Nutrition, and Ph.D. at Oklahoma State University in Animal (Ruminant) Nutrition. 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.

Phil Kaufman *UF/IFAS, Entomology & Nematology Depart., Gainesville, FL*

Dr. Phil Kaufman is an Assistant Professor with the Entomology and Nematology Department at the University of Florida. The primary focus of his research and extension program is to develop components to improve Integrated Pest Management (IPM) systems that include basic cultural and physical control strategies to enhance and adapt existing biological controls, and preserve existing pesticides through resistance monitoring and management as well as the develop novel safe pesticides and to transfer this information to Florida's stakeholders. Recent efforts have targeted pesticide resistance in house, horn and stable flies, between farm (and town) movement of stable and house flies, tracking E. coli O157:H7 on Florida livestock farms, brown dog tick and cattle fever tick pesticide resistance, development of new pesticides, and investigations into mosquito ecology in suburban areas and dung beetle populations on Florida cattle farms. As an Assistant Professor of Veterinary Entomology he teaches graduate and undergraduate courses in Medical and Veterinary Entomology. He is an active member of the Entomological Society of America, the Florida Entomological Society and the American Mosquito Control Association.

Curt Lacy *Agriculture & Applied Economics Depart. The UGA, Tifton, GA*

Dr. Curt Lacy is a Livestock Economist and Associate Professor in the Agricultural and Applied Economics Department at the University of Georgia-Tifton. Since coming to UGA in 2001, Dr.

Lacy has had extension and applied research responsibilities in the areas of livestock/forage economics and marketing. He also co-teaches an undergraduate class, "Issues in Animal Agriculture" and will be the undergraduate advisor for the UGA Tifton Agribusiness major that will begin in fall 2011.

Although he has many varied interests, his primary areas of emphasis are the economics and marketing of beef and dairy in alternative production systems, forage economics and breeding herd economics in beef, pork and dairy systems. He routinely provides beef cattle market updates and other economic information to producers, county agents and agribusiness people across the state and within the region. He is also the risk management coordinator for the Georgia Beef Challenge, one of the oldest beef cattle feed-out and carcass evaluation programs in the country.

Cliff Lamb *UF/North Florida Research and Education Center, Marianna, FL*

Dr. Cliff Lamb is currently a Professor and Assistant Center Director, NFREC, at the University of Florida. He initiated his post-secondary studies at Middle Tennessee State University and graduated with a B.S. in Animal Science in 1992. He received his M.S. and Ph.D. at Kansas State University. In 1998, after completing graduate school, Dr. Lamb became a Beef Specialist/Assistant Professor at the University of Minnesota. He was promoted to Associate Professor in 2003, until moving to the University of Florida in 2008. His primary research efforts focus on applied reproductive physiology in beef cattle emphasizing efficient management systems for replacement heifers and postpartum cows. In addition to research and extension, Dr. Lamb coordinates the beef research facilities at the University of Florida's North Florida Research and Education Center in Marianna.

Nevil Speer *Depart. of Agriculture, Western Kentucky University, Bowling Green, KY*

Dr. Nevil Speer currently is an Animal Science Professor and MBA at Western Kentucky University in the Department of Agriculture. He currently serves as the Program Director for the WKU Master of Arts in Leadership Dynamics program. Additionally, his duties include teaching, applied research and industry outreach with the Department of Agriculture.

Lawton Stewart *Depart. of Animal and Dairy Science, The UGA, Athens, GA*

Dr. Lawton Stewart is an Assistant Professor at The University of Georgia, in the Department of Animal and Dairy Science. He received his M.S. from the University of Florida and his Ph.D. from Virginia Tech., specializing in Ruminant Nutrition and Forage Utilization. The focus of Dr. Stewart's programs is beef cattle nutrition and management. His stated goals are to teach producers to understand the changing needs of their herd through the different stages of production, maximize their cheapest source of nutrients and forages, and to develop an economical supplementation strategy when needed. Dr. Stewart's efforts are to help producers improve production and efficiency in their herd, as well as, explore other opportunities in the

beef cattle industry in the areas such as preconditioning/backgrounding, stockering, and retained ownership.

Jim Strickland *President, Florida Cattlemen's Association, Myakka City, FL*
Jim Strickland, this year's Florida Cattlemen's Association President, has been in the cattle business for 35 years. For 20 years or so his sole income was from his cattle and day working for other ranchers. 19 years ago, Jim took a full time position at the Manatee County Property Appraisers office, assessing agricultural property. He is dedicated to promoting and educating the public and future generations about the life we cherish as farmers and cattlemen. He believes in hands on experiences to educate our community about the cattle industry by opening up ranches and farms to the public and school kids. "Nothing teaches our general public better about the life we cherish more than getting to see it in action."

Todd Thrift *UF/ IFAS, Depart. 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 been with the University of Florida's Department of Animal Science for eight years in 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.

Tom Troxel *Depart. of Animal Science, University of Arkansas, Little Rock, AR*
Dr. Tom Troxel has held the position of Professor and Associate Animal Science Department Head since 1992. Dr. Troxel's primary responsibility is planning, executing and evaluating beef cattle programs in order to support, strengthen and improve county programs. Other important duties include assisting and training county Extension agents and maintaining close-working relationships with other University of Arkansas faculty and related livestock organizations and agencies. Some of his major programming areas include the 300 Day Grazing program, Arkansas Beef Quality Assurance program, Arkansas Beef Audit, Livestock Market news, factors affecting the selling price of Arkansas cattle, and Animal Science electronic newsletters.

In addition to his state Extension responsibilities, Dr. Troxel served on a number of regional and national committees and activities. Some of these included American Society of Animal Science committees (national and southern section) and NCBA's Integrated Resource Management Coordinating Committee, Producer Education Committee and the Beef Quality Assurance Cow/Calf Assessment Task Force.

Dr. Troxel is a well published author. His articles appear in many popular press publications including the *Arkansas Cattle Business*. Dr. Troxel has published 30 referred journal articles, 76 abstracts, 55 extension publications and 64 experiment station reports.

Joao Vendramini *UF/IFAS, Range Cattle Research & Education Center, Ona, FL*

Dr. Joao (Joe) Vendramini, Forage Specialist at the Range Cattle Research and Education Center, Ona, FL, received his M.S. in Animal Science from the University of Sao Paulo, Brazil and a Ph.D. in Agronomy from the University of Florida. He has been closely involved with animal production and worked as a Farm Manager in a large-scale beef cattle operation in Southern Brazil, which collectively maintained more than 10,000 beef cattle; 2,400 acres of sugarcane; and 1,200 acres of soybean and corn. After he earned his PhD, Dr. Vendramini worked as Assistant Professor - Forage Specialist at Texas A&M University. His research program at the UF/ IFAS Range Cattle Research and Education Center in Ona, focuses on management of warm-season grasses, different aspects of the plant-animal interface in grazing systems, and effects of supplementation on forage utilization and animal performance. He is a member of the America Society of Agronomy, Crop Science Society of America, America Society of Animal Science, and Professional Animal Science.

Alvin Warnick *UF/ IFAS, Depart. of Animal Sciences, Gainesville , FL*

Dr. Alvin C. Warnick was born on a livestock farm in Hinckley, Utah. He received his B.S. at Utah State University, Logan, Utah in 1942 where he studied Animal Husbandry. From 1942 – 1945 he was a Radar Mechanic in the Army Air Corp and was stationed in England. After serving in the military, he returned to the United States and in 1947 he received his M.S. from the University of Wisconsin, Madison, specializing in Reproduction and Physiology. He continued on at the University of Wisconsin and received his Ph.D. in Genetics and Physiology. Dr. Warnick was an Assistant Professor at Oregon State University from 1950 – 1953. In 1953 the University of Florida was indeed honored to retain him as a Professor from 1953 – 1990. He also worked in Argentina, Brazil and Ethiopia. Dr. Warnick retired from the University of Florida January 31, 1990 but maintains a vital role in extension programs, as his expertise in the field is invaluable.

Mark Warren *UF/IFAS, Flagler County Extension, Bunnell, FL*

Mark Warren is currently a Livestock and Natural Resources extension agent for Flagler County. His responsibilities include meeting clientele educational needs in the areas livestock management, row crop production, timber management, pesticide application, and natural resource management. Mr. Warren is a 4th generation Floridian. He graduated from The University of Georgia and is completing his M.S. at the University of Florida.

Addressing Cow Herd Management and Business Issues: Market Outlook

60th Annual Florida Beef Cattle Short Course
Gainesville, Florida
May 4-6, 2011

Nevil C. Speer, PhD, MBA
Western Kentucky University

RECESSIONNARY THEME: WE'RE IN A DARK WOOD AND THE WAY IS NOT STRAIGHT

Rebalancing the U.S. Economy for a New Course

JULY 16, 2010, 1:55 PM ET
Return to Normal Will Be Painfully Long Trek

ECONOMY | JULY 3, 2010
U.S. Jobs Picture Darkens
Payrolls Shrink for First Time This Year as Census Work Winds Down

2010: RESILIENCE!!!!

Hedge Rows

Deleveraging the Personal Balance Sheet

"It's the consumer's turn to go through a restructuring…

the beginnings of a sustained slowdown in the US consumer."

Nancy Lazar, Vice chairwoman and economist, Manhattan's ISI Group: *Barron's* (9/22/08)

"Deleveraging will be a slow, arduous process for both households and the government."

Wells-Fargo Annual Economic Outlook 2011 (12/8/10)


THE WALL STREET JOURNAL.

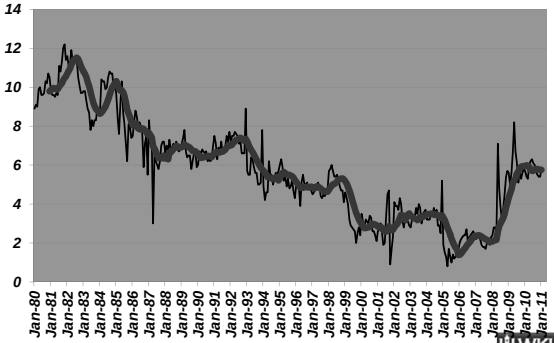
What's News

Lending Falls at Epic Pace

WKU

Personal Savings Rate (% of disposable income): 12-mo Moving Average

(Adapted From U.S. Dept. of Commerce – thru Jan, 2011)

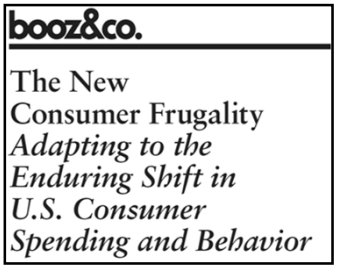


WKU

"Over the past 12 months, I reduced my expenditures in this category"

#1 Answer: Food away from home 58%!

% respondents who "agreed" or "strongly agreed"
March, 2010


booz&co.

The New Consumer Frugality
Adapting to the Enduring Shift in U.S. Consumer Spending and Behavior

WKU

Consumers Trading Down and Across

PLMA Consumer Research Report, GfK Custom Research North America, c. 2009

Recession influencing retail purchases

- **3 out of 4 shopping differently**
- **1 out of 3: economy "very important" in purchasing decisions**

Expenditures rotating from restaurant to retail

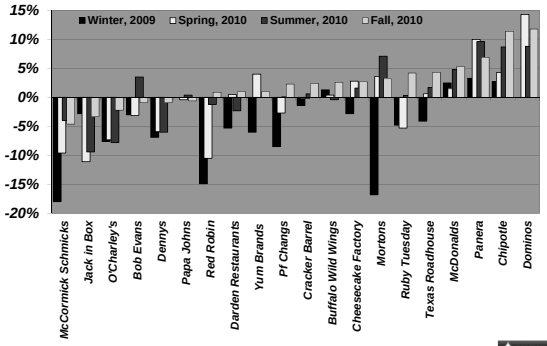
- **6 out of 10: eating out less often vs year ago**
- **Looking ahead 1 year, 50% continue to eat more meals at home**

"People are eating out less…
demanding more of supermarkets."

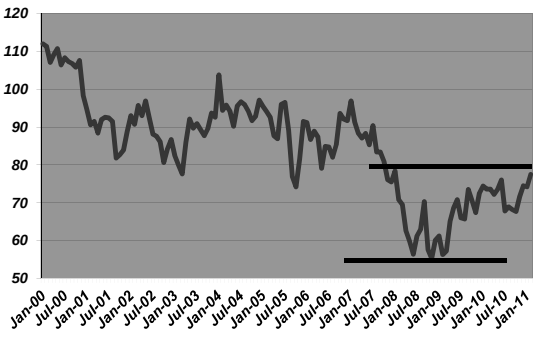
Lempert Supermarket Guru/Nat'l Grocer Association Consumer Panel (Feb 5, 2009)

Restaurants: Qrtly YOY Same-Store Sales

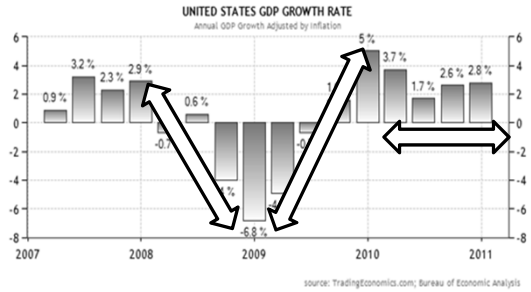
(Most recent reported quarter as December, 2010)



University of Michigan Consumer Sentiment



U.S. GDP Growth



Fixing The Economy

"Nothing we are seeing in a post-bubble credit collapse is normal."

Dave Rosenberg, Chief Economist & Strategist, Gluskin Sheff (8/5/10)

Each expansion since the '70s has been getting weaker and weaker, so much so that the last expansion before the Great Recession, the 2001-2007 expansion, was the weakest Expansion in the whole post-World War II history.

Lakshman Achuthan, Managing Director, Economic Cycle Research Institute (7/8/2010)

WKU

Housing / Unemployment: Enduring and Confounded

Broad-based Home Price Declines Raise Fear of Double-Dip Recession

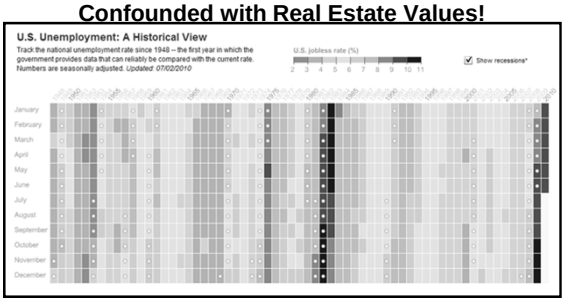
By **Mark Heschmeyer**
December 1, 2010

…what is really key from Friday's (12/3/10) data is the lack of commitment the business sector is making to the economy with the continued reliance on part-time workers who do not get benefits and can be let go on a moment's notice.

Dave Rosenberg, "Breakfast with Dave", Gluskin-Sheff (12/6/10)

WKU

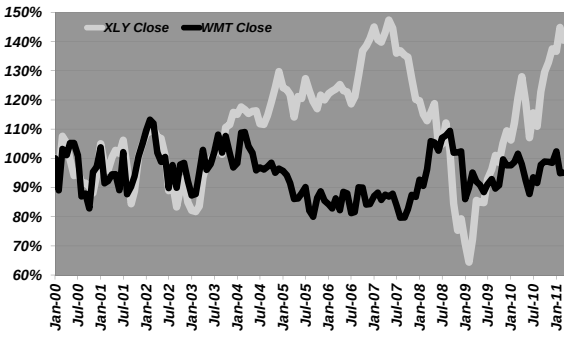
Unemployment…
Confounded with Real Estate Values!



"Structural unemployment is entrenched."
Robert Albertson, Investment Strategist, Sandler O'Neil and Partners
Bloomberg on the Economy (Feb 11, 2011)

WKU

A Tale of Two Consumers…
XLY vs. WMT: Relative Monthly Closing Values



Food Industry CFO Survey

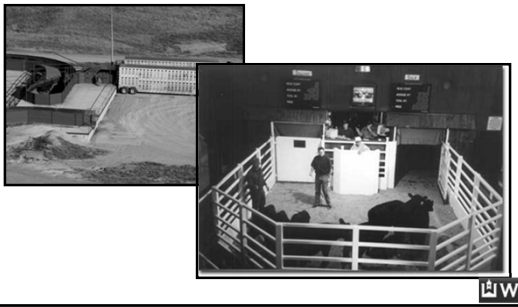
Reported by Feedstuffs (12/06/10)
530 companies: $50 mil-to-$1 bil annual revenue

"Value continues to dominate the food category," Krause said, noting that consumers are interested in learning more about where food comes from and its nutritional value. The survey found that the CFOs cited value as the consumer preference that would most significantly influence company product offerings (43%).

Daniel Krause, GE Capital (Food, Beverage, Agribusiness)

WKU

BUT WAIT…IT'S BEEN DIFFERENT THIS TIME AROUND!!!! (AT LEAST FOR LIVESTOCK)



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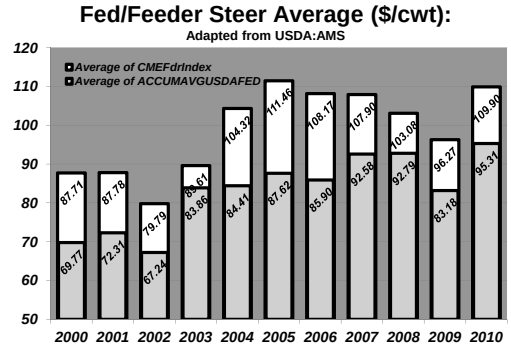

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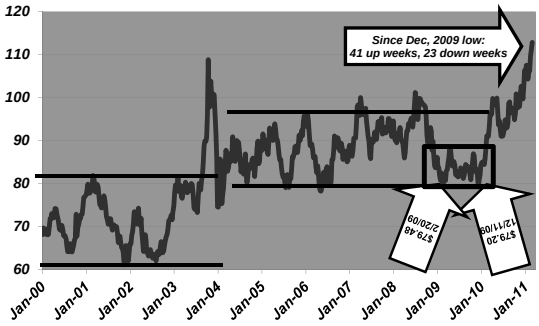
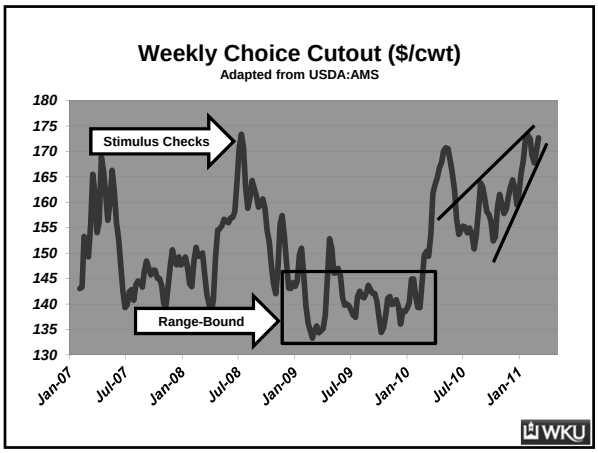
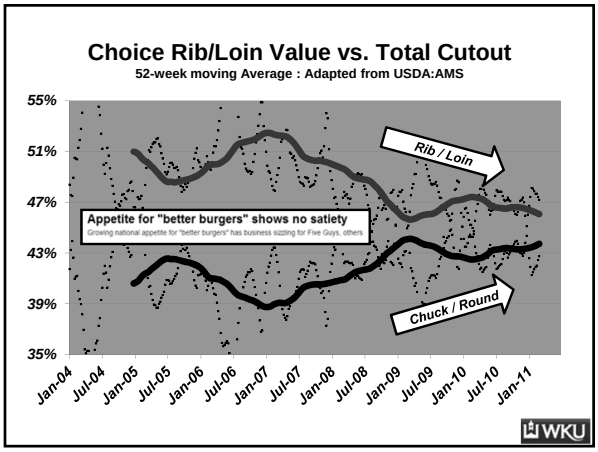
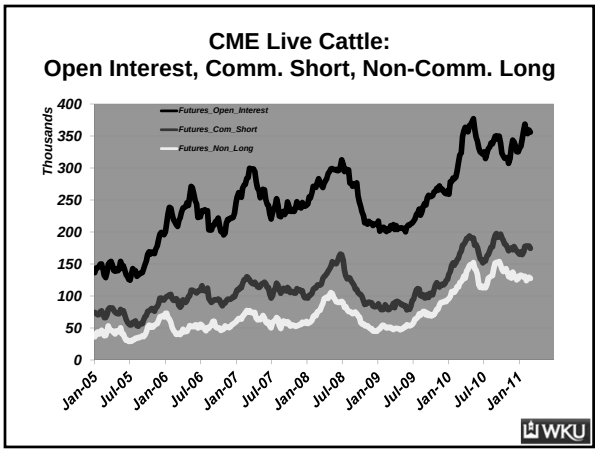
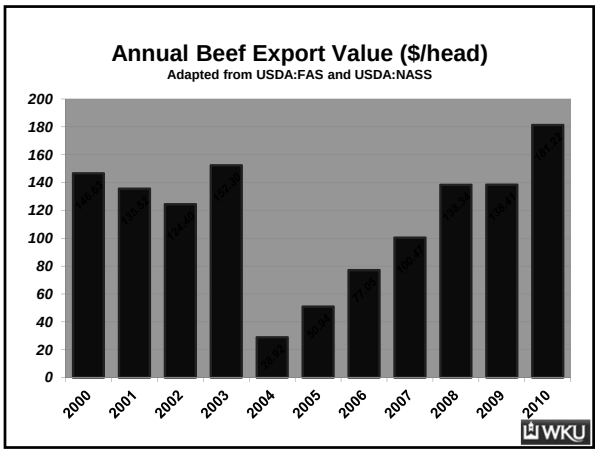
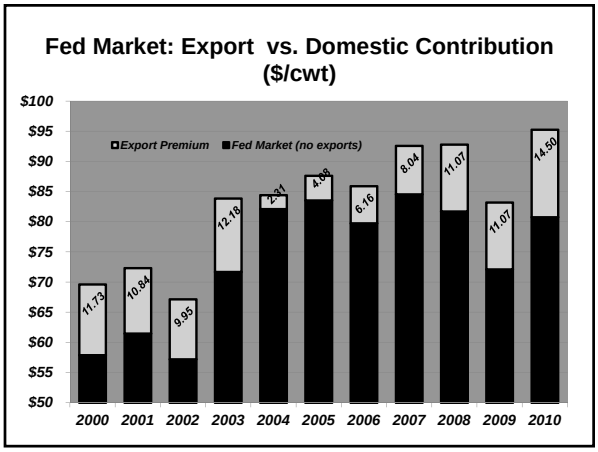


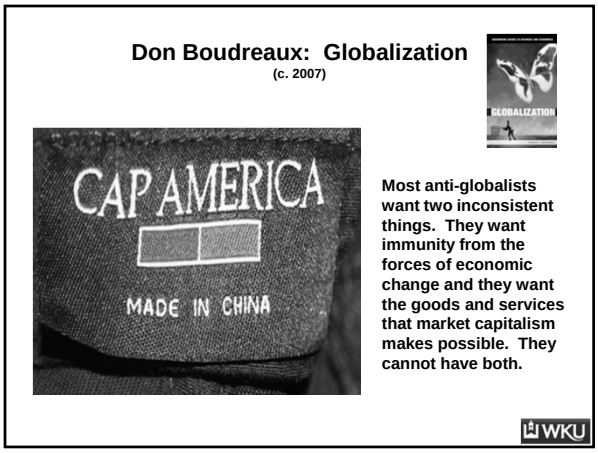

Weekly Choice Cutout ($/cwt)
Adapted from USDA:AMS
Stimulus Checks
Range-Bound
180
175
170
165
160
155
150
145
140
135
130
Jan-07
Jul-07
Jan-08
Jul-08
Jan-09
Jul-09
Jan-10
Jul-10
Jan-11
WKU


Choice Rib/Loin Value vs. Total Cutout
52-week moving Average : Adapted from USDA:AMS
Rib / Loin
Appetite for "better burgers" shows no satiety
Growing national appetite for "better burgers" has business sizzling for Five Guys, others
Chuck / Round
55%
51%
47%
43%
39%
35%
Jan-04
Jul-04
Jan-05
Jul-05
Jan-06
Jul-06
Jan-07
Jul-07
Jan-08
Jul-08
Jan-09
Jul-09
Jan-10
Jul-10
Jan-11
WKU

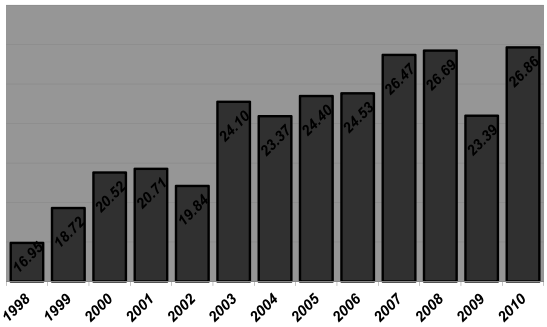

CME Live Cattle:
Open Interest, Comm. Short, Non-Comm. Long
Thousands
Futures_Open_Interest
Futures_Com_Short
Futures_Non_Long
400
350
300
250
200
150
100
50
0
Jan-05
Jul-05
Jan-06
Jul-06
Jan-07
Jul-07
Jan-08
Jul-08
Jan-09
Jul-09
Jan-10
Jul-10
Jan-11
WKU


Annual Beef Export Value ($/head)
Adapted from USDA:FAS and USDA:NASS
200
180
160
140
120
100
80
60
40
20
0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
WKU


Fed Market: Export vs. Domestic Contribution ($/cwt)
$100
$95
$90
$85
$80
$75
$70
$65
$60
$55
$50
Export Premium
Fed Market (no exports)
11.73
10.84
9.95
12.18
2.31
4.98
6.16
8.04
11.07
11.07
14.50
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010


Don Boudreaux: Globalization
(c. 2007)
GLOBALIZATION
CAP AMERICA
MADE IN CHINA
Most anti-globalists want two inconsistent things. They want immunity from the forces of economic change and they want the goods and services that market capitalism makes possible. They cannot have both.
WKU

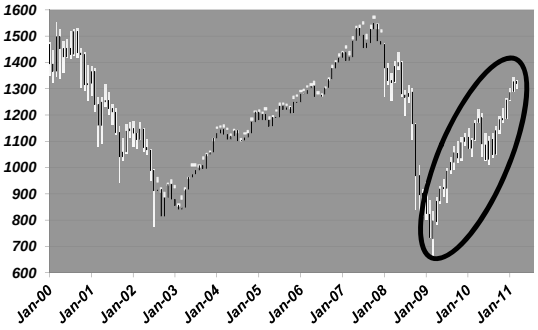
Aggregate Annual Feedyard Revenue (Bil $)



WKU

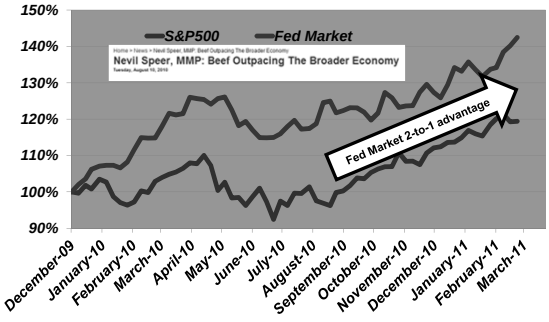
Lost Decade? S&P500 Monthly High / Low / Closing Values

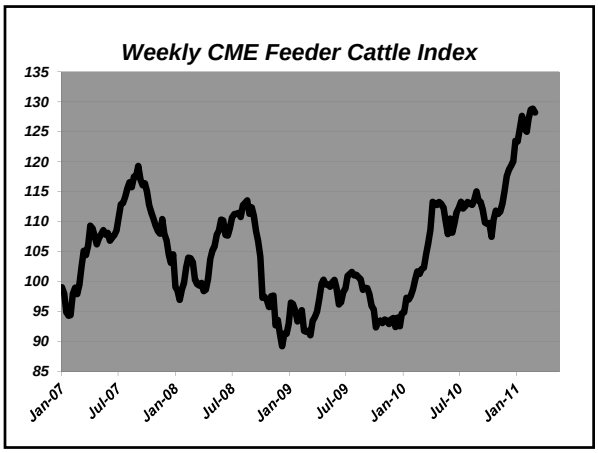
(Low: 667 – March, 2009 / High: 1576 – October, 2007)

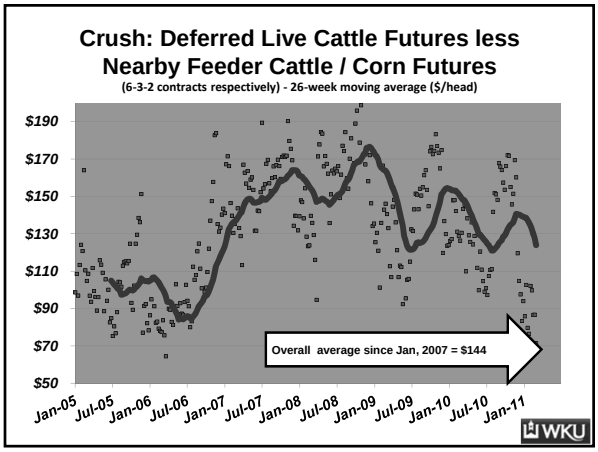


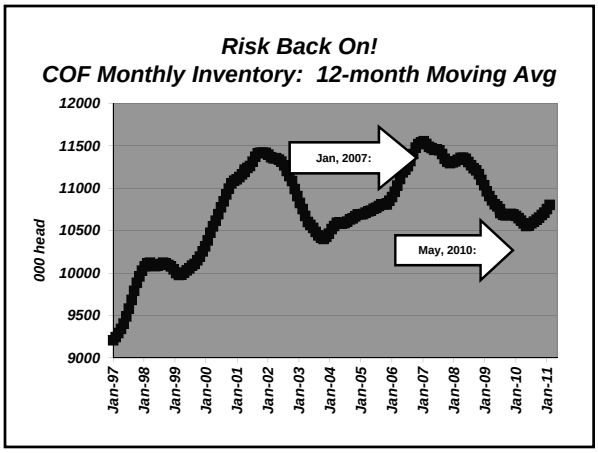
Relative Performance: Weekly Fed Market vs. SP500 Weekly Closing Values

(Dec '09 marks fed market's near-term low)

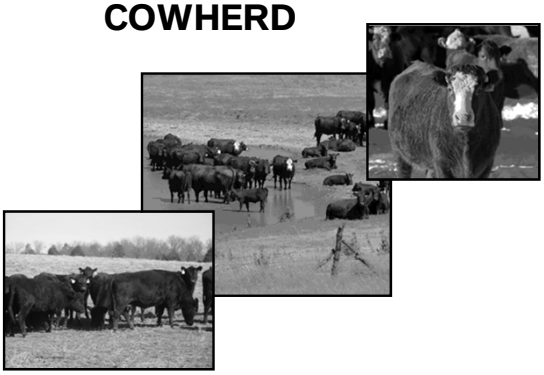



Weekly CME Feeder Cattle Index
135
130
125
120
115
110
105
100
95
90
85
Jan-07
Jul-07
Jan-08
Jul-08
Jan-09
Jul-09
Jan-10
Jul-10
Jan-11


Crush: Deferred Live Cattle Futures less
Nearby Feeder Cattle / Corn Futures
(6-3-2 contracts respectively) - 26-week moving average ($/head)
$190
$170
$150
$130
$110
$90
$70
$50
Overall average since Jan, 2007 = $144
Jan-05
Jul-05
Jan-06
Jul-06
Jan-07
Jul-07
Jan-08
Jul-08
Jan-09
Jul-09
Jan-10
Jul-10
Jan-11
WKU

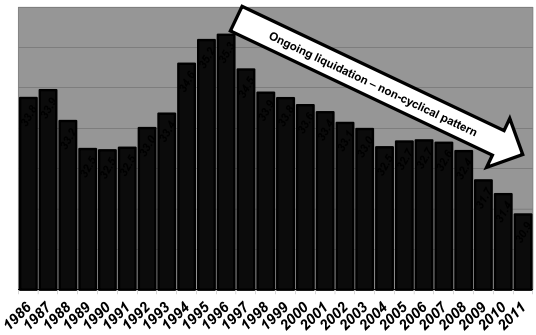

Risk Back On!
COF Monthly Inventory: 12-month Moving Avg
000 head
12000
11500
11000
10500
10000
9500
9000
Jan, 2007:
May, 2010:
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11

COWHERD



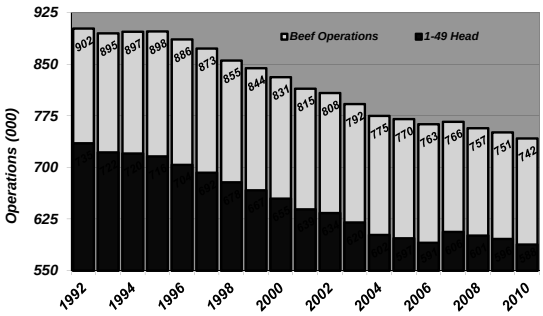
WKU

U.S. Jan 1 Beef Cow Inventory (mil cows)



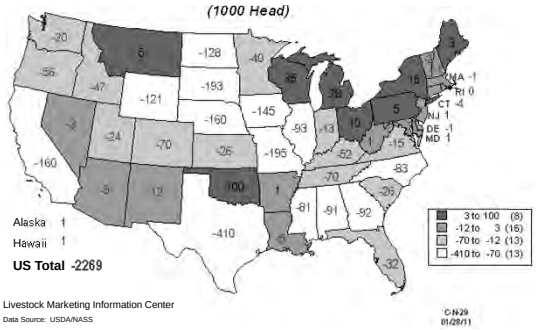
Beef Cow Operations: Overall vs. <50 head

Overall decline ~160,000 operations /
92% of decline explained by operations with <50 head

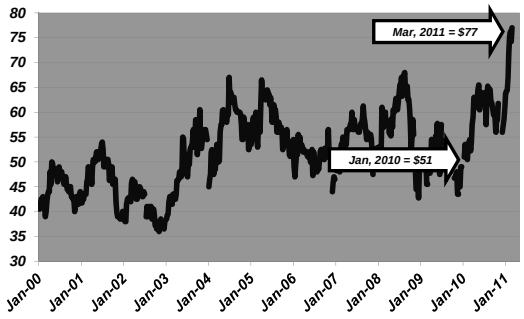


CHANGE IN BEEF COW NUMBERS JANUARY 1, 2002 TO JANUARY 1, 2011

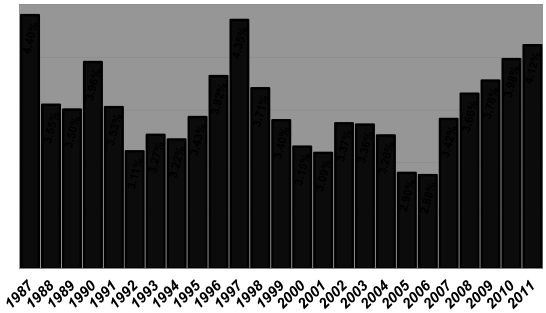
(1000 Head)



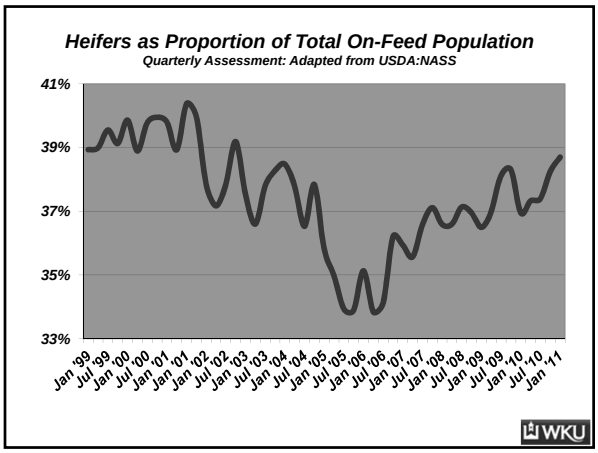
Weekly Slaughter Cow Prices ("Breakers") $/cwt



Oct thru Jan Cumulative Beef Cow Slaughter: % of Previous Year's Inventory



WKU



Characterizing Commercial Producers

Adapted From: Purdue Univ, Nat'l Conf. for Agribusiness
"Serving Commercial Producers: Meeting Needs, Adding Value"

- **Getting Bigger**
  - **Economies of Scale**
  - **Require More Attention**
- **Shift in Focus**
  - **Technology**
  - **Value**
  - **Contracts**
- **More Sophisticated**
  - **Business Oriented (vs. lifestyle or convenience)**
  - **Spend More Time Making Purchasing Decisions**
  - **(And Less Time Making Marketing Decisions)!!!!!!!**

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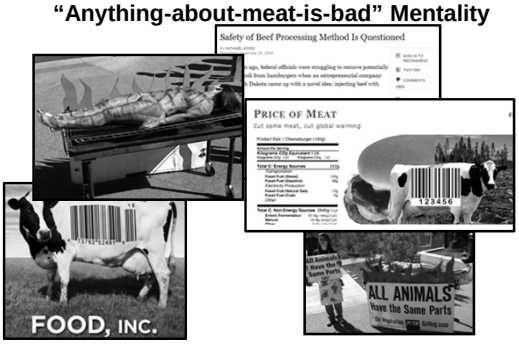
INCREASINGLY PERVASIVE

"Anything-about-meat-is-bad" Mentality



WKU

Warning: This hamburger may be hazardous to your health. Why the American food system is bad for our bodies, our economy and our envionment – and what some visionaries are trying to do about it.

WKU

AgSight: Meat Eaters, You're Just No Good

AgSight: Vegans, Let's Get Real Here

AgSight: Advocacy Can Never Go On Vacation!

AgSight: Elena Kagan - Food Industry Activist?

AgSight: Are Calories Just The Beginning?

Agsight: Healthcare's Public Option - Backdoor For More Agricultural Regulation

WKU

The Challenge

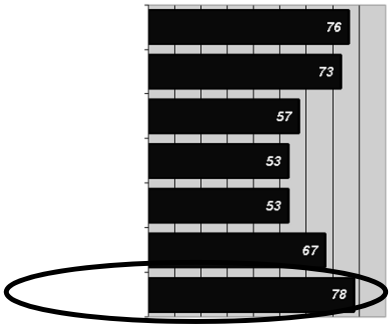
Center for Food Integrity

- **Building trust and confidence in the contemporary food system among a public that is largely disinterested and uninformed.**
- **The contemporary food system is not perceived as being consistent with the understanding or values of consumers or with the positive attributes historically assigned to farmers.**
- **Voices questioning current food system practices are increasing in number, volume and impact.**

WKU

What's For Dinner?: % Respondents

Deloitte Food Survey (May, 2008)



WKU

Become A Food-Producer Partner!!!

Shelf-Centered Collaboration

Kauffeld, Sauer and Bergson: Strategy + Business, Autumn 2007

- **The overarching goal is for each function and each business in the value chain to think end-to-end about the entire network of participants, from the first supplier to the *end consumer*.**
- **Instead of seeing their job as simply creating demand of supplying the shelf, *they can now contribute to making the entire value chain more effect***

WKU

USDA United States Department of Agriculture
Grain Inspection, Packers & Stockyards Administration

GIPSA

AgSight: Fix The Market!! But Is It Broken?
09/24/2010 08:46AM Average rating: (0)

AgSight: GIPSA Missing The Forest For The Trees

AgSight: "Level Playing Field" Fraught With Sinkholes
08/18/2010 01:15PM

Agsight: RCALF / OCM Lost In Translation
07/20/2010 07:36AM

Agsight: I Do Not Think It Means What You Think It Means

WKU

Thanks Jarrod:

A special thank you to Jarrod Fritz, President, of our local cattle association for his excellent leadership in trying to improve the financial position of grassroots cattle producers. He supports the Organization for Competitive Markets and the elimination of packer concentration.

At our last county meeting the guest speaker was Mike Callicrate, independent feed lot operator, activist for grassroots cattlemen and plaintiff in Pickett, et al vs. IBP Inc. Mike was enthusiastically received by over 100 cattlemen, several of which were from other counties.

We at [redacted] heartily support Jarrod, the Organiztion for Competitive Markets and the elimination of packer concentration. Our future as independent operators depends on it. We urge you to contact our Senators and support bill 1044 which will eliminate captive supplies.

Thanks Jarrod for helping "Grassroots Cattle Producers"

S 1044: Captive Supply Reform Act (Enzi et al., 2003)

WKU

Final Demand!!!!!

August, 2010 MMP

If ever there was a period in which the market was prone to disintegrating because of inequitable practices 2010 would be it. …the market's resilience is partially attributable to the previous 20 years of work: alliances and value-based marketing have contributed to increased prevalence of effective price signals throughout the supply chain. That's enhanced beef quality and consistency while ensuring responsive precision and efficiency of product delivery to various consumer segments. The bottom-line being improved customer satisfaction that's anchoring spending in these challenging times.

WKU

BUSINESS PERSPECTIVE

"The most dangerous situations arise when the threat is ambiguous. This leads managers to ignore or discount the risk and take a wait-and-see attitude. Such an approach can be catastrophic."

Roberto, Bohmer and Edmonson, "Facing Ambiguous Threats", *Harvard Business Review*, November, 2006

WKU

A Matter Of Perspective: Duck or Rabbit?

- The wrong question:
  - What's the market going to be?
    - Implies single mindset of being price taker
    - Myopic: doing what we've always done
- The right question:
  - What's the business environment telling us?
  - How will we construct our marketing and management decisions around those signals?
  - Where do new opportunities lie?

WKU

Kansas Farm Management Assoc.

Profitability Comparison Among Operations

Beef Cow Operation / Sell Feeders (per head)

Upper 1/3 Operations

- Total Costs: $703.57
  - Labor: $74.49
  - Feed/Pasture: $345.79
  - Other: $283.29
- Sale Price: $95.82/cwt
- Average Weight 730 lb

Lower 1/3 Operations

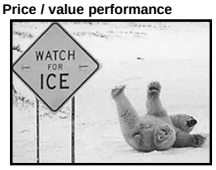
- Total Costs: $1064.22
  - Labor: $103.76
  - Feed/Pasture: $589.72
  - Other: $370.74
- Sale Price: $92.57/cwt
- Average Weight 690 lb

"Research suggests that while both production and price do impact profit, but they are much less important in explaining differences between producers than costs."

WKU

One Tough Business!!! The Challenge Matrix

- Consumer Demands
  - Food safety
  - Health / wellness attributes
  - Eating satisfaction
  - Animal welfare
  - Convenience
  - Consistency
  - Brand recognition
  - Personalized shopping experience
  - Price / value performance



- Evolving Business Pressures
  - Animal health guidelines
  - Trade issues
  - Just-in-time inventory
  - Informational technology
  - Global competition
  - Government programs
  - Source verification
  - Traceability mandates
  - Environmental regulations
- Production Headaches
  - Weather
  - Volatile Markets

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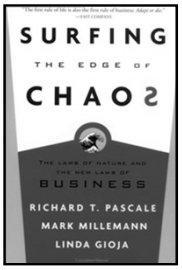
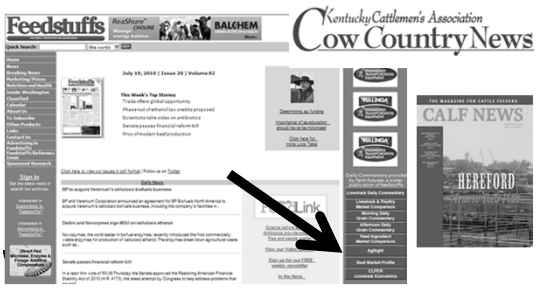
ADVANCING THROUGH CHAOS AND COMPLEXITY



Harder to handle are those non-routine challenges where discontinuous change is sought. These challenges often demand a leap in capability, and solutions are unproven or unknown. In these instances, nimbleness and agility are essential…This is not a "maybe" or a "sort of". It's a deal breaker.

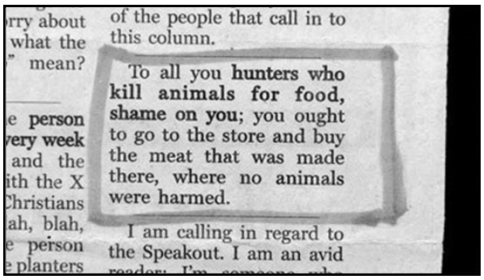
WKU

Monthly Market Profile
Beef Biz
AgSight



WKU

QUESTIONS????



rry about what the " mean?

e person very week and the ith the X Christians ah, blah, e person e planters

of the people that call in to this column.

To all you **hunters who kill animals for food, shame on you**; you ought to go to the store and buy the meat that was made there, where no animals were harmed.

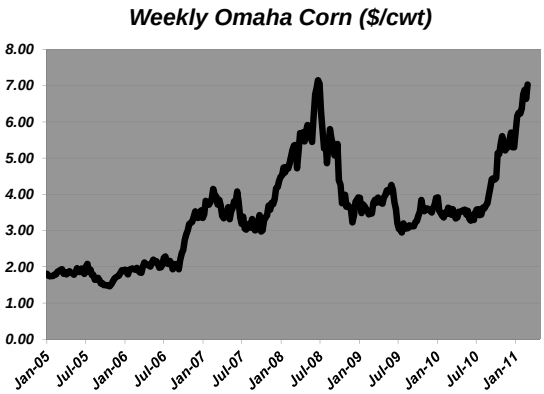
I am calling in regard to the Speakout. I am an avid

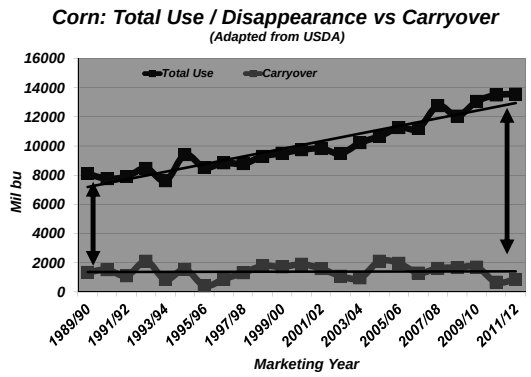
WKU

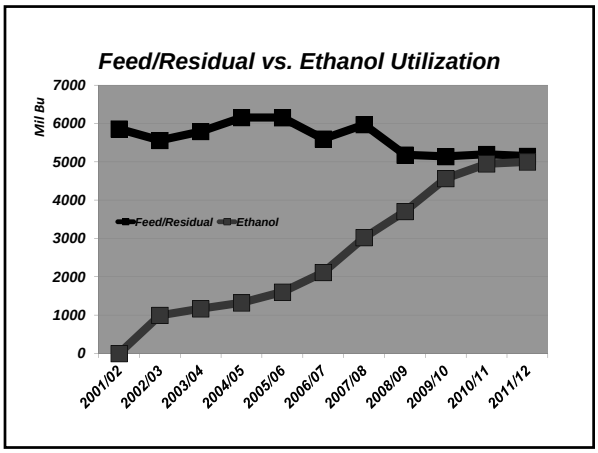
Addressing Cow Herd Management and Business Issues: Corn Economy

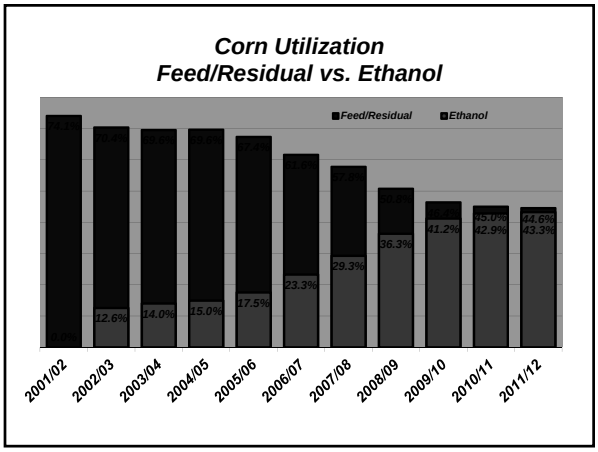
60th Annual Florida Beef Cattle Short Course
Gainesville, Florida
May 4-6, 2011

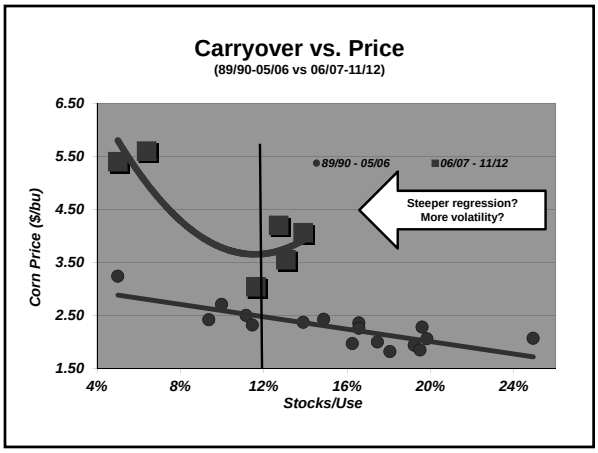
Nevil C. Speer, PhD, MBA
Western Kentucky University

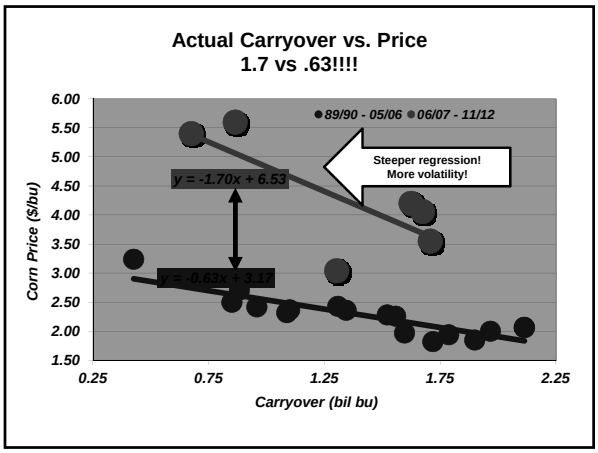


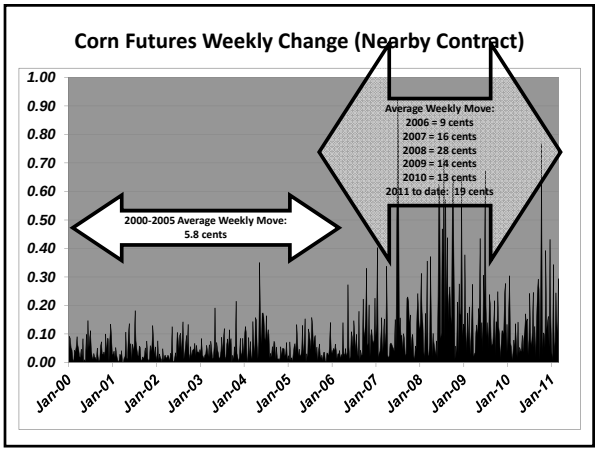


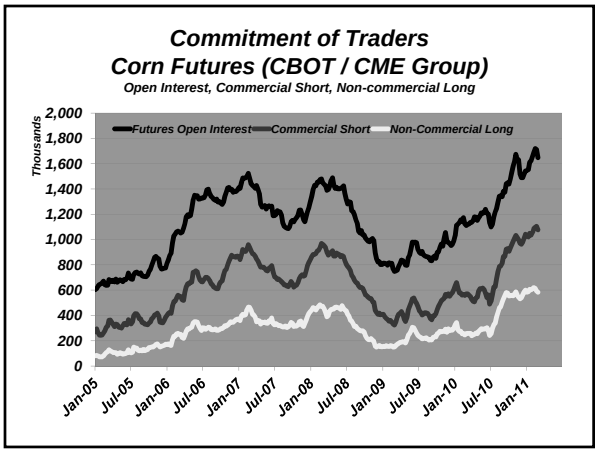

Feed/Residual vs. Ethanol Utilization
Mil Bu
7000
6000
5000
4000
3000
2000
1000
0
Feed/Residual
Ethanol
2001/02
2002/03
2003/04
2004/05
2005/06
2006/07
2007/08
2008/09
2009/10
2010/11
2011/12

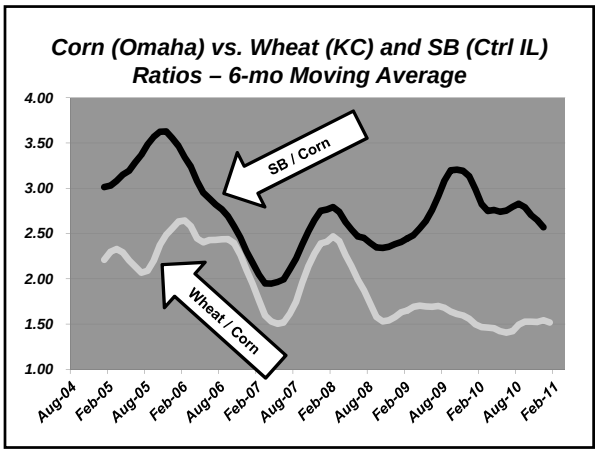

Corn Utilization
Feed/Residual vs. Ethanol
Feed/Residual
Ethanol
12.6%
14.0%
15.0%
17.5%
23.3%
29.3%
36.3%
41.2%
42.9%
43.3%
2001/02
2002/03
2003/04
2004/05
2005/06
2006/07
2007/08
2008/09
2009/10
2010/11
2011/12


Carryover vs. Price
(89/90-05/06 vs 06/07-11/12)
Corn Price ($/bu)
6.50
5.50
4.50
3.50
2.50
1.50
89/90 - 05/06
06/07 - 11/12
Steeper regression?
More volatility?
4%
8%
12%
16%
20%
24%
Stocks/Use

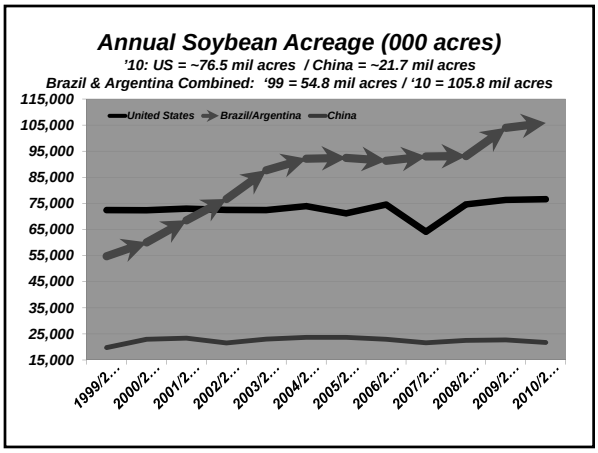

Actual Carryover vs. Price
1.7 vs .63!!!!
89/90 - 05/06
06/07 - 11/12
Steeper regression!
More volatility!
y = -1.70x + 6.53
y = -0.63x + 3.17
Corn Price ($/bu)
6.00
5.50
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
0.25
0.75
1.25
1.75
2.25
Carryover (bil bu)

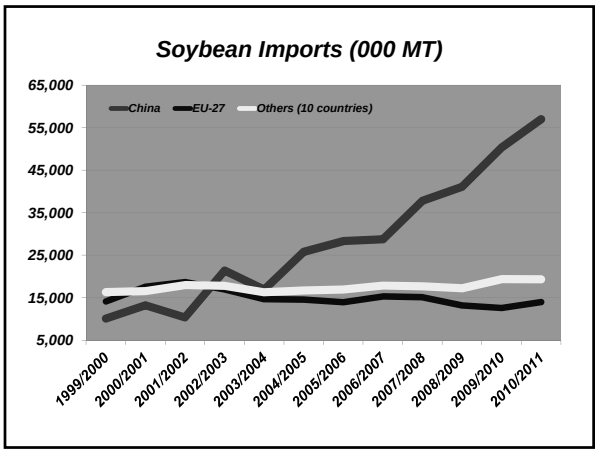

Corn Futures Weekly Change (Nearby Contract)
Average Weekly Move:
2006 = 9 cents
2007 = 16 cents
2008 = 28 cents
2009 = 14 cents
2010 = 13 cents
2011 to date: 19 cents
2000-2005 Average Weekly Move:
5.8 cents
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11

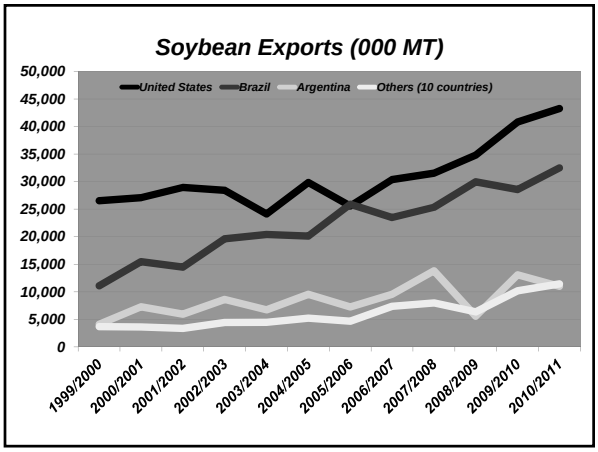

Commitment of Traders
Corn Futures (CBOT / CME Group)
Open Interest, Commercial Short, Non-commercial Long
Futures Open Interest
Commercial Short
Non-Commercial Long
Thousands
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Jan-05
Jul-05
Jan-06
Jul-06
Jan-07
Jul-07
Jan-08
Jul-08
Jan-09
Jul-09
Jan-10
Jul-10
Jan-11

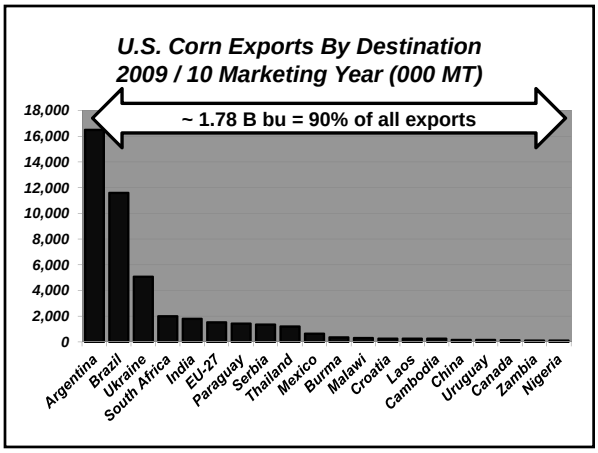

Corn (Omaha) vs. Wheat (KC) and SB (Ctrl IL) Ratios – 6-mo Moving Average
4.00
3.50
3.00
2.50
2.00
1.50
1.00
SB / Corn
Wheat / Corn
Aug-04
Feb-05
Aug-05
Feb-06
Aug-06
Feb-07
Aug-07
Feb-08
Aug-08
Feb-09
Aug-09
Feb-10
Aug-10
Feb-11


CORN:
EXPORTS
Bloomberg
China Corn Imports May Surge, U.S. Grains Council Says
October 05, 2010, 12:37 PM EDT
WKU


Annual Soybean Acreage (000 acres)
'10: US = ~76.5 mil acres / China = ~21.7 mil acres
Brazil & Argentina Combined: '99 = 54.8 mil acres / '10 = 105.8 mil acres
United States
Brazil/Argentina
China
115,000
105,000
95,000
85,000
75,000
65,000
55,000
45,000
35,000
25,000
15,000
1999/2…
2000/2…
2001/2…
2002/2…
2003/2…
2004/2…
2005/2…
2006/2…
2007/2…
2008/2…
2009/2…
2010/2…


Soybean Imports (000 MT)
China
EU-27
Others (10 countries)
65,000
55,000
45,000
35,000
25,000
15,000
5,000
1999/2000
2000/2001
2001/2002
2002/2003
2003/2004
2004/2005
2005/2006
2006/2007
2007/2008
2008/2009
2009/2010
2010/2011


Soybean Exports (000 MT)
United States
Brazil
Argentina
Others (10 countries)
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
1999/2000
2000/2001
2001/2002
2002/2003
2003/2004
2004/2005
2005/2006
2006/2007
2007/2008
2008/2009
2009/2010
2010/2011

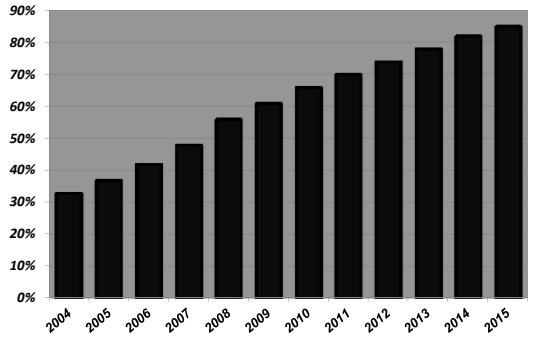

U.S. Corn Exports By Destination
2009 / 10 Marketing Year (000 MT)
~ 1.78 B bu = 90% of all exports
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
Argentina
Brazil
Ukraine
South Africa
India
EU-27
Paraguay
Serbia
Thailand
Mexico
Burma
Malawi
Croatia
Laos
Cambodia
China
Uruguay
Canada
Zambia
Nigeria

World Corn Supply and Use (09/10)

Million Metric Tons (MMT)	Beginning Stocks	Production	Imports	Domestic Feed 2/	Domestic Total 2/	Exports	Ending Stocks
World 3/	147.82	812.38	89.79	482.7	815.66	96.89	144.54
United States	42.5	332.55	0.21	130.57	281.42	50.46	43.38
Total Foreign	105.32	479.83	89.58	352.12	534.24	46.43	101.16
Major Exporters	5.11	36.22	0.28	9.7	17.3	18.5	5.8
Argentina	0.99	22.8	0.25	5	6.9	16.5	0.64
South Africa	4.11	13.42	0.03	4.7	10.4	2	5.16
Major Importers	18.22	107.06	52.24	112.16	160.36	3.42	13.74
Egypt	1.4	6.82	5.83	10.1	12.5	0.02	1.53
EU-27 6/	6.15	57.15	2.93	45	60	1.52	4.71
Japan	1	0	15.98	11.4	16	0	0.98
Mexico	3.56	20.37	8.3	14.2	30.2	0.64	1.39
Southeast Asia 7/	4	22.61	6.22	20.6	28.6	1.24	2.99
South Korea	1.47	0.08	8.46	6.36	8.41	0	1.59
Selected Other							0
Brazil	12.08	56.1	0.55	40	47	11.6	10.13
Canada	1.83	9.56	2.1	7.65	11.61	0.13	1.76
China	53.17	158	1.3	112	159	0.15	53.31
FSU-12	1.58	18.04	0.23	11.3	12.92	5.6	1.34
Ukraine	0.73	10.5	0.01	4.8	5.5	5.07	0.67

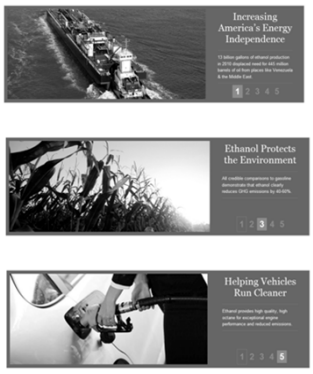
China: Commercial Hog Production

(Rebecca Bratter, Director Trade Development, U.S. Grains Council, USDA Outlook Forum Presentation, 2011)



THE INFLUENCE OF ETHANOL

RFA RENEWABLE FUELS ASSOCIATION
30 Years of Leadership



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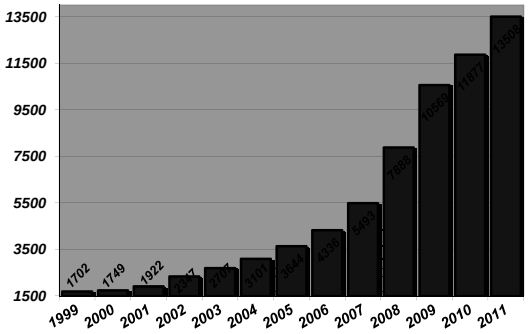
Ethanol – General Observations

- **Profitability / Sustainability**
  - **Mandates**
  - **Corn Price**
  - **Ethanol / Gas Margin**
    - **45-cent / gal tax credit**
    - **Ethanol π up to a 45-cent premium over gas**
- **150 B gal annual fuel use**
  - **E10 represents 15 B gal**
  - **Nearing blend wall**

Jan. 1 Annual Ethanol Capacity (mil gal)

Adapted from Renewable Fuels Association (RFA)



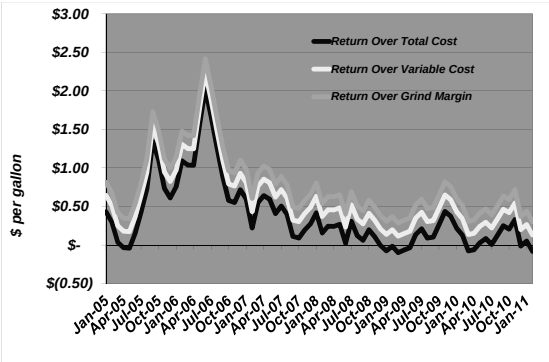
Ethanol Plant Alternative Scenarios: Crude, Gasoline and Shutdown Price of Corn

Source: Darrell Good and Scott Irwin, UofI (March , 2011)

Crude Oil Price ($/bbl)	Wholesale Gasoline Price ($/gal)	Shutdown Price of Corn for Ethanol Plants ($/bu)
75	2.00	5.89
95	2.50	7.84
110	3.00	9.78
130	3.50	11.72
150	4.00	13.66

Ethanol Profitability

Source: USDA AMS Iowa Ethanol Report, EIA



Ethanol Plant Locations (Source: RFA) (Implications for E85)

NEW DYNAMICS

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Financial Ramifications
Markets Always Uncertain…
What's New is Amplified Volatility!

- 25,000 head feedyard
- Daily corn usage: 7-8,000 bu
- Equivalent to 675,000 quarterly
- Current moving average = 30 cents
- Wrong decision: ~$200,000+
  - For just one quarter!!!!
  - $4/head over 2 turns
  - Potentially wipes out annual profit

Purchasing inputs is increasingly time consuming and complex

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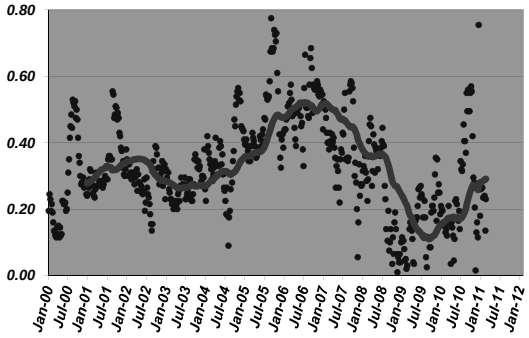
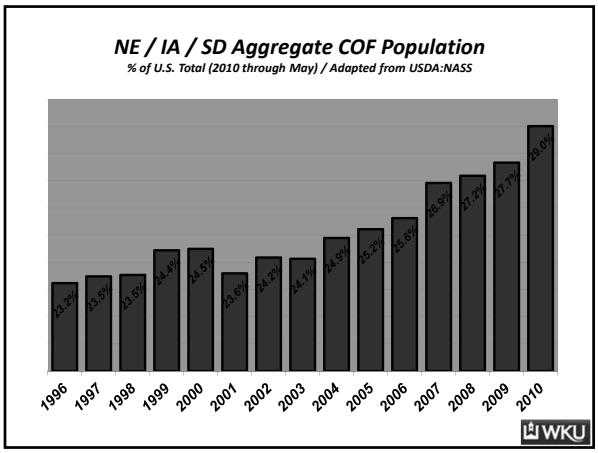
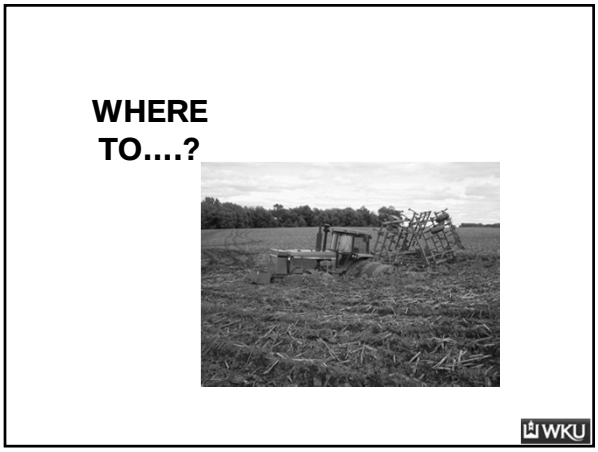
Capital Requirements

- $1/bu = ~$55/head (750-lb yearling)
- 30,000 head feedyard = $1.65 mil!!!

Weekly TX Triangle Corn Differential
($/bu: Basis Omaha) 52-week moving average




NE / IA / SD Aggregate COF Population
% of U.S. Total (2010 through May) / Adapted from USDA:NASS
23.2%
23.5%
23.5%
24.4%
24.5%
23.6%
24.2%
24.1%
24.9%
25.2%
25.6%
26.8%
27.2%
27.7%
29.0%
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
WKU


WHERE TO….?
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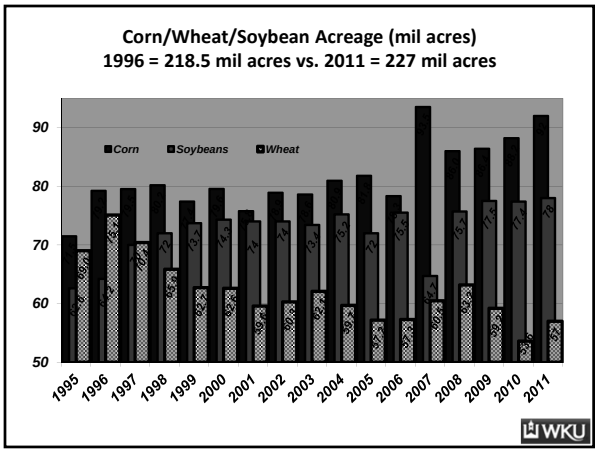
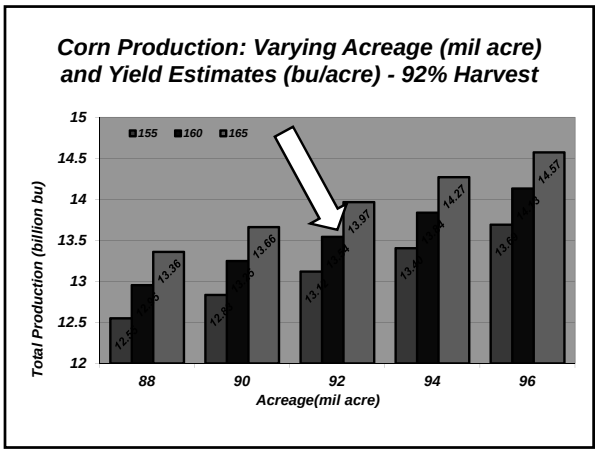
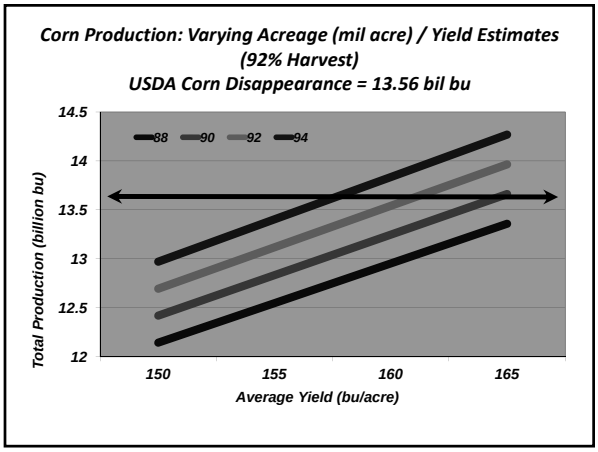
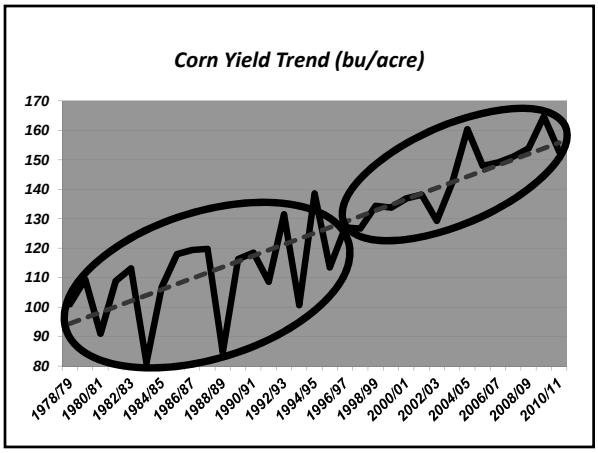
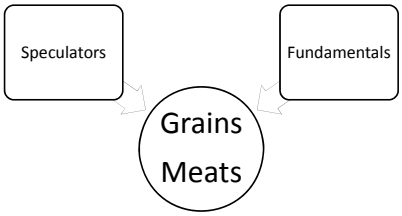

Corn/Wheat/Soybean Acreage (mil acres)
1996 = 218.5 mil acres vs. 2011 = 227 mil acres
90
80
70
60
50
Corn
Soybeans
Wheat
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
WKU


Corn Production: Varying Acreage (mil acre) and Yield Estimates (bu/acre) - 92% Harvest
155
160
165
Total Production (billion bu)
15
14.5
14
13.5
13
12.5
12
13.36
13.66
13.97
14.27
14.57
88
90
92
94
96
Acreage(mil acre)

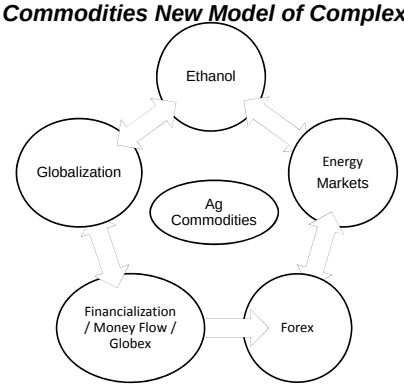

Corn Production: Varying Acreage (mil acre) / Yield Estimates (92% Harvest)
USDA Corn Disappearance = 13.56 bil bu
88
90
92
94
Total Production (billion bu)
14.5
14
13.5
13
12.5
12
150
155
160
165
Average Yield (bu/acre)


Corn Yield Trend (bu/acre)
170
160
150
140
130
120
110
100
90
80
1978/79
1980/81
1982/83
1984/85
1986/87
1988/89
1990/91
1992/93
1994/95
1996/97
1998/99
2000/01
2002/03
2004/05
2006/07
2008/09
2010/11

Ag Commodities Traditional Model
Internal Drivers Only



Ag Commodities New Model of Complexity



Risk =
1. Danger
2. Opportunity

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Business Transition: Black Swans


Black Swans Now a Regular Part of Market Landscape

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By: Jeff Cox
CNBC.com Staff Writer

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For global financial markets, once-in-a-lifetime events are happening with such regularity that black swans may as well be white swans.

Such supposedly rare occurrences, brought into the national consciousness largely through Nassim Taleb's 2007 book, "The Black Swan," have dominated the markets for more than a decade.

"What you really want to plan for are 'what ifs' rather than counting on a linear forecast of what's going to happen."

Gerald Greenwald, Founding Principal, Greenbriar Equity Group LLC
Former Chairman and CEO, UAL Corp
Former Vice-Chairman, Chrysler
Bloomberg on the Economy; Jan 13, 2009

WKU

CZ11: March 15-18
Lots of Volatility!!!

A Matter Of Perspective: Duck or Rabbit?

- **The wrong question:**
  - **What's the market going to be?**
    - **Implies single mindset of being price taker**
    - **Myopic: doing what we've always done**
- **The right question:**
  - **What's the business environment telling us?**
  - **How will we construct our marketing and management decisions around those signals?**
  - **Where do new opportunities lie?**

WKU

Always remember, it's the worry you haven't even thought to worry about that should worry you the most!

Clarice Bean, Don't Look Now **(Lauren Child)**

WKU

Championing the Beef Industry

Betsy Booren, Ph.D.

Director, Scientific Affairs, American Meat Institute, Washington, DC

Negative news coverage and the popularity of books like *The Omnivore's Dilemma, Fast Food Nation* and the film *Food, Inc*. are giving credence to distorted information about food production systems that is not based on fact. It is important to understand the degree to which these myths are taking hold among Americans and it is essential to target communications efforts around the myths that are most strongly believed by Americans. To begin the process of responding to the distorted or inaccurate information being given on food production, specifically beef production, it is critically important to examine and better understand how we arrived at our current dilemma.

The beef food production continuum is made up of four groups: the beef industry, regulatory agencies, public health agencies, and consumers. Consumers influence the other three factions in demand, policy, and human needs. But the consumer of 2011 is different than the consumer of five, ten, and twenty years ago.

The last twenty years have seen momentous changes in technology. Consumers no longer receive their news from primarily newspapers and network television. Twenty-four hour cable news, entertainment news, blogs, and the internet have revolutionized how consumers receive information. News is instantaneously posted on the internet, texted, or tweeted. Information is provided in headlines, 140 characters, and 2-minute video clips. This has created a culture of instant gratification, simple answers to complicated problems, and short attention spans.

To complicate matters, Americans have never been further away from agriculture both physically and conceptually. Less than five percent of the U.S. population is on farms and this distance spans generations. Despite this, most Americans have opinions on food, but where is their "knowledge" coming from? Historically, Americans have sought the advice of institutions like corporations, and the government agencies. But today those institutions are viewed with distrust and Americans look towards people with similar values as experts, regardless of qualifications.

So the question becomes, how does the beef industry overcome these challenges?

The beef industry should capitalize on the need to fill knowledge voids of consumers and not let activists be the only source of credible information. The beef industry also needs to be considered by the consumers as a trusted source of information. Messages should be factual and positive. Research has shown that consumers can overcome negative perception of meat products when in-depth positive information is given. [1]

To better address this issue, the American Meat Institute (AMI) in March 2010 retained Harris Interactive to conduct an on-line survey of 2,100 Americans. Respondents were asked to score myths on a scale of 1-100 (1-being least favorable; 100-most favorable), in terms of the degree to which they agreed or disagreed. "Anti" industry respondents ranked the meat industry below 30. The mean favorability score for the meat industry was 48.7, which was higher than automotive (47.4), pharmaceutical

[1] Fox, J. (2002). Influence on purchase of irradiated foods. *Food Technology*. 56.

(42.3), banking (40.7) and oil and natural gas (39.5). Those who are pro-industry tend to be male, Republican, conservative, married and meat consumers. Those who are "anti" industry are most likely to be female, liberal, higher educated and on some type of vegetarian/non-meat diet. A majority (63%) say they have not heard anything about the production of meat or poultry in the past three months. However, those who reported hearing something said the coverage was mostly negative (77%). The survey overall showed that Americans, unaided, continue to focus on price, quality, and freshness when making purchases. However, when probed, they did express concern about a number of issues and the top myths were identified:

- hormone use in meat and poultry production;
- eating too much red meat can increase heart disease risk;
- Americans today are eating more meat and poultry than recommended;
- antibiotic use in livestock production is a concern and use is increasing;
- most sodium nitrite comes from meat products; and
- inspectors only visit meat and poultry plants occasionally and that lack of federal oversight makes livestock abuse common.

A multiple media curriculum was developed to debunk these myths. The messaging was factual, positive, and consumer and media friendly.

Beef producers can utilize those factual, positive and consumer/media friendly messaging techniques. Not only that, but one should not be discouraged in responding to questionable statements. In responding effectively, one should acknowledge the concerns or confusion. Ask them questions to clarify their concerns. Then ask permission to share facts. If possible, don't rush through your response and, if appropriate, answer any follow-up questions. It is critical not to get frustrated or angry as that will leave an even greater negative impression than when you started. Keys to successfully communicating the beef industry's message are to be factual, friendly, respectful, and not getting discouraged.

Florida beef producers are the local farmers and ranchers. You are not the "big bad industry" and it is essential you communicate that to your local media, community, and your local, state, and federal congressional representatives. Beef producers are experts and critical as you provide essential products and services, are employers, and contribute to the economy of the state of Florida.

The meat and poultry industry is responsible for as much as $20.4 billion in economic activity in Florida.[2] Not only does the manufacture and sales of meat and meat-related products create jobs in Florida, which include firms as varied as trucking companies, machinery manufacturers, accounting firms, and grocery stores. They are good jobs that are important as Florida's unemployment is 11.6% and over 1 million people are looking for jobs and collecting unemployment benefits. [2]

Championing the beef industry is critically important and you must be engaged with media, congress, consumers, other allied industries, and even your critics. It is essential to target communications efforts around the myths that are most strongly held by Americans and to focus on correcting misperceptions and avoid raising issues where there is not strong concern or awareness. We must work hard not just to encourage consumption, but to also give consumers permission to feel confident in meat and poultry when they are consuming it. This can help potential erosion of consumption and help avoid public policy initiatives that are based on lack of education, science, and information.

[2] www.meatfuelsamerica.com. Accessed: March 22, 2011.

A Sixty-Year History of the University of Florida's Beef Cattle Short Course

Alvin C. Warnick, Ph.D.

Professor Emeritus, Department of Animal Sciences, University of Florida, Gainesville, FL

My objective is to mention some early beef cattle events and give proper credit to some of the early original people who had much foresight and vision. Thus, I will mention something about time, people and important events in the early days of the department.

First, the people who started the early programs.

1. Dr. Tony J. Cunha, he became chairman of Animal Husbandry and Nutrition in 1950, after coming here in 1948 from Washington State College, Pullman WA. He was chairman until 1974 when he went to California State Polytechnic University, Pomona as Dean of Agriculture.
2. Professor James E. Pace, Extension Beef Cattle Specialist, who came from Clemson in the early 1940s until retirement in 1980.
3. Dr. Marvin Koger, Geneticist, came to Florida in 1951 from New Mexico. He managed the breeding projects at the Beef Research Unit and breeding project at the Branch Experiment Stations. He retired in 1988.
4. Dr. Albert M. Pearson, Meats Scientist and livestock judging coach, came from Cornell University, Ithica, NY in the late 1940s until 1955, when he went to Michigan State at East Lansing.
5. Dr. James F. Hentges, originally from Oklahoma, an Animal Nutritionist from the University of Wisconsin came in 1952 and was in charge of production at the Beef Research Unit until his retirement in 1986.

Early Florida beef cattle producers and managers who aided in the early short course programs were:

1. Mr. Max Hammond, W.H. Stuart Brahman Ranch, Bartow, FL.
2. Mr. Louis Gilbreath, Camp Ranch, Ocala, FL.
3. Mr. Dan Childs, Lake Placid, FL.
4. Mr. Leroy Baldwin, Baldwin Angus Ranch, Ocala, FL.
5. Mr. Jeannette Chitty, Stardust Ranch, Micanopy, FL

The presidents of the Florida purebred beef groups. The editors and the publishers, the Cody Family, with the Florida Cattlemen's magazine in Kissimmee made a good contribution.

Lastly, and very important are the officers, members and advisors to the department's undergraduate Block and Bridle Club. They did so much in preparing meals, helping provide facilities and in doing much work during the three-day event.

The first beef cattle program was held December 4 and 5, 1952 called the Beef Cattle Breeders and Herdsmen Short Course. Many of the topics centered around preparing, feeding and showing beef cattle for the show ring. The first program had 29 speakers from out of state. It was held in the new Cecil M. Webb Livestock Pavilion built in 1951 with funds from Mr. Webb of Dixie Lily Company in Williston, FL. This structure was a great asset to the department for teaching livestock classes, holding conferences, short

courses, and it had dormitory rooms for students and was used for University functions with the marching band. The new meats laboratory and Webb Livestock Pavilion were dedicated in 1952.

Also in 1952, it was the first department student livestock judging team that competed at the Chicago International Livestock Exposition, coached by Dr. Albert M. Pearson with such luminaries as Ken Durrance, then an undergraduate student. Later, the team was coached by Professor Don Wakeman, who also was advisor to the Block and Bridle Club.

In May 1953, the livestock field day was held in the pavilion. My first participation was April 8-10, 1954 when I gave a live demonstration of pregnancy diagnosis in a beef cow. The same name of Beef Cattle Breeders and Herdsmen Short Course was used through the 4th event in 1955.

At each year's short course, the program focused on current beef cattle problems with local faculty, national and international leaders, along with successful beef commercial and purebred ranch managers. The short course programs of 1961, 1965, 1971, and 2001 provided material for the publication of four important and timely books on beef cattle breeding materials. The 1961 course entitled *Crossbreeding Beef Cattle* was published in 1963 with 25 speakers from several states, including such notables as Prof. John Knox, New Mexico, Drs. Ralph W. Phillips and Everett J. Warwick, USDA, Washington, DC. The course in 1964 featured factors affecting calf crop with four international leaders and several specialists from the USA and our faculty. This resulted in the book *Factors Affecting Calf Crop* published in 1967 by University of Florida Press. The second course on crossbreeding in 1971 resulted in the classic book, *Crossbreeding Beef Cattle Series 2*, published in 1973 by University Press. These three volumes were all edited by Drs. T.J. Cunha, Marvin Koger and Alvin C. Warnick. The last book published in 2004, *Factors Affecting Calf Crop* was edited by Drs. M. J. Fields and R. S. Sand was published by CRC Press, Inc. which resulted from the 2001 short course.

Dr. Cunha always made short course assignments well in advance to the faculty. One job was to destroy all of the sparrow bird nests from the livestock pavilion. This job was assigned to Professor Phillip Loggins. The use of the cow bell was well used by Dr. Cunha to keep everyone on time following the refreshment breaks. One year Dr. Don Hargrove tried to provide facilities for visual aids during daylight. It was a valiant effort but not very successful. Special thanks should go to the Block and Bridle students, advisors and workers at the meats lab for providing meals during the three-day event. Drs. Pete Carpenter, Roger West, and Zane Palmer deserve much credit. Sometimes we had 1,000 people attend, coming from Florida, the southeastern states, and Central and South America. The 1985 three-day course moved from the livestock pavilion to the Hilton Hotel on S.W. 13th Street. It moved, in 2004, to the U.F. Conference Center when it was built on S.W. 34th Street across the street from the Phillips Center

The Latin Beef Cattle short course in Spanish grew from the original course with Drs. Joe Conrad and Lee McDowell. Feeders from the west and cattle breeders from the USA recognized the quality and goodness of the past annual short course programs. The future looks bright for the quality and goodness of the material presented by our faculty and invited speakers. Much credit should go to the faculty, staff and guest speakers during the past 60 years.

Factors Affecting Calf Crops – 39th Annual Beef Cattle Short Course

University of Florida - May 2-4, 1990

Front row: Bob Sand, Co-Chairman, Jim Brinks (Colorado), Bob Bellows (Montana), Marvin Koger, Al Warnick, Jim Wiltbank (Utah), Michael J. Fields, Co-Chairman

Middle row: Peter Chenoweth (Queensland), Ralph Pelaez, Marvin Pace (Wisconsin), Clarence Ammerman, Neal First (Wisconsin), Andy Tucker, Ed Hauser (Wisconsin), Sid Sumner

Back row: Rolf Larsen, Don Hargrove, Maarten Drost, Bill Kunkle, Jim Kinder (Nebraska) Fuller Bazer, Bob Short (Montana), Paul Genho, John Stitt, Findlay Pate, Dave Pritchard, Ron Randel (Texas); not availbale, Bob Wettermann (Oklahoma) and Bill Thatcher

Implications of Selection for Residual Feed Intake in the Cowherd

G. Cliff Lamb, Tera E. Black, Kalyn M. Bischoff, and Vitor R. G. Mercadante[1]

North Florida Research and Education Center, University of Florida, Marianna, FL

Introduction

The definition of efficiency is a ratio of outputs to inputs. Businesses use measures of efficiency to establish benchmarks and goals for production and finance, which may result in decisions that increase productivity without increasing costs of production. A well-run, profitable commodity business is usually operated more efficiently than its competitors. In the case of beef cattle, competition can arise from two sources: other producers who sell similar classes of cattle; and, other protein-producing species, such as pork and poultry, which compete with beef in the marketplace. Measuring efficiency across the entire integrated beef system is difficult due to the different classes of cattle (growing, finishing, breeding), breed differences, and how the different biological systems (nutrition, reproduction, lactation, basal metabolism) interact. There are measures of efficiency that can be used to optimize biological productivity and/or economical profitability in beef production enterprises. One of these is feed efficiency.

Applications of feed efficiency warrant consideration in the beef industry because 55 to 75% of the total costs associated with beef cattle production are feed costs (NRC, 2000; Arthur et al., 2001a; Basarab et al., 2002). A 5% improvement in feed efficiency could have an economic impact four times greater than a 5% increase in average daily weight gain (Basarab et al., 2002), and feedlot studies have demonstrated that a 10% improvement in average daily gain (ADG) improved profitability 18%; whereas, a 10% improvement in feed efficiency returned a 43% increase in profits (Fox et al., 2001). Thus, efforts aimed at improving the efficiency of feed/forage use will have a large impact on reducing input costs associated with beef production. For example, in Florida alone with approximately 1.83 million cattle on inventory, a 10% increase in feed/forage efficiency could reduce production costs by at least $36 million annually.

Although the depths of feed efficiency research have vastly expanded in the past decade, most research efforts have focused on growing/fed cattle. Until now, little data has been collected on the breeding herd, which consumes about 70% of the feed utilized throughout all beef production systems. In Florida, forage grazing females such as replacement heifers, young cows, and mature cows compose the predominant classes of cattle; therefore, it is important for producers to better understand the implications feed efficiency has on the breeding herd.

Determining Feed Efficiency

Due to complex biological processes and the relationship of feed intake to body size and production level, selecting cattle based on feed intake alone is rarely used. Instead, different measures or traits of feed efficiency have been used. Feed efficiency is a measure of how much saleable product is being produced for each unit of feed consumed. Factors that influence feed/forage efficiency include age, sex, diet type, breed, production level, environmental temperature, growth promotants, physical activity, and many other management and environmental variables (NRC, 2000). These factors are important to consider when selecting cattle to evaluate for feed efficiency.

Feed Conversion Ratio

Traditionally, the most common measure of feed efficiency in beef enterprises has been feed

conversion ratio (FCR), also referred to as feed:gain (F:G). It is the ratio of feed intake to live-weight gain. A calf that consumes 15 pounds of feed per day and gains 3 pounds live-weight per day would have a FCR of 15 to 3, or 5:1, or simply 5. A calf with a low FCR consumes less feed per unit of gain compared to calves with a high FCR; therefore, it converts feed at a high rate, is classified as more feed efficient, and is highly desirable for cattle owners and for feedlots that charge on a gain basis. Feed conversion ratio is most often used as a tool to evaluate groups or pens of growing cattle to determine costs of production and break even prices in feeding operations. It is a moderately heritable trait (Crews, 2005) and cow/calf producers who have access to this data can potentially use this information as a marketing tool to promote the sale of their feeder calves. However, when applying this feed efficiency trait to their cow herd, beef producers should consider the relationship of FCR with mature body size. The highly negative correlation between FCR and growth rate (Koots et al., 1994) as well as the observed increase in mature cow size resulting from lean FCR selection (Mrode et al., 1990) indicates that selection for improved FCR may result in amplified cow maintenance requirements and higher feed costs.

Residual Feed Intake

Residual feed intake (RFI) is an alternative measure of feed efficiency that has not been shown to increase mature weights or greatly affect other phenotypic traits in cattle. It measures the variation in feed intake beyond that needed to support maintenance and growth requirements. It is calculated as the difference between actual feed intake and the feed an animal is expected to consume based on its body weight and average daily gain. Therefore, when cattle consume less feed than expected for their size and rate of gain, they have a negative RFI, which equates to a more desirable feed efficiency status as compared to cattle with more positive RFI values. One of the important findings in almost all of the studies to date show little or no correlated response in other important traits such as growth rate when selecting for RFI, so calves with lower RFI values consume less feed for similar performance.

Residual feed intake is determined by placing a group of like-type or similar cattle on a feeding test for 70 days, after a 21-day adaptation period to the facilities and diet. The calculation of RFI requires collection of individual daily intake data and biweekly animal weights; however, facilities equipped to measure individual intakes are becoming more common and accessible for producers.

Reducing feed costs in beef cattle can significantly improve profitability for the production enterprise. Studies have shown differences in RFI values that range between -4.3 lb/d (the calf consumes 4.3 lb/d less than it is expected to) and 4.0 lb/d (the calf consumes 4.0 lb/d more than it is expected to). This represents a difference of over 8.3 lb/day of feed savings in efficient versus inefficient animals. The savings in feed costs between low and high RFI animals could be as high as $92 (assuming 170 days on feed and $130/ton of feed).

Understanding the interactions of feed efficiency or RFI on biological processes and management procedures is critical when utilizing RFI as a tool for beef cattle selection. Improvements in feed and forage efficiency by RFI will not only increase ranch profit through reduced input costs, but they can also reduce potential environment disruption due to lower methane emissions and nutrient excretions. This is especially critical when the cost of feed resources continues to increase, the availability of forages continues to decrease, and the concern for the cattle industry's environmental impact is at its highest.

Unlike FCR, RFI is phenotypically independent of the traits that are used to calculate it. As an example, a data set that was collected in the Feed Efficiency Facility (FEF) at the North Florida Research and Education Center in Marianna is shown with RFI and average daily gain (ADG) presented. There is a substantial representation of different gains and variation in RFI. Calves A and B both entered the FEF

weighing 819 pounds and left weighing 1051. Their weights and gains (3.32 lbs/day) were identical. Based on their weight and performance numbers, the calves were expected to consume 24.32 pounds of feed/day. However, calf A's actual daily intake was 22.86 pounds and calf B's actual daily intake was 25.76 pounds for RFI's of -1.46 and +1.44, respectively, a difference of 2.90 pounds of feed consumed per day.

Over the course of the 70 day feeding period, calf A consumed 203 pounds less feed than calf B, yet performed exactly the same. Assuming similar diets and a similar rate of gain (3.32 pounds/day) it would take each calf 180 days to gain 600 pounds, but calf A would consume 522 pounds less feed. For 100 calves in a feedlot pen, this translates into 52,200 pounds less feed, and at $0.08/pound feed, this would result in a savings of $4,176 ($41.76 per calf). Assuming all other costs are equal, the resulting cost of gain in pen A would be $0.07/lb less than in pen B. Once again, this is a significant savings for the feeder.

Selecting for Residual Feed Intake

Genetic progress made by selecting for RFI is feasible only if the trait is somewhat heritable, or able to be successfully passed on to future generations. A variety of studies have examined heritability estimates for RFI, and values range from 0.16 (Herd and Bishop, 2000) to 0.47 (Lancaster et al., 2009). Because most heritability estimates fall between these values, RFI has been termed moderately heritable. Therefore, selecting for RFI should reduce feed costs without affecting growth rate or mature size, while maintaining the ability to produce more efficient progeny. It has been demonstrated that divergent selection for RFI results in progeny that maintain efficiency. Angus steers born to parents selected for low RFI (more efficient) had improved feed efficiencies in the feedlot compared to steers born to high RFI parents, with no accompanied change in performance of growth or carcass characteristics for the low or high progeny (Richardson et al., 1998). It was also reported that progeny of high RFI parents consumed 5% more feed per day than low RFI steers (Richardson et al., 2001). These results indicate that genetic selection for RFI is possible and lower RFI progeny may be economically superior to higher RFI counterparts.

Selection for feed efficiency in cattle has traditionally been accomplished by indirect procedures and various management strategies (i.e., not direct selection). Cattle selected for divergent RFI lines over a five-year period showed average selection differentials of -0.70 and 0.86 lb/d per year for the low and high lines, respectively. An annual divergence rate in RFI of 0.46 lb/d was achieved between the lines with a realized heritability of 0.33 (Arthur et al., 2001a). While RFI, feed intake (FI) and feed conversion rate (FCR) changed significantly over the duration of the study, average daily gain (ADG) and 365-day body weight remained constant, indicating selection for RFI did not impact growth rate.

Selection for RFI in cattle can have dramatic implications in the beef cattle industry. Low RFI cattle consume less feed and have lower maintenance requirements while growth appears to be unaffected. Generation of RFI expected progeny differences (EPDs) will allow for the selection of more efficient animals. Recent research at the U.S. Meat Animal Research Center (MARC) in Clay Center, NE demonstrated that tropically adapted breeds (Brangus and Beefmaster) performed as well or exceeded *Bos taurus* genetics in most of the economic traits of importance with the exception of carcass quality traits (Cundiff, 2004). Previous studies have shown that this advantage can be tripled in tropically adapted cattle when studies are conducted in subtropical/tropical environments (Olson et al., 1991). This project will allow for the evaluation of tropically adapted breeds in a subtropical environment, thereby improving the ability of producers using these types of cattle to compete in a global economy.

Residual Feed Intake and the Cowherd

Forage Utilization

Improving feed efficiency is not just relegated to growing cattle and some differences may be seen in mature cows. Although little work has

been validated in lactating and nonlactating beef cows, two studies have indicated that selection for low RFI may have positive effects on future forage intake and reproductive efficiency. In non-lactating beef cows fed a forage-based diet, the most efficient cows (top third) consumed about 20 % less forage than the least efficient cows (bottom third; Table 1; Meyer et al., 2008). Therefore, when forage is limited small improvements in efficiency can make a large improvement in cowherd maintenance. Therefore, selection of replacement heifers based on efficiency could assist in the reduction of maintenance costs of the cowherd. However, little data is available that demonstrates the overall productivity of beef cattle operations that have selected for feed efficiency over several generations.

Reproductive Efficiency

Reproductive efficiency is a key component to cow-calf enterprises because it is a primary determinant of profitability. Since nutritional status has been identified as an important mediator of reproductive events (Wiltbank et al., 1969; Day et al., 1986), differences in feed intake may affect the age of puberty (AOP) for heifers as well as the length of the anestrous period for cows.

It was recently reported that British-bred heifers (n = 137) with positive RFI values (inefficient) reached puberty 13 days earlier ($P = 0.03$) than negative (efficient) heifers (Shaffer et al., 2010); however, RFI had no effect on pregnancy or conception rates. Phenotypic correlations ($P < 0.05$) between RFI and ultrasounic measures of subcutaneous rib (initial r = 0.19; final r = 0.27) and rump fat (initial r = 0.17; final r = 0.24) were sustained throughout the trial, indicating that more feed efficient heifers may have delayed attainment of reproductive maturity due to decreased fatness.

In crossbred beef heifers (n = 61) between 7.6 and 9.5 mo of age, RFI adjusted for backfat (BF) over a 113-d feeding test was calculated (Basarab et al., 2009). The average age at which heifers attained pubertal status were similar between positive and negative RFI heifers; however, more inefficient RFI heifers tended (P = 0.09) to reach puberty by 12 ($P = 0.09$) and 13 ($P = 0.06$) mo of age compared with efficient heifers. These results are consistent with Shaffer et al. (2010) and indicate that puberty may be slightly delayed in more efficient heifers.

It has been reported that pregnancy rates for mature cows producing Low, Medium, or High RFI progeny (Basarab et al., 2007) and for mature cows divergently selected to produce Low or High RFI calves (Arthur et al., 2005) are similar. However, in both of these studies, it was reported that cows producing more efficient progeny tended to calve later in the season than their counterparts. Therefore, it appears that RFI has no effect on overall pregnancy rates; however, more efficient females may have slightly delayed attainment of pregnancy throughout their lifetime.

A recent study investigated the postpartum performance of Brahman first-calf heifers and multiparous cows which had been previously evaluated shortly after weaning for feed efficiency (RFI; Loyd et al., 2009). Although prepartum and postpartum body weight and body condition score did not differ by RFI group for either cows or heifers, efficient cows exhibited estrus sooner (42 ± 4.1 vs. 55 ± 3.7d), developed a corpus luteum (CL) sooner (40 ± 4.1 vs. 53 ± 3.7d), and exhibited estrus in conjunction with CL formation sooner (42 ± 4.1 vs. 54 ± 3.9d) than inefficient cows. However, no difference was detected between efficient and inefficient heifers for estrus and/or CL formation. The authors concluded that selection for efficient cattle using RFI as a selection tool may result in a shorter postpartum interval in multiparous Brahman cows.

With these results taken collectively, it is unclear whether or not more efficient females have a reproductive advantage or disadvantage over less efficient counterparts. Little is known about the relationship between feed efficiency and reproductive efficiency, demonstrating the need to continue this work.

Relationship Between Residual Feed Intake for the Growing Heifer and the Lactating Cow

In our recent novel data, feed efficiency was measured in 74 replacement heifers (Phase I) of six breeds (n = 14 Angus; n = 11 Brahman; n = 22 Romosinuano; n = 10 Angus × Brahman; n = 9 Angus × Romosinuano; n = 8 Brahman × Romosinuano) using the GrowSafe System (GrowSafe Systems Ltd., Alberta, Canada) for individual feed intake collection. After Phase I, these females were retained until they gave birth to their second calf as 3-year old cows. Upon calving, the 3-year old cows reentered the Feed FEF with their calves for a second feed efficiency period (Phase II). For the heifer (Phase I; Table 2) and cow phases (Phase II; Table 3), upon arrival into the feed efficiency facility, females were allowed a 21-day (Phase I) or 14-day (Phase II) acclimation period before initiating a 70 d feed efficiency test. The diet for heifers was a forage-based growing diet (2.1 Mcal ME/kg DM) formulated to meet requirements to support growth rates of approximately 2.2 lb/d, whereas the diet for cows was a forage-based diet consisting of 86.7% Tifton 85 Bermudagrass silage, 12.4% dried distillers grains plus solubles, 0.7% range mineral, and 0.2% salt, suitable for lactating beef cows (NRC, 1996).

In phase II, the cows were milked to determine energy-corrected milk production on trial day 14 (day 28 ± 3.5 of lactation) and 70 (day 84 ± 3.5 of lactation) to more appropriately account for lactational differences when calculating RFI. In addition, cows were carcass ultrasounded for ribeye area (REA) and backfat thickness (BF) on trial day 0 and 70. The ADG for heifers and cows was calculated using the slope of the body weights collected weekly or biweekly, during the test. In phase I, RFI was calculated by accounting for breed differences and regressing dry matter intake (DMI) on ADG and mid-metabolic weight (MMW; weight halfway through the test raised to the 0.75 power) for each animal. Heifers were sorted and placed into Low (< 0.5 SD; n = 27), Medium (< 0.5 SD >; n = 23), and High (> 0.5 SD; n = 24) RFI groups, with more negative RFI values being most efficient (Low), intermediate RFI values being less efficient (Medium) and positive RFI values inefficient (High). In phase II, we incorporated traits that significantly affected cow DMI, which were breed, ADG, MMW, milk production on day 14 and 70, and BF on day 70. Cow performance based on their RFI ranking as heifers (Low, Medium, and High) was assessed to determine how heifers of differing feed efficiency statuses performed subsequently as mature, lactating cows (Table 3).

Individual heifer RFI values ranged from -4.5 lb/d (most efficient) to 4.1 lb/d (least efficient) and individual cow RFI values ranged from -7.5 lb/d (most efficient) to 11.8 lb/d (least efficient). In Phase I (Table 2), Low, Medium, and High heifers had similar ages, body weights (BW), body condition scores (BCS), and ADG; however, those which were most efficient (Low) consumed 3 lb/d less than those which were intermediate (Medium) and 4.9 lb/d less than the least efficient (High) heifers. Intermediate heifers also consumed 1.9 lb/d less feed than the least efficient heifers.

When cow performance was assessed based on heifer feed efficiency rank (Table 3), cows which were most efficient as heifers had significantly lower DMI than their counterparts and consumed 2.6 or 2.8 lb/d less than cows that were Medium and High heifers. Interestingly, DMI was the only parameter that significantly differed; therefore, the most efficient heifers subsequently became cows that were phenotypically similar, but consumed less feed than cows that were considered less efficient as heifers.

There have been relationships between RFI and carcass fat content reported in the literature, but they are inconsistent, with no relationship in some studies (Herd and Bishop, 2000; Arthur et al. 2001b; Richardson et al., 2001) and a moderate relationship in another (animals with improved efficiency were also leaner, Herring and Bertrand, 2002). Relationships between RFI and mature cow size are limiting, but Herd and Bishop (2000) presented preliminary evidence that selection for improved feed efficiency has little effect on mature cow size. In our study,

there were no relationships observed between RFI in the growing phase for heifers and mature cow size, milk production, carcass composition, or reproductive parameters as mature cows. A strong correlation between RFI measured after weaning and RFI measured in mature breeding females has been previously reported (Archer et al., 2002); however, we did not observe this relationship. This is likely because the cows in our study were lactating while those in the previous study were not.

Conclusion

Feed efficiency is not a new measure, but it is one that is receiving more attention as feed costs have increased. Many seedstock producers and bull testing facilities have installed technology that allows for the determination of RFI and some breed associations have started the process of standardizing data collection and analysis and soon EPD's and Value Indices for feed efficiency will be reported. The use of DNA testing for feed efficiency is becoming more widely available. Producers who would like to include feed efficiency in their selection criterion will have several tools available to them. In addition, ongoing and future research efforts in RFI will likely clarify how RFI affects the entire efficiency of the breeding herd. Producers who understand and appropriately incorporate this type of information into their operation will have the means to make sound decisions to improve the efficiency and profitability of their enterprise.

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Table 1. Average forage intake (DMI) of cows with low and high residual feed intake (RFI; adapted from Meyer et al., 2008)

Variable	Low RFI	High RFI
Experiment 1		
DMI, lbs/day	27.28	34.32
Experiment 2		
DMI, lbs/day	27.50	31.02

Table 2. Heifer performance characteristics for Low, Medium, and High RFI ranked heifers (Phase I)[a].

	RFI Classification[b]			
Trait	Low	Medium	High	p-value
No. of heifers	27	23	24	-
Initial age, d	294.7 ± 4.3	299.4 ± 4.7	288.8 ± 4.6	0.27
Initial BW, lbs	561.2 ± 12.1	570.0 ± 13.2	571.8 ± 12.8	0.81
Final BW, lbs	676.1 ± 13.0	691.0 ± 14.1	690.4 ± 13.6	0.67
BCS	5.80 ± 0.06	5.85 ± 0.06	5.88 ± 0.06	0.62
ADG, lbs/d	1.78 ± 0.07	1.85 ± 0.07	1.80 ± 0.07	0.68
DMI, lbs/d	18.74 ± 0.51[x]	21.74 ± 0.55[y]	23.67 ± 0.53[z]	<0.0001
RFI, lbs/d	-2.27 ± 0.15[x]	0.20 ± 0.15[y]	2.35 ± 0.15[z]	<0.0001

[a]ADG = average daily gain; BCS = body condition score; BW = body weight; DMI = dry matter intake; RFI = residual feed intake.
[b]Heifers were sorted and placed into Low (< 0.5 SD), Medium (< 0.5 SD >), and High (> 0.5 SD) RFI groups based on their RFI values, with more negative values (Low) being efficient and positive values (High) inefficient.
[xyz] Significant differences of Least Squared Means within a row ($P < 0.05$).

Table 3. Cow performance, milk, and carcass ultrasound parameters (Phase II) based on heifer rankings considered as Low, Medium, and High feed efficiency categories[a].

	RFI Classification[b]			
Trait	Low	Medium	High	p-value
No. of cows	27	23	24	-
Initial age, d	1127.2 ± 6.7	1128.2 ± 7.2	1112.5 ± 7.1	0.22
Initial BW, lbs	932.9 ± 17.4	925.5 ± 18.9	973.5 ± 18.5	0.15
Final BW, lbs	961.2 ± 18.5	958.8 ± 20.0	989.3 ± 19.6	0.47
BCS	4.4 ± 0.1	4.4 ± 0.1	4.4 ± 0.1	0.88
ADG, lbs/d	0.40 ± 0.13	0.53 ±0.13	0.37 ± 0.13	0.71
DMI, lbs/d	22.7 ± 0.90[x]	25.5 ± 0.97[y]	25.3 ± 0.95[y]	0.04
Cow RFI, lbs/d	-1.19 ± 0.62[x]	1.10 ± 0.68[y]	0.26 ± 0.64[xy]	0.05
d 14 ECM, lbs/d	11.92 ± 0.81	11.33 ± 0.90	12.94 ± 0.88	0.43
d 70 ECM, lbs/d	9.75 ± 0.73	10.27 ± 0.79	10.91 ± 0.77	0.55
d 0 REA, cm^2	30.46 ± 1.02	29.48 ± 1.11	30.75 ± 1.04	0.69
d 70 REA, cm^2	28.77 ± 0.97	30.32 ± 1.08	30.07 ± 1.01	0.51
d 0 BF, cm^2	0.25 ± 0.01	0.25 ± 0.01	0.28 ± 0.01	0.08
d 70 BF, cm^2	0.27 ± 0.01	0.25 ± 0.01	0.28 ± 0.01	0.26
d to calving	36.9 ± 4.4	35.0 ± 4.7	28.8 ± 4.7	0.44
d to first postpartum ovulation	75.7 ± 4.5	73.8 ± 4.5	76.0 ± 6.3	0.94

[a]ADG = average daily gain; BCS = body condition score; BF = backfat; DMI = dry matter intake; ECM = energy corrected milk; RFI = residual feed intake; REA = ribeye area.
[b]Heifers were sorted and placed into Low (<0.5 SD), Medium (<0.5 SD >), and High (>0.5 SD) efficiency groups based on their RFI values, with more negative values (Low) being efficient and positive values (High) inefficient.
[xy] Significant differences of Least Squared Means within a row ($P < 0.05$).

Real-Life Implementation of Controlled Breeding Season

T. R. Troxel, Ph.D.

Professor and Associate Department Head, Animal Science, University of Arkansas, Little Rock, AR

Story in Brief

Reducing the length of the calving season can be the first step toward improved beef production efficiency. The objectives of this demonstration were to reduce the length of the calving season and to document the production and economic impact when converting a long calving season (> 200 days) to a short calving season (< 90 days). A 3-part plan was developed for 6 cow-calf herds to reduce the length of the calving season. The average number of years to reach the cooperator's desired cowherd calving season was 3.8 ± 0.75 years. The percentage of cows calving during the desired calving season was higher for the final year compared to the benchmark year (92.0 ± 11.66% vs. 46.3 ± 14.01% (mean ± SD), respectively; $P < 0.002$). The mature cow calving percentage did not change from the benchmark year to the final year (89.2 ± 6.05% and 87.2 ± 9.47%, respectively; $P > 0.75$). The average length of the calving season decreased from 273.3 ± 84.88 days in the benchmark year to 85.2 ± 4.75 days in the final year ($P < 0.002$). Due to the limited number of farms and large variability, there were no ($P \geq 0.14$) differences for herd break-even, specified costs/animal unit (AU) and income over specified cost/AU from the benchmark year to the final year; however, herd breakeven decreased 30%, specified costs/AU decreased 40%, and income over specified cost /AU increased 100%. Thus, shortening the calving season is perhaps one of the most important and cost-effective practices that can be implemented by a producer.

Introduction

In a USDA, APHIS and Veterinary Services survey, 54.8 % of the beef cattle producers in the Southeast did not have a set calving season which is more than reported for the west (16.2%) and central (32.9%) regions. With the profitability of a cow-calf operation getting more and more difficult to obtain, reducing the breeding and calving season can be the first step toward improved production efficiency.

There is a number of management advantages to a controlled breeding and calving season. With today's cattle industry demanding more uniform lots of calves, marketing may be the most important reason to reduce the calving season. Data from the 2010 University of Arkansas livestock market study demonstrated feeder calves sold in 2 to 5 head ($110.52) and groups ≥ 6 head ($112.60) sold for a higher price than calves sold one head at a time ($107.81; $P < 0.0001$). Labor and time are very important and expensive commodities for a cow-calf producer. A controlled calving season concentrates time and labor for calving, reduces expenses and increases efficiency. The herd health and management of the cow herd is better facilitated with a shortened calving season. Cow nutritional management can be improved when all cows are in the same stage of production. Culling and selection of replacement heifers based on records can be better accomplished. A summary of how different management practices are implemented in a controlled and year-long breeding programs are compared in Table 1.

One of the excuses given for failing to maintain a short calving season is removing bulls and keeping them separate. This is a problem for most small operations. However, with high tensile electric fence, bull lots can be constructed economically and double as weaning lots when preparing calves for the market. If a bull cannot be removed until weaning, pregnancy checking and culling late breeding

cows is a method of shortening the calving season. Leasing bulls may also be an option. This allows a calf-calf producer to obtain bulls for the breeding season and return them to their owners once the breeding season is over.

Long Calving Seasons Mean Lighter Weaning Weights

Long calving seasons (more than 90 days) result in a wide range in age of calves at weaning time. That age at weaning has a significant effect on weaning weight is well known, but this fact is given little management attention (Table 2). If a single weaning date is used, younger calves wean at a lighter weight. Therefore, if the calving season lasts 90 days or less, no calves will be less than 180 days old at weaning. This means that the average weaning weight for the herd with a 90 day calving season will be higher simply because there are no calves less than 180 days of age at weaning time. Average weaning weight increases even more for herds that calve in less than 90 days because the average age at weaning increases.

Breeding and Calving Season Demonstrations

Six beef cow-calf operations in Howard (n = 2), Dallas (n = 2), Union, and Montgomery counties contacted their local county Extension agent and expressed their desire to participate in the Arkansas Beef Improvement Program (ABIP) Breeding and Calving Seasons Special Project. The goals of the ABIP project were to reduce the length of the calving season and to document the production and economic impact when converting a long calving season (> 200 d) to a short calving season (< 90 d).

In collaboration, the producer, county Extension agent, and Animal Science faculty developed a 3-part plan to reduce the length of the calving season. The 3 parts included: 1) determine when the cows were calving (annual calving distribution); 2) establish the months and length of the desired calving season; and 3) develop a management plan to transition the cow herd to the desired calving season.

Part one of the plan determined the current annual calving distribution (benchmark year). It was typical for a large group of cows to calve January through May, with very few cows calving in the summer months (June, July and August) and an additional group calving in the fall. The second part of the plan was the producer determining the desired calving period (months and length). Some producers selected a fall calving season and some a spring calving season. All of the producers selected a calving season of ≤90 days. From the benchmark calving distribution, a plan was developed by the producer, agent, and Animal Science faculty to reach the desired calving season (part 3). Supplemental feeding, mineral supplementation, bull breeding soundness examinations, and other management factors that could affect reproduction rates were reviewed and changes were made if necessary.

Because of the uniqueness of each farm, a specific plan was designed for each cow herd. The projected dates for the beginning and end of the breeding and calving seasons were determined and monitored yearly. Most producers had a benchmark calving season greater than 7 months and often times the herd was split into 2 groups (fall and spring calving groups). Over time the breeding season was restricted in order to obtain the desired calving season. This entailed moving some cows from spring to fall calving or fall to spring depending upon the primary calving season desired.

The cow-calf producer was required to complete a budget for each year of the program that included herd inventory, number of animal units (AU), production information, income, and costs. The herd inventory reflected the number of animals as of January 1 of the budget year. It included mature cows (a female pregnant with at least her second calf), growing heifers (weaned heifers that had not conceived), first-calf heifers (heifers that were pregnant or nursing their first calf but were not pregnant with their second calf), bulls for breeding the mature cow herd and heifers, and growing bulls (6 to 16 months of age). Total number of AU in the cow herd was calculated based on ME requirements as described by Gadberry and Troxel (1999).

Production information for the mature cows included calf-crop percentage, culling percentage, replacement rate, death loss, and number of females exposed to the bull. Calf-crop percentages were determined by dividing the number of calves weaned by the number of females exposed to the bull.

Income summary included the number of cattle and calves sold, average bodyweight/head, and average price/lb. Included in the income section were calculated values for total pounds sold, total income, average selling price, total pounds sold/AU, and income/AU. The selling price established in the benchmark year was used to determine income in subsequent years to prevent market price fluctuations from confounding the results.

The specified costs included salt and mineral, supplemental feed, veterinarian costs, growth implants, fly control, sales commission, hauling, day labor, pregnancy testing, bull cost or AI, breeding soundness examinations, replacement heifer or cow purchase, grazing lease, fertilizer, lime, purchased hay, herbicide, and miscellaneous. No overhead items, such as family expenses, machinery, depreciation, etc., were included in the budget.Summarized values included total specified cost/AU, herd break-even (specified cost divided by pound of beef sold) and income over specified cost/AU.

Calving season length, percent of cows calving in the desired season, net calf crop, herd breakeven and income over specified costs/AU for both the benchmark year and final year were analyzed using a simple paired t-test. All means are reported as the raw mean ± the calculated standard deviation.

Results and Discussion

The average number of years to reach the cooperator's desired calving season was 3.8 ± 0.75 years (mean ± SD). The results of the benchmark year and the final year are summarized in Table 3. The percentage of cows calving during the desired calving season was higher for the final year compared to the benchmark year (92.0 ± 11.66% vs. 46.3 ± 14.01%; $P < 0.002$). The mature cow calving percentage did not change ($P > 0.75$) from the benchmark year (89.2 ± 6.05%) to the final year (87.2 ± 9.47%), but the average length of the calving season decreased ($P < 0.002$) from 273.3 ± 84.88 days to 85.2 ± 4.75 days for the benchmark year and the final year, respectively.

Due to the limited number of farms and large variability, there were no differences for herd break-even ($P > 0.24$), specific costs/AU ($P > 0.68$) and income over specified costs/AU ($P > 0.14$) from the benchmark year to the final year. When comparing means, breakeven decreased 30% from \$0.61 ± 0.22/lb to \$0.43 ± 0.25/lb from the benchmark year to the final year, respectively. Specified costs/AU decreased 40% from \$209.70 ± 145.68 to \$126.20 ± 40.41, whereas income over specified cost improved 100% from \$95.00 ± 68.27/AU to \$189.70 ± 133.50/AU, from the benchmark year to the final year, respectively. Although these differences were not statistically significant, they were financially relevant to the cooperators. These results provide evidence that these farms increased beef production efficiency and improved profitability by decreasing the length of the calving season. This project was very successful but required a cattle cooperator who was committed to reducing the calving season and would stay with the program for 4 to 5 years.

Implications

Shortening the length of the calving season is the most important cost-effective practice that can be implemented by a cow/calf producer. Cost of the change is minimal and production costs can be reduced without reducing production which leads to improved production efficiency. A short controlled calving season forms the cornerstone for additional prudent management practices. Without a short calving season (≤ 90 days), opportunities for increasing production efficiency and reducing the cost per calf weaned are limited.

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Table 1. Management practices compared in controlled vs. year-long breeding programs[a]

Basic Management	**Controlled Breeding**	**Year-Long Breeding**
Castration Vaccination Pregnancy testing Parasite control Weaning	Once or twice yearly	Three to eight times yearly
Feeding	Selectively feed before calving and after– • decrease in time for return to estrus • increase in conception rate • increase number of early born calves • decrease death loss in calves	Must feed according to average pregnancy status of herd or feed dry cows as if they are lactating (50 to 100% increase) or suffer delayed estrus and conception, late born calves, high calf mortality. Can separate lactating and non-lactating cows, but should be performed weekly.
Utilization of Forage	Can plan calving and rebreeding during times of peak forage production.	Must buy supplement for cows during low forage availability and must separate them from non-lactating cows to conserve cost.
Marketing	Gives uniformity to calf crop (near same age) • plan marketing	Cattle must be marketed over selected periods as they achieve minimum age and weight. A single marketing limits weight of late born calves and severely reduces return to dam.
Selection and Culling	• Cow/Calf Accurately evaluates calf weights as they reflect milk producing ability and genetic capabilities of cow.	• Cow/Calf No valid means of comparison; weight gain of calf and lactation level of cows varies with season of year.
	• Cows From one pregnancy testing can eliminate slow or hard breeding cows and expect progressive increase in reproductive rate of herd. Accurately identify cows calving every 365 days.	• Cows Must use multiple periods of pregnancy testing. Difficult to determine cause for open cows due to extreme variation in environment, i.e., nutrition, parasitism, disease.
Calf Mortality	• Health program Can plan comprehensive herd health plan with minimum labor while providing maximum protection. • Calving difficulty 75% of calf losses occur at birth–80% due to difficult calving. Checking frequently (3 to 4 times daily) can increase calves saved by 200% with only 50% labor increase.	• Health program Must work calves on minimum of 30-day intervals if immunization and control is to be effective. • Calving difficulty Frequent checks are difficult due to number of months over which cattle must be observed.
Heifer Development	Permits accurate and selective feeding of heifers and reduces age variability among heifers which results in a higher percentage of puberal heifers at the start of breeding.	Difficult to feed and develop due to large variation in age and weight. Must also isolate older nursing heifers due to the possible occurrence of puberty and the resulting pregnancy causing calving problems and/or death of calf and heifer.

[a]Adapted from "Long Calving Season: Problems and Solutions" by L.R. Sprott and J. R. Beverly, Texas Agricultural Extension Service, The Texas A&M University System (B-1433)

Table 2. Effect of age of calf on weaning weight[a]

Calf Age at Weaning (days)	Weaning Weight (lb)
80-99	303
100-119	304
120-139	301
140-159	377
160-179[b]	401
180-199	441
200-219	472
220-239	473
240-259[c]	503
260-279	517
280-299	538
> 300	578

[a]From J. A. Minyard and J. C. Dinkel, 1965.
[b]Calves less than 180 days at weaning will have the lightest weaning weights.
[c]Calves held beyond this age will compete with their dams for forage and supplement.
Adjustments in stocking rate and/or levels of feed may be necessary to ensure optimum performance

Table 3. Length of calving season, percentage of cows calving in the desired calving season, mature cow calving percentage, herd breakeven, specified costs per AU and income over specified cost per AU for the benchmark year and the final year of the calving season project (mean ± SD).

Production Item	Benchmark Year	Final Year
Length of calving season (d)	273.3 ± 84.88 [a]	85.2 ± 4.75[b]
Percentage of cows calving in the desired calving season (%)	46.3 ± 14.01 [a]	92.0 ± 11.66 [b]
Mature cow calving percentage (%)	89.2 ± 6.05 [a]	87.2 ± 9.47 [a]
Herd breakeven ($/lb)[c]	0.61 ± 0.22 [a]	0.43 ± 0.25 [a]
Specified costs per AU ($)[d]	209.70 ± 145.68 [a]	126.20 ± 40.41 [a]
Income over specified cost per AU ($)[e]	95.00 ± 68.27 [a]	189.70 ± 133.50 [a]

[a,b]Means within rows without a common superscript differ ($P < 0.002$).
[c]Specified cost divided by pounds of beef sold.
[d]The specified costs included: salt and mineral, supplemental feed, salt and mineral, supplemental feed, veterinarian costs, growth implants, fly control, sales commission, hauling, day labor, pregnancy testing, bull cost or AI, breeding soundness examinations, replacement heifer or cow purchase, grazing lease, fertilizer, lime, purchased hay, herbicide, and miscellaneous.
[e]Income over specified costs divided by the AU grazing on the farm. An AU is equal to a 1,000 lb cow.

Economic Evaluation of Cow Culling vs. Replacement Heifers

Curt Lacy, Ph.D.

Associate Professor, Department of Agriculture and Applied Economics, The University of Georgia, Tifton, GA

Notes

Impact of 50 Years of Beef Technologies

Matt Hersom, Ph.D. and Todd Thrift, Ph.D[1].

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

Introduction

Beef cattle producers utilize technologies to improve animal performance, well-being, and enterprise profitability. Utilization of technologies in the beef industry is a major contributor to the safe, wholesome, and affordable beef supply in the United States. The accumulated use of technology in the beef industry has improved cattle and enterprise efficiency and decreased the resource inputs of feed and land.

Important technologies that have been adopted include: antibiotics, implants, ionophores, parasiticides, genetics, vaccines, physiological modifiers, and nutrition. The adoption rate is high because of the efficacy and return on investment, but varies between segments of the beef industry (Lawrence and Ibarburu, 2008). The improvements in beef cattle production can't be attributed to any individual technology. However, incorporation of multiple technologies in several segments of the beef industry has transformed the U. S. beef industry. Following is a brief evaluation of the effect that individual technology has on beef production.

Antibiotics

Antibiotics are utilized in two distinct methods in the beef cattle industry. Sub-therapeutic use involves low-dose levels, generally included in the feed or water. In this application, antibiotics are utilized to increase growth rate and improve feed efficiency (Elam and Preston, 2004). The growth promoting mechanism of sub-therapeutic antibiotics occurs through manipulation of the microorganism in the rumen. The manipulation of the microorganism population and function results in improved digestion, metabolism, and absorption of nutrients. The increase in feed utilization means that the animal needs less feed and produces less waste. Use of sub-therapeutic antibiotics elicits a 7% increase in feed efficiency (Table 1; Elam and Preston, 2004) and 7% increase in average daily gain (ADG; Elam and Preston, 2004; Lawrence and Ibaruru, 2008). The effect of sub-therapeutic antibiotic use has an estimated cost of production impact of $9.57/animal or 1.22% of the cost in the stocker sector (Lawrence and Ibaruru, 2008). In contrast, in the feedlot sector antibiotic use has a smaller cost of production impact ($5.86, 0.56%; Lawrence and Ibaruru, 2008).

Therapeutic use of antibiotics results in healthier cattle. The use of antibiotics combats bacterial diseases, reduces morbidity and mortality. A decrease in the incidence and severity of disease and death improves cattle production efficiency and cattle well-being. The increase in use of antibiotics in the cattle industry is similar to the use in human medicine (Elam and Preston, 2004). The use of therapeutic antibiotics is important to modern beef cattle production because of the increased use of high-grain diets, co-mingling of cattle, and scale-size of many modern beef enterprises. Wileman et al (2009) estimated that metaphlaxis use of antibiotics in feedlot cattle compared to non-treated cattle increased ADG by 0.25 lb/d, decreased morbidity from 55% to 29%, and decreased mortality by 50% (3.8 compared to 1.8%).

Implants

Implants used for growth promotion are one of the earliest and most revolutionary technologies adopted by the beef industry (Elam and Preston, 2004). Implants can be utilized in every segment of the beef production industry (cow-calf, stocker, and feedlot) and provide a benefit for all aspects of the beef industry. Implants

tend to have the largest impact in the feedlot sector, but their effectiveness in all segments is important. Estrogenic implants function to metabolically enhance nutrient use thereby enhancing the growth performance of implanted cattle. Androgenic containing implants have an additive effect to the estrogen that it is combined with to enhance muscle growth along with the enhanced growth performance.

The estimated impact of implants in the stocker segment indicates nearly a 13% impact on stocker ADG (Table 1; Lawrence and Ibaruru, 2008). Additionally, implants account for 2.31% effect on the breakeven price in the stocker system that translates to a cost of production impact of $18.19 cost per head (Lawrence and Ibaruru, 2008). Industry standard implant programs in feedlots typically increase ADG by 15 to 20% (0.55 lb/d) and improve feed efficiency by 8 to 12% (Lawrence and Ibaruru, 2008; Elam and Preston, 2004; Wileman et al., 2009). Likewise, implants account for a 6.52% effect on the breakeven price in the stocker system that translates to a cost of production impact of $68.59 per head (Lawrence and Ibaruru, 2008). Implants also function to attenuate fat deposition in beef carcasses, increase ribeye area, and increase total lean tissue. Increases in carcass yield and lean tissue result in decreased cost of gain benefitting both the producer and beef processor. Lawrence and Ibaruru (2008) estimated that if implants were removed completely from all segments of the beef industry it would result in a 7.14% increase in breakeven price and a $71.28 increase in the production cost per animal. Wileman et al. (2009) estimated that not using implants in the feedlot would result in a $77 increase in the cost of production for feedlot steers.

Ionophores

Ionophores (monensin-Rumensin®, lasalocid-Bovatec®, laidlomycin propionate -Cattlyst®) are used in the feeds of cattle to affect the microbial population in the rumen. Ionophores function by selecting against or negatively affecting the metabolism of certain bacteria in the rumen. The affected bacteria are those that decrease rumen digestive physiology and the energy supply from the ruminal digestion feedstuff. By controlling detrimental bacteria in the rumen less waste products are formed, beneficial bacteria are more efficient, and more beneficial organic acids and microbial protein are formed for the cattle to metabolize. Therefore, an increase in the overall energy status of the animal is observed and the cattle actually become more efficient. Ionophores can be fed to any class of cattle and can be utilized in any segment of the beef cattle industry. Similar to many other feed additives, ionophores are fed in very small amounts and supplied in another feedstuff as carrier for intake. Ionophores are also utilized to decrease the incidences of coccidiosis, bloat, and acidosis.

In the stocker cattle segment and replacement heifers the use of ionophores increases ADG by 5 to 15% and improves feed efficiency by 8 to 12% (Lawrence and Ibaruru, 2008; Elam and Preston, 2004). The economic effect on stocker cattle is less than implants, contributing an impact of 1.46% on the breakeven price, and $11.51 effect on the cost of production. In the feedlot, ionophores improve ADG by 1 to 6% and improve feed efficiency by 3.5 to 8% (Lawrence and Ibaruru, 2008; Elam and Preston, 2004). Similar to the stocker sector, ionophores in the feedlot contribute a smaller but significant effect on breakeven price and production cost per head differential (1.18% and $12.43, respectively) compared to not using ionophore technology. Production practices that combine the use of ionophores and implants likely result in a synergetic effect (Elam and Preston, 2004) on growth performance of cattle. Ionophores increase the amount of energy available from the diet and the application of implants stimulate lean tissue growth which utilizes the increased available energy.

Parasiticides

Parasites are a diverse group of pests that generally decrease the performance and value of cattle afflicted by them. Internal parasites affect cattle through a decrease in feed digestion and increased energy requirements and both combine to result in a decrease in feed efficiency, body weight gain milk production, and conception rate in growing and mature cattle. Additionally,

the deleterious effects of a parasite load on cattle can depress the overall health and immune system of cattle which can result in secondary incidents of viral and bacterial disease. There are wide spectrums of product that can be utilized to treat and control parasites. The literature is conflicting in the positive and/or non-effects on cattle production. Other work will address the specifics of flies and internal parasites directly. Regardless some general benefits compared to non-use of parasiticides were summarized by Preston and Elam (2004).

- Cow body weight and condition score increased (20 to 30 lbs and 0.2 to 0.4 units, respectively).
- Cow conception rate increased.
- Calf weaning weight increased (20 to 40 lbs)
- Heifer growth rate (0.1 lb/d), pubertal status (33% more reach puberty) and conception rate (+31%) at 14 months are improved.

Analysis by Lawrence and Ibaruru, (2008) indicated that de-worming had 17.79% positive impact on stocker cattle ADG (Table 1). Likewise, de-worming had a significant effect on breakeven price and production cost per head when utilized. In the feedlot the positive effect of de-worming continued, having and estimated 5.6% impact on ADG and 3.9% improvement on feed efficiency. De-worming had the second largest economic effect in the feedlot (2nd to implants) on breakeven price and production cost per head.

Physiologic Modifiers – Beta Agonist

Beta-agonist also mis-named as "repartitioning agents" act to increase lean muscle yield and decrease fat deposition. Actually, β-agonist act to increase protein synthesis, decrease protein degradation, and block fat cell growth. The β-agonist doesn't shunt nutrients from fat accretion to muscle accretion, but rather affect the protein and adipocyte enzyme activity. Generally, a β-agonist is fed during the last 4 to 6 weeks of the finishing period. Utilizing a β-agonist can improve feedlot ADG by 14 to 25% and increase feed efficiency by 13 to 25% (Lawrence and Ibaruru, 2008; Elam and Preston, 2004). An added benefit is that carcass lean gain is also improved by nearly 70% during the β-agonist feeding period (Elam and Preston, 2004). Use of β-agonists decreases feedlot breakeven price by 1.24% and decreases feedlot cost per head by $13.02 (Table 1; Lawrence and Ibaruru, 2008). Additionally, the utilization of β-agonist is additive to the response of implants and ionophores. The overall effect of β-agonist as percent is decreased because they are used for a short period of time (Elam and Preston, 2004), compared with other technologies.

Vaccines

Vaccines are some of the oldest technologies utilized in the beef cattle herd. Vaccination against bacterial and viral diseases is prophylactic and must be administered before exposure of the animal to the pathogen. Vaccines are pathogen specific and many products are compounded so that one retail product can address several pathogens. Vaccines demonstrate effectiveness only when the pathogen is present in the animal's environment, whereas if the pathogen is not encountered the vaccine has no beneficial effect. Significant vaccines of interest include: blackleg, bovine rhinotracheitis (IBR), bovine viral diarrhea (BVD), bovine respiratory syncytial virus (BRSV), parainfluenza, costridium perfringes, haemophilus, pasteurella, and leptospira. For some of these vaccinations it can be difficult to quantify the benefits in normal production. For other vaccinations, the benefit is readily discernable or the lack of vaccination results in obvious production decreases. Numerous studies have examined the relationship between health status (vaccination titer) and performance in the feedlot. Fulton et al. (2002) is one example that examined the relationship of vaccination program on feedlot performance. Direct relationships between health and performance were evident for: total treatment costs, net value, gross margin, ADG, and carcass grade.

Genetics

Beef cattle genetics over the last 50 years has exhibited both long-term planning and short-sighted reaction to trends. The movement of beef cattle genetics has generally been to create

a cow herd that fits the vast differences among production environments and create a calf that can enter a feedlot to produce a beef product to satisfy perceived consumer demands. Early in the past 50 years the genetic pool was dominated by early-maturing, excessively fat, compact-compressed English breeds. Changes in carcass processing led to a move to leaner, less fat covered carcasses. The need to manipulate the carcass led to the introduction of exotic Continental breeds. These breeds altered carcasses, increased ADG and feed efficiency, and increased the final mature bodyweight of finished cattle and the cow herd in general. Utilization of crossbreeding programs has had an extraordinary positive benefit to the beef industry regarding cow herd productivity, calf growth, and beef products.

Evaluation mechanisms for genetic potential are equally utilized in the past and today. Sponsored bull test stations have traditionally been used to evaluate bull genetic merit for growth attributes. Likewise with the advent of ultrasound technology, carcass attributes can be assessed on these growing animals. Residual feed intake (RFI) is an evaluation tool that is gaining in popularity for both sires and dams in the beef industry. RFI evaluates the cattle's potential for efficient feed intake relative to growth. Genotyping or DNA profiling is becoming more commonly available. DNA profiling is often utilized in multi-sire herds to establish paternity. Less proven (accuracy and precision) technology includes genetic markers, genetic mapping, and gene expression. Limitations of genetic evaluation mechanisms is that many of the traits that are of value in the beef industry are lowly heritable, influenced by multiple genetic inputs, influenced by the animal's environment, or all combinations of the previous mentioned.

Nutrition

In some aspects nutrition technology has progressed over the last 50 years, however many of our nutritional practices remain unchanged. Genetic progress has changed the nutritional requirements of the cow herd and growing cattle. Larger cattle with heavier mature body weights and greater growth rates have increased the nutrients requirements of the cow herd.

Recently the role of fat supplementation has been examined to facilitate reproductive performance. Similarly, the use of melengestrol acetate (MGA) to regulate the estrus cycle of heifers and cows has aided in application of breeding technology. However in the cow-calf and stocker sector forage-based production systems are still the predominant mechanism to manage and feed cattle.

Utilization of feed by-product feeds is one of the largest, new, and expanding opportunities. Evolution of corn processing has made by-products including corn gluten feed and distillers grains in the wet and dry form important feed resources for beef cattle production. Other by-product feeds are utilized on a national, regional, and local basis. By-product feeds are utilized by every segment of the beef cattle industry as economical means of providing energy, protein, fat, and minerals. Additionally, the evolution of corn grain processing in the feedlot has occurred. Corn grain now is routinely processed in some manner prior to mixing in the feedlot ration. Processing includes grinding, high-moisture, or steam-flaked corn. The inclusion of many feed additives in the feedlot diet has facilitated the increased level of corn processing and inclusion of greater amounts of corn in the feedlot diet. Tylosin as an antibiotic feed additive that is included routinely in feedlot diets, coupled with an ionophore is a common practice in the feedlot industry. Other advances in feed technology that have proliferated include chelated/organic source minerals and direct fed microbial products.

Conclusion

Preston and Elam (2004) estimated that productivity of the U.S. beef herd has increased by over 80% in the last 50 years. Much of the increase, but not all, in productivity can be attributed to the development and adaption of technologies to improve beef production. Antibiotics, implants, ionophores, β-agonist, prasiticides, vaccines, genetics, and nutrition all make important contributions to the efficiency of beef production. Additionally, increases in

grain and forage crop yields, and decreases in relative feed prices have been important to spur the economic momentum of the beef cattle industry.

Elimination of the production technologies would represent a large setback for U.S. beef production. Lawrence and Ibarburu (2008) estimate elimination of just 5 technologies (parasite control, implants, sub-therapeutic antibiotics, ionophores, and β-agonists) would increase per head production costs by $360 over the lifetime of an animal. Likewise selling price for finished cattle would have to increase by 36% to offset the cost across all of the beef production segments. Modeling by Lawrence and Ibarburu (2008; Table 2) estimate an elimination of beef technologies would result in a 14% smaller calf crop, 18% decrease in beef production, 180% increase in beef imports, and a 13% increase in retail beef prices. Additionally, if the level of production was expected to be maintained, additional land areas would have to be incorporated for cow herd management and feedstuff production. The increased land area dedicated to beef production and associated feed production would mean more land area put into intensive agricultural production, potentially affecting environmental issues.

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Lawrence, J. D., and M. A. Ibarburu. 2008. Economic analysis of pharmaceutical technologies in modern beef production.

Table 1. Effect of utilizing technologies on average daily gain (ADG) and estimated cost of production in the stocker and feedlot segment compared to no use.[1]

Technology	ADG, %	Breakeven price, %	Cost per head, $
Stocker Sector			
Implants	12.85	2.31	18.19
Ionophores	7.74	1.46	11.51
Sub-therapeutic antibiotics	6.87	1.22	9.57
De-wormer	17.79	2.74	20.77
Fly control	8.09	0.80	6.28
All technology		10.40	80.79
Feedlot Sector			
Implants	14.13	6.52	68.59
Ionophores	2.90	1.18	12.43
Antibiotics	3.37	0.56	5.86
Beta-agonists	14.04	1.24	13.02
De-wormer	5.59	2.11	22.16
All technology		11.99	126.09

[1] Adapted from Lawrence and Ibarburu (2008).

Table 2. Model estimation of effect of beef technology ban after 5 years[1].

	Values after 5 years			
	With Technology	Without Technology	Difference	% Change
Inventory (Million cattle)				
Beef Cows, Jan 1	32.9	33.0	0.1	0.2
Total Calf Crop	37.8	32.5	-5.3	-14.1
Steer and Heifer Slaughter	27.2	22.6	-4.5	-16.5
Cattle and Calves, Jan1	95.4	83.7	-11.7	-12.2
Cattle on Feed, Jan 1	13.7	11.4	-2.3	-16.9
Beef Supply and Use (million lbs)				
Production	24,784	20,225	-4,545.6	-18.1
Net Imports	2,901	5,123	2,180.1	180.7
Retail Consumption (lbs)	35.4	59.9	-5.6	-8.5
Prices and Returns				
Finished Steers	87.28	104.94	17.33	20.2
Feeder Steers	120.02	147.48	26.52	22.8
Utility Cows	54.36	67.72	13.09	25.3
Retail Beef ($/lbs)	4.09	4.63	0.53	13.1
Cow-calf Returns ($/cow)				
Receipts	584.51	627.28	40.77	7.0
Expenses	446.17	491.29	45.94	10.1
Net Returns	138.34	135.99	-5.17	-7.9

[1]2005 prices as base, adapted from Lawrence and Ibarburu (2008).

Applied Management for Fly Control

Phillip E. Kaufman, Ph.D.

Assistant Professor of Veterinary Entomology, Entomology and Nematology Department, University of Florida, Gainesville, FL

In Florida, cattle have numerous arthropod pests. Most of these pests are considered external parasites, as their attack on cattle is principally on the skin, as opposed to internal parasites such as "worms" or nematodes and bot flies. The common external parasites include filth flies such as non-biting house flies and biting stable flies and horn flies, as well as the numerous other blood-feeding flies, such as mosquitoes, biting midges, black flies, horse flies, and deer flies.

To successfully combat these pests and potential threats to cattle health, producers must understand the biology, ecology and principles of pest management. To attempt control of these pests otherwise, often will result in failure of the treatment and perhaps additional undesirable impacts including those on animal health and the environment. The most common pests on pastured cattle are the horn fly, *Haematobia irritans*, and the stable fly, *Stomoxys calcitrans* (Figure 1). These two pests share several features and many of the insecticide-based techniques used to manage one, often assist in the management of the other. However, there are important differences in their biology that make management challenging. Of particular concern is in understanding where the immature stage develops and what you can do to reduce them. For pests in confinement operations, the house fly is the most important pests and has been successfully managed in many livestock, poultry, and equine facilities using the principles of integrated pest management (IPM). This system has several components that are adaptable to a wide variety of on-farm situations and a program can be customized to an individual farm. The use of IPM with horn flies and stable flies is particularly important in that insecticide resistance has been observed with both flies, making the simple use of ear tags or pour-on's less reliable than in the past.

Figure 1. Horn fly (top), stable fly (bottom). Not angled wings of horn fly and biting mouthpart of both flies.

The basics of setting up an IPM program involves the utilization of a multi-step system, which cycles among seven steps: preparation, pest identification, pest sampling, situation analysis, determination of management actions, implementation of these actions and re-evaluation. The first step of a fly pest management program is to realize that if you have cattle, you will have flies. To have a goal of and to attempt to eliminate all flies on the animals is unrealistic, will result in failure and will promote insecticide resistance on the farm. Therefore, preparation for the fly season is paramount. These flies will be on the farm, and taking the time to consider your options for their management before they arrive will help you in managing them when they do arrive.

Identification and Monitoring

Horn flies are the most commonly observed fly on pastured cattle, spend their entire adult lives on the cattle and rest on the backs, sides and belly of the animals. While stable flies are associated with both buildings and pastures and are only on animals when they are feeding. In general, stable flies will be observed on the lower legs of animals and cause animals to bunch and stamp their feet. Learning to recognize these flies will help one choose the appropriate monitoring and management tactics. Both flies are similar in color and general appearance, with each having a non-retractable biting mouthpart projecting forward. However, a couple of features can be used to help to easily distinguish them. Horn flies are much smaller than stable flies and often cattle will "glisten" due to the fly holding its wings at an angle, reflecting the sunlight. Stable flies are about the size of the common house fly and hold their wings flat over their backs. Stable flies also appear to have a "checker-board" abdomen (area of body covered by the wings).

When viewing flies on animals, both fly location on the animal and the animal's reaction to the fly can assist with identification. Horn flies are always resting on the cattle, and will be present in up to three areas: the back, side and belly. Animals will toss their tails and swing their heads to their sides and back to dislodge flies, but never stamp their feet. When disturbed, horn flies fly up in one group, and typically return to the animal they left, such as when animals flick their tails. Horn flies may feed anywhere from 4 to 30 times per day, but their bite is not as painful as the stable fly. Levels of between 200 to 10,000 flies have been reported on individual animals. Bulls are much more likely to carry heavy horn fly loads than other animals in the herd.

Stable flies, most often are observed on the legs of animals and when feeding, cause foot stamping and use of the head to dislodge flies from legs and, although ineffective, tail flicking. The bite from stable flies is quite painful and cattle exhibit an aggressive defensive behavior. When not feeding, stable flies rest on structures, fences or vegetation.

Although the immature stages (larvae and pupae) of both flies superficially appear to be in similar habitats, there are important differences. Horn flies only develop in fresh, undisturbed cattle manure. If manure is disrupted early in the fly's development, most larvae will die. Stable fly immatures develop in rotting organic matter, particularly if it is formed from hay or straw and contains manure or urine that is in contact with soil. However, stable flies are quite capable of developing in rotting piles of grass clippings, without the presence of manure. Winter hay feeding rings and other areas where manure, urine and grass mix and stay moist promote stable fly development and are thought to be a major source of on-farm, stable fly sources.

Horn fly and stable fly monitoring is conducted in a similar fashion. The numbers of horn flies and stable flies should be counted from up to 10 mature cows. These numbers should be averaged and recorded. If 10 animals are not available, either conduct repeated counts over a specific period of time (perhaps 15 minutes) or use fewer animals. Only flies that can be seen from a stationary position should be counted. All horn flies that can be observed from one side (top, side and belly) should be counted. An alternative method to estimate horn fly numbers is shown in Figure 2. Observations of stable flies is also done from one side of the animal,

but in this case only flies that are observed on the viewable portion of all four legs are counted. Research in California suggests that 10 tail flicks per minute is equivalent to a count of 5 stable flies per leg. It has been determined that economic losses to stable flies occur on beef cattle (Nebraska) when a farm average of greater than 100 horn flies per side of animals or 2.5 stable flies per leg (10 per animal). Again, record these numbers, and compare animal comfort (also recorded). Develop your own farm thresholds.

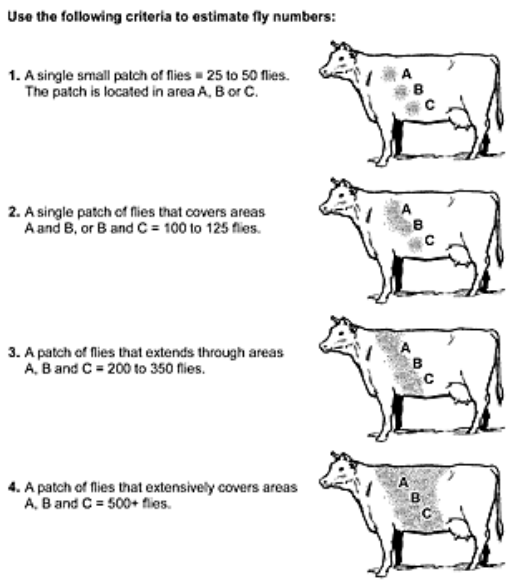

Figure 2. A method of estimating horn fly numbers in the field.

Fly Management:

The management options for an IPM program can be grouped into 5 areas: Cultural, Mechanical, Physical, Biological and Chemical. Cultural control consists of changing the environment to make conditions less favorable to fly development. Mechanical control includes the use of active devices to kill exiting flies, such as cultivation or disruption of development sites to aid in drying. Physical controls include passive devices to eliminate or exclude existing flies, such as traps. Biological control is the use of living organisms to kill pests at any life stage. These can include predators that consume fly eggs or larvae, parastioids (mistakenly called "fly predators" by some), which are tiny wasps that kill developing fly pupae, and pathogens or pest diseases that typically target adult flies. Chemical control includes the use of pesticides, pheromones, food attractants and repellants. There is no single pest management program that will work for all farms and producers need to determine which types work for them. Additionally, no single tactic will provide long-term fly management.

Cultural and mechanical control techniques are sometimes linked and serve as the foundation of a successful confined animal pest management program. However, the use of cultural controls in pastured systems is much more difficult and largely unproven. One approach that is often considered, but typically does not work, is the use of pasture drags to disrupt the dung pats and kill the immature horn flies. This approach would only be possible in intensively grazed rotation systems in which animals trample their own manure and the constant movement of animals between smaller pastures allows for the dragging of these pastures when vacated. One major problem with this approach is pasture-fouling, wherein the manure pats that are dragged, smear across a wider area of grass that cattle reject when offered access at later grazing periods. A cultural control technique that will lower stable fly populations on cattle includes the removal and dispersal of winter hay feeding site debris. If this material is dispersed using a manure spreader, stable flies will have limited local development sites. It is likely that flies will immigrate from other areas; however, local production will be decreased.

Physical control holds potential, but must fit the system. In this approach, items such as traps are used to reduce pest pressure. Several options are available, but only a few have been thoroughly evaluated. Walk-through horn fly traps utilize the horn flies avoidance behavior of dark places, and as such, animals are walked through a darkened structure wherein the horn flies leave the host and fly toward the "windows," where they are captured and eliminated. No commercial products remain on the market; however, design plans exist for individual construction of a device shown to remove 40-50% of the horn flies

(http://extension.missouri.edu/publications/DisplayPub.aspx?P=G1195). Traps exist for stable flies. However, most of these are sticky-based and would not last long given Florida's sandy soils or are too small for use on large acreages. Louisiana State University is in development of a producer-made, highly attractive stable fly trap that is constructed from blue and black fabric and is treated with an insecticide. Flies are attracted to the contrasting colors and when they land on the fabric, the stable flies acquire a toxic dose of the insecticide. These treated-target traps have been shown effective in preliminary tests, but are highly dependent on the pasture size and trap and animal densities. It is hoped that designs will be made available within a year or two. Unfortunately, horn flies have such an attraction to their cattle hosts, that this type of trap holds no interest for them.

While human-assisted biological control is important and effective in confined systems, its use has never proven viable in pastured systems. Recent research on Ocala, FL equine farms suggest that the naturally-occurring *Spalangia* parastioids are the most commonly encountered species attacking both house flies and stable flies. As these parasitoids are the most often encountered, augmenting these wasps with additional *Spalangia* from a commercial insectary may improve fly management, but only if on-farm production of stable flies is confirmed and cannot be eliminated using cultural controls, such as cleaning up winter-feeding areas. Releasing parasitoids for control of horn flies has been shown over and over to be ineffective. However, tremendous natural enemy populations exist in your pastures already. These include predators, parastioids and fungi. Some common predators are beetles and mites; however, the red imported fire ant probably has the greatest impact on reducing horn fly populations by consuming immature flies. Other naturally-occurring insects that reduce horn fly populations include the large variety of dung beetles. These beneficial beetles consume or bury and disrupt dung pats, preventing horn fly development. Certain insecticide applications may have detrimental effects on the dung beetles; thereby inadvertently increasing horn fly numbers.

Chemical control is an important component of an IPM program, but should be the option of last-resort. When used, chemical control first should be attempted with lower impact techniques, such as forced-use backrubbers and dust bags. For this technique to be effective, animals should be directed into contact with these devices in order to reach mineral supplement or water by placing the backrubber or dust bag in a restricted walking area, such as a gate. In fact, these dispensing devices, provided they are recharged, along with the other techniques outlined herein will provide season-long horn fly management. The widespread use of insecticide-containing ear tags has lead to widespread insecticide resistance in horn flies, especially with many of the pyrethroid-based products. Recently, the use of insecticide pour-on products has rapidly increased across the US, however, if horn flies are resistant to the products in the ear tags, they will also be resistant to those same products in pour-on products. Due to their reduced on-animal activity, stable flies have not had many of the resistance issues that have plagued horn fly management; however, recent studies performed in our laboratory have shown resistance to permethrin in Florida stable fly populations. To prolong the use of ear tags and pour-on techniques, producers should rotate among active ingredients (a.i.), not just products – read the label and choose products that have different a.i.'s. Ear tags should be removed from cattle when horn fly populations begin to increase. Leaving them in until animals are worked in the fall only accelerates horn fly resistance development and subsequent failure of the products in the future. Because of rapid losses in product registrations, producers should consult the "External Parasites on Beef Cattle" EDIS publication or contact their local Cooperative Extension Office for a detailed list of currently registered products.

Other Important Fly Pests:

Horse flies and deer flies are commonly called tabanids. These are large, strong-flying, aggressive, blood-feeding flies that inflict

painful bites (Figure 3). There are dozens of important species in Florida and these flies emerge at various times thought the year, often overlapping with one another. These flies also develop in aquatic and semi-aquatic environments, making immature control challenging. The adults will readily fly miles for a blood meal and are difficult to discourage with repellents or whole-animal insecticide sprays, although short-term relief can be obtained. Moving animals away from low-lying areas during a particular species outbreak may provide some relief. There are many traps available for purchase. Most of these traps rely on the excellent visual abilities of the flies and operate through the use of contrasts of black and white or black and yellow. Traps have not been shown to provide sufficient relief to animals, but they can, in some cases, remove large quantities of these flies.

Figure 3. Horse fly adult.

Sources of further information include:
UF/IFAS EDIS System – Tremendous amount of free information: http://edis.ifas.ufl.edu
Pet and Livestock Pests: http://edis.ifas.ufl.edu/topic_in_pet_and_livestock_pests
External Parasites on Beef Cattle: http://edis.ifas.ufl.edu/ig130
Horn Flies: http://edis.ifas.ufl.edu/ig137
Stable Fly (Dog Fly) Control: http://edis.ifas.ufl.edu/ig133
Management of External Parasites with Forced-Use Dust Bags: http://edis.ifas.ufl.edu/ig135
Pesticide Safety Around Animals: http://edis.ifas.ufl.edu/ig128
Entomology Dept. Publications: http://entnemdept.ifas.ufl.edu/publicat.html
Pest Alert: http://entnemdept.ifas.ufl.edu/pestalert/

County Extension Offices: Fantastic resources for many needs – 1st stop.

Control of Helminth Parasites in Cow Calf Operations in the Southern United States

Thomas M. Craig, Ph.D.

Department of Veterinary Pathobiology, Texas A&M University, College Station, TX

To control parasitic disease in cattle one has to first determine which parasite(s) are present and if they are or could cause harm. The idea of "I don‟t care what they have, I just want to kill „um all" is not likely to be a successful approach over time. The class of cattle, geography, time of year and management may help determine if the numbers of parasites are sufficient to cause clinical or economic disease. Each producer is likely to have a different array of parasites that infect his/her cattle and this will determine if the cost of parasitic infection will reach the economic threshold. Occasionally clinical disease may be seen but the primary loss is economic. Lower milk production, decreased calf weaning weight, delayed return to estrus or repeated breeding are the major economic effects of helminth (worm) parasites.

During the past 30 years with the advent of broad spectrum, safe, effective drugs there has been a shift in the kinds of parasites a cattle producer is likely to encounter. Some parasites such as cattle grub, scab mites, and lung worm are gone or so rare they cause a stir when identified. Others that were and still are of lesser significance are still here and are increasing in prominence. The remainders are important now as they were then and, in some instances, much more important because of animals‟ failure to develop immune resistance due to low levels of exposure or increased exposure due to higher stocking density.

Control programs should be predicated on the idea that we prevent disease not that we rid the herd of parasites. The surviving parasite species either have strategies that enable some of them to evade treatment by not being where they will be adversely affected when treatment is done or evolved populations that are resistant to the drugs used.

Parasitic nematodes are the most important profit-limiting group of parasites in the cattle industry at this time. They are found from the true stomach to the large intestine with each parasite species occupying a specific portion of the digestive tract and earning its living in different ways. All of the important parasite species have the same life cycle in the environment but vary in where they go and what they do inside cattle. Eggs are passed by female worms living in the digestive tract and the egg must develop in the dung pat for a few days to weeks before hatching. The larva that emerges from the egg feeds on bacteria and after a week or two, molts to the infective stage larva. This infective stage moves away from the dung pat in a film of moisture and if there has been sufficient rainfall and/or dew ascends in a film of water onto the vegetation where it is grazed by cattle.

Overall, the stomach parasite *Ostertagia ostertagi* is the most important parasite of cattle in North America. Most of the suggestions associated with control programs are directed toward this parasite. However, *Ostertagia* is a temperate climate parasite and cannot persist in tropical climates such as far South Florida or Texas. In the remainder of the southern United States (most of Texas or Florida) this parasite is transmitted to cattle during the cool season, October to May. It is important because it is one of the few parasites that do well in older cattle. Cattle become resistant to *Ostertagia* after being exposed multiple times over several years. If

there are several years not conducive to the transmission of the parasite older cattle react similar to calves, whereas exposed cattle will develop resistance to the parasite by 3 to 4 years of age. Cattle with Braham ancestry may never develop resistance to *Ostertagia*.

The disease caused by *Ostertagia* is associated with the emergence of the larval stages from deep in the crypts of the glands lining the stomach. The emergence is part of the maturation process and occurs 10 to 14 days after they were acquired by grazing unless the worm goes into hypobiosis. The cells lining the stomach glands are either destroyed or put in fast forward and do not produce the hydrochloric acid needed to convert the enzymes in the stomach into a form necessary for digestion. In addition there will be leakage of protein into the lumen of the gastrointestinal tract and a failure to absorb nutrients in the intestine. A result of this is an animal that loses its appetite even though it may appear normal. When there are large numbers of larvae emerging concurrently, as happens following hypobiosis, diarrhea and fluid loss is commonly seen. The disease following hypobiosis is called type II ostertagiosis and treating cattle during the hypobiotic period with an effective drug against these resting larvae is essential to control programs.

Conversely *Haemonchus placei* is a tropical parasite that may only be transmitted during a short time period in the summer in the north but April through October in the south.

Because of a limited time frame during which successful transmission occurs many nematodes undergo hypobiosis or arrested development. Hypobiosis is a cessation of metabolic activity within the host whereby the parasite survives by evading unfavorable conditions in the host or environment. If worms mature and reproduce at an unfavorable time the eggs or larvae encounter conditions too hot, too dry, or too cold for their successful gaining of a host. Hypobiosis occurs with *Haemonchus* over winter and *Ostertagia* over the summer in the south. Hypobiotic larvae are not recognized by the host immune system so even if the host has the ability to expel that species of worm it is unable to do so. However, when the host is stressed, during parturition or lactation, when the worms resume development and they will successfully reproduce in the host.

Resistance by the host to parasites is largely under the control of the immune system and requires exposure to the parasite in order to stimulate a protective response. Host resistance is relative as animals become resistant to disease but not free of parasites. Within populations we see an extreme variability in parasite numbers even in resistant hosts. Approximately 20% of the herd will have 80% of the parasites. Some of the variation may be accounted for by factors such as stress, or lactation. For instance, first calf heifers are still trying to grow, feed a calf, and compete with older and wiser cows for quality nutrients and tend to have a much higher parasite load than the remainder of the herd.

Early infection by gastrointestinal nematodes by single suckled beef calves is usually limited and the provision of high quality feed (milk) assures that the suckling calf will probably not show signs of disease. The exposure to parasites is much less than when calves are run as a group. Likewise, with adequate nutrition they are able to compensate for numbers of parasites that may otherwise cause disease. However, if replacement calves are not sufficiently exposed they may fail to gain sufficient immunity to give them a level of protection during their productive lives. Immunity to some species of parasitic nematodes may be established during the first grazing year as there is sufficient exposure to stimulate some protective response. One common calf nematode *Cooperia* is a small intestinal parasite with one species more likely to be transmitted in the cool season along with *Ostertagia* and others in the warm season with *Haemonchus*.

One species of *Cooperia, C. punctata*, a warm season parasite, may cause excessive inflammation of the small intestine, apparently due to the attempts of the body to rid itself of the parasite. This is the major species implicated with anthelmintic resistance in cattle. The genus can cause diarrhea if it is present in large numbers and can be a problem in dairy or light

weight stocker calves. In time, *Cooperia* stimulates a strong protective response and is unlikely to be seen in older cattle in sufficient numbers to be of any concern.

Haemonchus in young cattle can be a primary pathogen. Most problems with *Haemonchus* have been associated with stocker or dairy calves on high density summer pastures. Suckling calves are infected but the resistance to the parasite by adult cattle is such that they act as a biological vacuum sweeper removing most of the larvae from the pasture so that the calves are not seriously affected. However calves grazing pastures with forages such as Coastal bermudagrass may encounter sufficient worms that they die of exsanguination. *Haemonchus* is a voracious blood sucker and calves may look normal until just prior to death. Some calves will be very sluggish and may develop bottlejaw but do not lose much weight or usually have diarrhea associated with this parasite. The losses caused by this parasite are clinical not just economic.

The large intestinal parasite *Oesophagostomum radiatum* is the only parasite of this group of nematodes that can be transmitted by larvae penetrating the skin as well as by grazing. The larval stages of the parasite cause the formation of nodules in the intestinal wall which are a cause for condemnation of intestines at slaughter. The adult worms are also blood suckers but pale in comparison with *Haemonchus*. A major problem is that the eggs of *Cooperia, Haemonchus, Ostertagia Oesophagostomum*, and a few others all look the same. So diagnosis of the worm species based only on egg morphology may miss the correct diagnosis.

The large roundworm of cattle, *Toxocara vitulorum*, has been seen in Florida and south Texas. This worm is a tropical parasite that is transmitted to calves while suckling. The worm becomes an adult in the calves" intestine where it produces a thick shelled egg that is very resistant to the environment. Each female worm will produce hundreds of thousands of eggs each day. The egg is the infective stage. A larva develops in the egg after a few weeks and remains encased in the egg until eaten by a bovine. In the cow the egg hatches and the larval worm migrates into the tissues where it ceases migration until the cow calves and the larva resumes its migration to the mammary glands and the calf becomes infected while suckling. Where calves are infected by a great number of these large worms (nearly a foot in length) the calf suffers from ill thrift. However finding eggs in most calves is an interesting finding that veterinarians congratulate themselves in being able to diagnose the worm species because of its unique egg.

Liver flukes in cattle are either present or absent from a premises. Maps showing their distribution are only an approximation, and do not indicate the microhabitat of the snail intermediate host; which are low laying areas with clay soils that are periodically flooded, or seeps that keep the soil moist. The range of the intermediate host snails appears to be expanding. Seasonal transmission varies with geographic region and available moisture. Only a few cows infected with flukes will directly benefit from treatment. Treating adult cattle for *Fasciola hepatica* will have only minimal effect in their production. However, treating these cattle may lower the infection rate in the snail population sufficiently that calves on the pastures will acquire levels of parasitism below the threshold of disease. Environmental manipulation of snail habitat may be feasible in some circumstances but is unlikely to have long-term effects. The effective drugs against liver flukes in the U.S., Clorsulon and albendazole, are only effective against adult *Fasciola*. By the time the drugs are used the damage caused during fluke migration has already occurred but treating cattle before the snail activity season may lower transmission the following season. Treating cattle in the autumn appears to be the best approach in the south.

Approximately 50 years ago a revolution occurred in the development of anthelmintics. The products had a much broader spectrum of activity than anything previously used and the safety margin was sufficient that over dosage was unlikely to cause toxicity. With the development of these safe, effective products the

approach to the control of parasitic disease shifted from one of treating "wormy" cattle to strategic or tactical approaches which resulted in cattle that ate more, grew faster, produced more milk and were able to exploit pastures, which formerly had been too dangerous to graze by young cattle. Economic parasitism, not clinical disease has become the gauge of the success for anthelmintics. The primary economic effects of anthelmintics (drugs that kill worms) are those of increased milk production in grazing cattle and the increased growth rate in beef calves. Not only do cows produce more milk there is evidence they breed back more quickly after calving. To be certain not all experiments indicated these findings, as there is variability among herds, geographic localities and years. Different anthelmintics have features that may give them a competitive advantage: cost, ease of administration, spectrum of activity (both in species stages of the life cycle stages controlled), or the persistence of activity. Four classes of anthelmintics currently on the market in North America are effective against gastrointestinal nematodes: Benzimidazoles (albendazole, fenbendazole, and oxfendazole), imidazothiazoles (levamisole), tetrahydropyrimidines (morantel), and macrocyclic lactones (doramectin, epronomectin, ivermectin and moxidectin). The drugs are administered orally, topically, or by injection depending on the solubility and metabolism within cattle and the effects depend on the species and developmental stage of parasites of major concern.

Benzimidazoles prevent the polymerization of rapidly dividing cells, such as those lining the intestine of the worm, and the cells are not able to absorb nutrients essentially starving the worms. This family of drugs is extremely safe with possible exception of Albendazole in the first month of pregnancy. Imidazothiazoles and tetrahydropyrimidines act on receptors in nematode muscle cells which causes a spastic paralysis. Adequate doses of these drugs are important because at low doses some worms recover and are able to reestablish. Overdoses of these drugs may cause calves adverse reactions such as staggering, slobbering, and increased urination. Apparently the effects of these drugs on the worm are due not only the ability to cause the paralysis but the worm must be situated so that normal peristalsis removes it from its normal habitat before recovery. Macrocyclic lactones (macrolides) paralyze parasites but not all muscles are affected equally. The pharyngeal muscles are especially vulnerable to these compounds and the worm is unable to feed. The worms may be lost through normal peristalsis. The macrolides have residual effects against newly acquired larvae that are dispatched as they enter the host.

The specific drug, method of administration, and species of worm will determine the duration of residual activity. At first glance a product with residual activity has considerable advantages as cattle can remain in highly infested pastures without danger of disease. However, as the efficacy tails off it can be a powerful selection mechanism for anthelmintic resistance. Doramectin and moxidectin have longer residual activity than ivermectin. Moxidectin has the longest duration with 99% efficacy against *Ostertagia* at 35 days post injection.

Strategic use of anthelmintics to control parasites clear the host of hypobiotic larvae before the worms do damage and lessen pasture contamination by preventing the number of larvae in the environment that reach levels that cause disease later. The seasonality of arrested development varies geographically. *Ostertagia* undergoes summer arrest in the south and this becomes the strategic period. Tactical use of anthelmintics is the application of the drugs when worm levels are increasing in numbers or likely to do so. Such as two weeks following rains after a period of drought or a few weeks after green up of a pasture in the spring. Treatment based on egg counts, serum protein, hematocrit, or pepsinogen levels can also be considered.

From the time of development of the anthelmintics we have on the market there have been a few worms out there that decided that they did not believe the label and were tolerant of the drug‟s effect. If the drug was used on that population of worms, after a while they were the only worms present, as the believers were killed

and the population changed from a few worms tolerant to, to a lot of worms resistant to a drug. Because cattle ranchers do not tend to use anthelmintics as often as small ruminant or horse owners, the advent of detectable numbers of resistant worms took longer to become apparent in cattle than elsewhere. Is anthelmintic resistance a problem in cattle? It can be! Not everywhere or all the time. *Cooperia* and *Nematodirus* (a small intestinal parasite more important in dry and cold climates) were tolerant of the macrocyclic lactones from the get go. They are still resistant to this class of drugs but both genera stimulate an early robust resistance to disease. When light weight stocker or replacement calves are grazed on heavily contaminated pastures the use of a benzimidazole or combined with a macrocyclic lactone is certainly warranted. A major concern is populations of *Haemonchus* that are resistant to both benzimidazoles and macrocyclic lactones just as in small ruminants. Did the resistant worms come from small ruminants? Probably not but, the resistant worms are found in the highest prevalence in the Gulf Coast and have been transported elsewhere. Properties where calves are backgrounded or permanent summer pasture are used by one group of naïve calves after another are the major source of the resistant worms at this time. Resistant *Haemonchus* in cow-calf operations is not common and if it were, the cows cleaning up the pasture is likely to keep the level below that of any significance.

Evidence has been reported that the use of pour-on macrocyclic lactones to control flies especially often at low doses is a powerful selection mechanism for resistant worms. You might get fly control for a while then loose the effectiveness of the dewormers. Because most of the resistance thus far reported has been in calves. The cow may act as a biologic vacuum sweeper and unless under dosed for the other worm species once or twice a year the drugs are likely to be effective in cows but not in calves.

The bottom line is to treat the Southern cow herd with a drug effective against arrested *Ostertagia* in the late spring i.e. May or June. If you want to save money; treat bulls, first and second calf heifers and not the older cows. If suckling calves are at least 200 lbs body weight, treating them at the same time as mommy will usually result in heaver calves at weaning. Lighter calves, if nursing, will not likely be benefited by treatment. In calves an injectable or oral product is essential. If you are setting the dose gun for the calves set the dial at the weight for the heaviest calves not the mean. Deworm calves at or near weaning again using an injectable or oral product and there is considerable evidence that using both concurrently may improve parasite control. Treat for flukes in the early autumn to protect snails. Evaluate the effectiveness of anthelmintics in replacement cattle on the farm every several years. The internet will not tell you which dewormer is best for your ranch, the cattle will.

Poisonous Plants – Are Your Animals at Risk?

Jason Ferrell, Ph.D.

Department of Agronomy, University of Florida, Gainesville, FL

Livestock managers, go to great lengths to ensure the health and safety of their animals. High-quality hay and feed are often purchased from great distances to ensure the proper balance of forage and protein so that animals can operate at an optimum level. Therefore, it is troubling to consider the fact that potentially harmful weeds may be growing in the pasture. This discussion will cover the misconceptions of plant poisoning and the most common offenders.

Misconceptions

1. *My animals have never been poisoned*. Animal response to toxic plants is highly variable, ranging from hardly perceptible to animal death. Generally speaking, animal death is not common since only a few species of plants possess deadly toxins. But just because you have never lost animals as a result of plant poisoning does not mean they have not been exposed to poisonous plants.

2. *Poisonous plants in hay are safe*. Most plant toxins are very stable compounds that do not break down during the curing process, thus retaining their toxic properties. Of course not all weeds are toxic, but if weedy hay is being fed it is important to know what weeds are present and the risk associated with these species.

3. *Only young animals are at risk.* Yes, young animals are generally more likely to eat poisonous plants out of sheer curiosity. However, if desirable forage becomes scarce, even mature animals will begin to browse on poisonous plants.

4. *Poisonous plants occur naturally and there is little I can do about it.* Yes, there are a number of poisonous plants that occur naturally in a pasture, but it has been my experience that most poisonous plants are actually planted by land owners. Red maple, cherry, lantana, azaleas, and oleander are all landscape plants that can be harmful to animals. It is important to ensure that these species are not planted within reach of the animals.

Symptoms and Procedure

As stated previously, most plant toxins are designed to deter grazing and function by making the animal sick rather than resulting in instant death. The most common symptoms of poisonous plants exposure is general sickness, loss of appetite, off-color urine, weight loss, standing alone, excessive water intake and shaggy coat. If these symptoms are observed, it is important to call your local county extension agent and veterinarian. The extension agent can perform an inventory of what plants are present and hopefully find which species has been ingested. This information can help narrow down which toxin is responsible for the sickness and allow the veterinarian to develop an appropriate treatment plan.

Most common Poisonous plants

Red Maple and Cherry

Cherry trees are highly toxic to all animals. Cherry is very common around pastures since seeds from these trees are readily consumed by birds and deposited along fencerows. Cherry trees produce cyanide in the leaves and limited exposure can lead to animal death. Red maple is less toxic, but causes a blood disorder that can leave the animal sick for an extended period of time. Both cherry and maple are much more toxic if animals consume wilted leaves. These trees should be removed from the pasture to prevent browsing. If trees are not removed, it is of critical importance to scout the pasture after each storm event and remove any limbs that

have fallen to the ground so the animals will not eat the wilted leaves.

Crotalaria or Rattlebox

The whole plant is toxic, especially the seed. Since the seed is the most toxic portion, poisoning from the plant is most common in the fall after prolific seeding has occurred. The toxin in the plant causes liver damage, which can be irreversible. Generally speaking, animals become sick after ingesting this plant, but may not die for months afterward as the disease progresses.

Coffeeweed

Like crotalaria, all parts of these plants are toxic, but seeds are most toxic. These plants have an off-flavor and are generally avoided by animals. However, coffeeweed is relatively frost tolerant and will remain green after the first light frost has caused bahiagrass or bermudagrass to become dormant. Most coffeeweed poisoning occurs at this time since it is one of the few plants that remain green in the pasture. Mowing these plants near, or immediately after, frost is an effective management plan.

Bracken fern

This plant is commonly found in densely shaded areas directly under trees, or in areas recently cleared of trees. It does not produce seed, and all parts are toxic with roots being the most toxic. Bracken fern is generally eaten in the summer when the animals retreat into the woods for shade. Like most toxic plants, bracken fern is only eaten because desirable forage is not available in the heavily shaded environment.

Perilla mint

Two factors make this plant easy to identify;

1. Square stem
2. Mint-like odor

Perilla mint grows best in partial shade – along forest borders or around farm buildings. All parts of this plant are toxic, but flowers are most toxic. Adverse effects from animal exposure are most common in the fall when flowers are present.

Poisonous plants can be problematic, but are not insurmountable. By knowing which species to watch for, and when to be vigilant, poisonous plants will become just another weed in your overall management portfolio.