Southwest Beef Management Symposium - 2006

January 18-19, 2006

Tucumcari, New Mexico

NM STATE Cooperative Extension Service

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The National Animal Identification System: What It Is and What It Is Not

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Introduction

In early 2004, the USDA announced that a National Animal Identification System would be implemented for agricultural animals in the USA. This announcement was part of the response to the first case of BSE within the USA. However, the proposed guidelines for the United States Animal Identification Plan (USAIP) were developed by the National Institute of Animal Agriculture and presented in October 2003, before the BSE case was diagnosed. Since 2004, the early phases of the NAIS have been initiated by the USDA and state animal health agencies.

Out in the livestock production community the degree of familiarity with the proposed NAIS and its intended use varies from complete naiveté to thorough comprehension with varied amounts of misunderstanding and confusion and anxiety scattered across those degrees. This wide array can be attributed to a number of factors. Among these factors are: the relative newness of the program, varied ideas about what the NAIS should be and how it should be used, the current lack of any final rules and regulations, articles and other information that do not adequately distinguish between the compulsory aspects of the proposed USDA program and the other voluntary, potentially beneficial uses of animal identification within the animal industries.

If the NAIS is implemented as currently proposed, there will be mandatory aspects and voluntary aspects. Distinguishing among these aspects should provide producers a better understanding of what they must do from a regulatory standpoint versus what they may voluntarily implement to perhaps benefit the management, production, and marketing of their livestock.

The NAIS: The USDA Intentions

The USDA Animal Plant Health Inspection Service (APHIS) is the federal entity charged with implementing the NAIS. State animal health agencies are working with the USDA-APHIS to implement components of the system in each state. The USDA Draft Strategic Plan can be viewed at http://animalid.aphis.usda.gov/nais/index.shtml.

As stated by USDA-APHIS, the goal of NAIS is to be able to identify all animals and premises that have had contact with a foreign or domestic animal disease of concern within 48 hours after discovery. A system that provides for rapid tracing of infected and exposed animals during an outbreak situation, will help limit the scope of outbreaks and ensure that they are contained and eradicated as quickly as possible.

Note that the system deals with animal disease containment - specifically foreign animal diseases or domestic diseases of concern. These are diseases such as foot and mouth disease, avian influenza, brucellosis, and BSE. As proposed, the only government agencies with access to the NAIS would be those involved with containment and eradication of a defined list of animal diseases.

In order to accomplish the 48 hr traceback objective, the NAIS must have three components: premises identification, animal identification, and animal tracking. Premises identification assigns a unique number to *locations* where animals are raised or managed.

This component of the NAIS will track where animal were born and where they have moved during their lifetime. The Premises identification number will be in a computer databank and will not be on eartags or other identification devices. Animal identification will assign a unique animal identification number to the *animal* or group (if appropriate). So think of the animal identification number as the animal's name and the premises identification numbers as the addresses where that animal has resided during their life. In the beef industry, the proposed means of animal ID will be radio-frequency eartags (RFID tags).

Animal tracking involves reporting the movement of an animal from one premises to another. Animal identification numbers will be assigned to the premises where an animal was born. When the animal moves from that premises to another, it must have an animal identification number. The premises receiving the animal will report the in-movement. If the animal moves from that premises to another, the receiving premises again reports the in-movement. Movement must be reported within 24 hr or by the end of the next business day. The RFID tags are not changed as animals move from premises to another.

As currently proposed the animal has to be identified when it moves to another premises. If an animal spends their entire lifetime on the same premises, they may never be identified in the system.

So as currently proposed, in order to comply with the NAIS the premises that is shipping animals is responsible for having the animals identified. The premises receving the animals is responsible for reporting the in-movement.

The Premises Identification component is currently being implemented in all states. Producers are encouraged to register for Premises Identification numbers. In our states, registration can be completed on-line or via mail or FAX. Forms can be obtained on-line or from state animal heath agencies or in most case Cooperative Extension personnel.
The USDA's proposed timeline for implementation has the NAIS being fully implemented (all three components) in January 2009. However, the USDA proposed that all premises be registered with enforcement (regardless of livestock movements) by January 2008 and animal identification be required with enforcement beginning January 2008. Proposed regulations in Texas will move the timeline for Premises registration up to January 2007.

To summarize, under the current plan the government has a limited intended use for the NAIS - disease tracking and containment by the USDA-APHIS. Compliance will require registration of premises for a premises identification number, applying animal identification numbers when animals leave their premises of origin, and reporting in-movements when animals move to a different premises.

The NAIS: Voluntary Aspects

The USDA-APHIS "mandatory system" will require very little information about the individual animal that is identified. Other than the dates of movement and premises visited, APHIS will need to know if the cattle are involved in any type of federal vaccination/eradication program (i.e. brucellosis or tuberculosis), if available some indication of the age of cattle (not specific birth date; perhaps month or quarter of the year) for disease investigation purposes. Beyond this, little other information may be required to comply with the USDA-APHIS NAIS program.

However, the presence of the RFID in cattle facilitates the collection, storage and transmission of a lot of information that can potentially benefit the producer - performance/production data, management records (i.e. vaccination records, preconditioning programs), health management of stocker cattle, inventory management - to name a few. This information may be useful at home on the ranch, it may be useful working with lenders, and it may be useful in the market.

The key point is that this is a voluntary use of identification; none of this is mandated in the current government proposed NAIS. So, when you see information transfer, or age verification, or source verification, or vaccination records, or genetic records, or carcass data, or some other use of animal identification mentioned in the press or elsewhere, remember this is not something you will have to do to comply with the USDA-APHIS program. Instead, these are *voluntary* aspects that will be greatly facilitated by the mandatory NAIS.

Remember that animal identification facilitates information transfer and someday in the next few years animal identification will be commonplace. So adding one plus one we could surmise that in the future information transfer will be more commonplace. This should be a point to ponder for all producers as they respond to the implementation of the NAIS. Should we do the minimum to comply with the USDA-APHIS program or, should we invest in the future by learning about ID technology, purchasing equipment that might not be necessary otherwise, and developing a information management system that can potentially benefit production efficiency and marketability of our cattle?

Animal Tracking Technology: A Look into Radio Frequency Identification (RFID) Systems for Beef Cattle

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Introduction

With each passing day, the threat of discovering a foreign animal disease (FAD) in the U.S. increases. This increase supports the movement toward a nationwide livestock tracking system to rapidly contain a FAD and minimize associated economic ramifications to livestock producers and rural economies. Unlike many of our largest beef export competitors, the U.S. beef industry does not have a tracking system in place to assist animal health officials rapidly track geographical movements and commingling events of the entire U.S cattle population if a FAD crisis arises. Since the initial framework of the National Animal Identification System (NAIS) was released in April 2004, the beef cattle industry has generally transitioned from *Why do we need the NAIS?* to *How can we implement the NAIS?*

Multiple components and factors must work in unison for the NAIS to be an effective system. Due to the complexity of the U.S. beef cattle industry it is critical during the *voluntary* period of the NAIS to determine and document *what will* and *won't* work in the real world. In this process, individual producers are challenged to become actively involved in developing solutions that will work on all livestock operations (regardless of size or geographic location) within the parameters of a national ID system.

One of the four essential components required for the NAIS to be effective is individual identification of the entire U.S. cattle population. For generations producers have used various forms of individual and group identification to assist in management and prove ownership of cattle. The NAIS documents have *proposed* the use of radio-frequency identification (RFID) ear tags as the form of individual identification to be used in the national identification system for cattle. This paper is intended to serve as an introduction of how RFID systems function and what they cost.

Understanding RFID Technology

While RFID systems are a relatively new concept to the larger population of the U.S. beef cattle industry, RFID technology for individual identification and tracking has been used extensively by government and other commercial industries for decades. Radio frequency identification permits the receipt and transfer of information between a transponder (i.e. ear tag, implant, or bolus) and a transceiver (i.e. RFID reading device) via radio waves. Radio waves are the longest waves of the electromagnetic spectrum and have frequency ranges from 100 kilohertz (kHz) to 10 gigahertz (GHz). Most mass-produced and commercially available ear tags meeting requirements for the NAIS register between 125-134.2 KHz, and are commonly classified as low-frequency RFID (lf-RFID) ear tags.

The use of RFID technology in the form of a subcutaneous implant is used extensively by the companion pet industry for individual identification. For cattle, the most common and commercially available RFID transponder is available in the form of a button-type ear tag. Most companies in the livestock identification business have lf-RFID tags available for cattle. For a manufacture's lf-RFID tags to be considered for the NAIS, it must meet specific standards set forth by the International Organization for Standardization. Commonly referred to as ISO, the International Organization for Standardization is an international nongovernmental, nonprofit network of the national standard institutes of 156 countries. This organization sets standards that provide a common technological language between suppliers and their customers. In a final report submitted on the NAIS, the Cattle Working group recommended ISO-compliant RFID ear tags as the cattle industry standard for individual identification under the NAIS. Furthermore, only those RFID tags that are ISO 11784- and 11785-compliant will meet the technological requirements of the NAIS.

Standard 11784 defines the code structure for the data stored in each RFID transponder (i.e. ear tag). The code structure is composed of digits, and will store a 3-digit country code (i.e. USA-840, Canada-124, and Mexico -484;To view a complete list of ISO Country Codes visit the following website: *www.aipl.arsusda.gov/formats/ref.113.html*) and 12-digit national identification code. The 15-digit combination of the country and national identification code constitutes a unique, globally recognized animal identification number (AIN).

Standard 11785 defines the technical specifications for communication (i.e. data transfer) between the RFID transponder and transceiver. Under ISO standard 11785, data transfer between transponders and transceivers can occur either by full- or half-duplex transmission. Full-duplex (FDX), or continuous, transmission allows both the transponder and transceiver to establish a constant communication where both can simultaneously send and receive multiple signals to transfer data, similar to a telephone conversation. Half-duplex (HDX), or alternating, transmission more closely resembles communication between walk-talkie's. With HDX, the transceiver will send a signal to the transponder, the transponder will recognize the signal, and subsequently send a return signal to the transceiver. A single inquiry from the transceiver to a FDX transponder yields multiple responses, whereas a HDX transponder only yields a single response. It is important to note each ISO-11784 and 11785 compliant, low-frequency RFID ear tag commercially available must be able to be read by any ISO-compliant transceiver, regardless of manufacturer.

Commercially available ISO-compliant, lf-RFID ear tags contain a microchip and copper wire encapsulated in a plastic outer covering. The microchip contains the unique 15-digit AIN, whereas the copper wire serves as an antenna to transmit data and communicate with the transceiver. Today, the 15-digit AIN is currently printed on the external plastic covering of the lf-RFID ear tag, and the first three digits refer to the manufacture code (i.e. Allflex – 982, Digital Angel – 985, etc.; For a complete list of manufacture codes visit www.icar.org/manufacturer_codes.htm). These tags are considered official individual animal identification and will be adopted into the NAIS. In the near future the AIN will be laser etched on the external plastic covering of the RFID ear tag and the manufacture code will be replaced with a country code assigned by ISO. Additionally, all ISO-compliant RFID ear tags will also have the U.S. shield and the logo of the manufacture on each tag.

Low-frequency RFID ear tags commercially available from major tag distributors do not contain an internal power source (i.e. battery), and rely on a temporary charge from the transceiver to transfer data. Because they do not have an internal power source they are referred to as passive tags. When the lf-RFID ear tag enters the radio frequency field of the transceiver, the radio waves are sent from the transceiver to the antenna in the ear tag. When this occurs the tag becomes temporarily charged and able to transfer data to the transceiver.

Passive characteristics limit communication distance (or read range) with a transceiver, but provide a long-lasting economical lf-RFID ear tag in a useable package.

Radio frequency ear tags with internal batteries do exist and are marketed by smaller companies throughout the world. The largest benefits of adding an internal battery to an RFID ear tag are an expanded read range with a transceiver and an increased data storage capability. However, the internal battery has a limited lifetime (depending on the added functionality), and increases the size and the price of the tag.

While the ear tag receives most of the attention, the RFID system requires additional components to function. The transceiver (i.e. tag reader) and the data accumulation device (i.e. computer) contribute significantly to a functioning RFID system. Tag readers serve as: 1) a large antenna that emit radio waves to communicate and power the lf-RFID tags, 2) a data converter, allowing the conversion of the radio-wave message to a digital format, and 3) a digital data transporter – transporting the newly converted digital data to a computer where the data can be stored and used for needed purposes. The most common tag readers are either portable handheld wands or stationary panel devices.

Read range between an RFID ear tag and a tag reader is influenced by: the tag tuning characteristics, communication between different companies tags and readers, power available to the reader, powering ability within the tag to respond, antenna characteristics, and competition from other devices emitting electric signals. It has been our experience that handheld tag readers typically read tags within 6 inches, whereas stationary panel devices can achieve read ranges up to 36 inches under ideal conditions. The read range associated with portable handheld readers make them most useful when cattle are properly restrained in a squeeze chute. Stationary panel readers may be more suitable in situations where large volumes of cattle with RFID ear tags are handled without the need for individual restraint (i.e. sale barn, ports, etc.). While panel readers provide a larger read range cattle must travel past the reader in a single file manner to minimize *collision* incidence, which occurs when two lf-RFID ear tags compete for a signal with a single tag reader at the same time. When this competition occurs one or neither of the competing tags may acquire the necessary signal to communicate with the reader, resulting in no transfer of the data (i.e. AIN in the case of lf-RFID). Applying the lf-RFID tag in the left ear is being communicated throughout the industry to increase recognition of official forms of identification and minimize equipment and labor investments associated with reading tags in both ears.

Tag readers can transport the converted digital data by either a wired- or wireless-connection with a computer. RS-232 serial port or USB connections are common wired-connections available between the tag reader and computer. Wireless-connections between the tag reader and computer are also commercially available for both handheld and panel readers. Portable handheld and stationary panel readers can transfer data to a desktop, laptop, or personal digital assistant (PDA) by either the wired- or wireless connections. To establish a wireless connection both the reader and computer of choice must have the internal components, or capability to attach an external component (i.e. wireless adapter) to establish the connection. Furthermore, with many of the most current models of PDA's, an RS-232 serial port or USB adapter may be necessary to establish a wired connection with a reader. To import the data from RFID ear tags into a readily accessible format (i.e. Excel® and Access®), the computer must also have a keyboard wedge program that translates the digital signal from the reader into recognized keyboard strokes (i.e. letters, numbers, and symbols).

Cost of Implementing an RFID System on Beef Cattle Operations

Not as clearly defined in the draft documents of the NAIS is the direct cost of the program to producers. Many interpretations suggest the only direct cost to producers will be the cost of an RFID ear tag and the necessary labor to apply the tag prior to cattle leaving their premises of origin. If this holds true, this scenario will require minimal additional input for producers who do not typically individually identify all the cattle in their inventory. In addition to meeting the requirements for the NAIS, many producers are evaluating how to use RFID technology as tool in a complete individual identification system (i.e. in-herd data management and marketing). This section is designed to provide some cost comparison between RFID systems, with relative cost for RFID tags, readers, laptop computers, PDA's, and wedge software. These estimates do not account for the necessary power source for readers and laptop computers.

RFID Equipment Cost

ISO compliant lf-RFID ear tag	$2.50
Portable Handheld ISO compliant lf-RFID tag reader (wired connection)	$500.00
Portable Handheld ISO compliant lf-RFID tag reader (wireless connection)	$1200.00
Stationary Panel ISO compliant lf-RFID tag reader	$3000.00
Laptop computer (RS-232 serial port, USB, and wireless connection capabilities)	$800.00
Personal Digital Assistant (wireless connection capabilities and RS-232 adapter)	$375.00
Keyboard Wedge Software for laptop	$30.00
Keyboard Wedge Software for PDA	$75.00

Table 1. Estimated RFID equipment investment with laptop computer as the sole data collection and storage device.

RFID System Purchasing Option

Option 1	Option 2	Option 3
1. Handheld Tag Reader (wired connection) 2. Laptop Computer 3. Wedge Software	1. Handheld Tag Reader (wireless connection) 2. Laptop Computer 3. Wedge Software	1. Stationary Panel Tag Reader 2. Laptop Computer 3. Wedge Software

Estimated RFID Equipment Investment Per Option[1]

Option 1	Option 2	Option 3
$1330.00	$2030.00	$3830.00

Depreciated RFID Equipment Investment Per Option[2] (per animal basis)

Cow Inventory	Option 1	Option 2	Option 3
50	$29.95	$34.62	$46.62
100	$15.23	$17.56	$23.56
200	$7.86	$9.03	$12.03
500	$3.45	$3.91	$5.11
1000	$1.97	$2.21	$2.81
1500	$1.48	$1.64	$2.04

[1]Does not include cost for ISO-compliant lf-RFID ear tag per head.

[2]Includes depreciation for ISO-compliant lf-RFID ear tag per cow with a useful life of 5 years, ISO-compliant lf-RFID tag reader with a useful life of 3-years, purchased lap top and PDA with 100% of time allocated for individual ID system, purchased keyboard wedge software with a useful life of 5 years, and an estimated $500 of extra labor.

Table 2. Estimated RFID equipment investment with personal digital assistant (PDA) as a data collection device and a laptop computer as the data storage device.

RFID System Purchasing Option

Option 1	**Option 2**	**Option 3**
1. Handheld Tag Reader (wired connection) 2. PDA 3. Laptop Computer 4. Wedge Software	1. Handheld Tag Reader (wireless connection) 2. PDA 2. Laptop Computer 3. Wedge Software	1. Stationary Panel Tag Reader 2. PDA 3. Laptop Computer 4. Wedge Software

Estimated RFID Equipment Investment Per Option[1]

Option 1	**Option 2**	**Option 3**
$1705.00	$2330.00	$4205.00

Depreciated RFID Equipment Investment Per Option[2] (per animal basis)

Cow Inventory	**Option 1**	**Option 2**	**Option 3**
50	$37.73	$40.90	$54.40
100	$19.12	$20.70	$27.45
200	$9.81	$10.60	$13.98
500	$4.22	$4.54	$5.89
1000	$2.36	$2.52	$3.20
1500	$1.74	$1.85	$2.30

[1]Does not include cost for ISO-compliant lf-RFID ear tag per head.

[2]Includes depreciation for ISO-compliant lf-RFID ear tag per cow with a useful life of 5 years, ISO-compliant lf-RFID tag reader with a useful life of 3-years, purchased lap top and PDA with 100% of time allocated for individual ID system, purchased keyboard wedge software with a useful life of 5 years, and an estimated $500 of extra labor.

Animal Tracking Technology Resources

National Animal Identification System (NAIS) http://animalid.aphis.usda.gov/nais/

International Organization for Standardization www.iso.org

Company's Marketing RFID Technology for Individual Identification http://beefstockerusa.org/rfid/grid.htm

RFID Technology Updates www.rfidjournal.com

2005 ID INFO EXPO – http://www.animalagriculture.org/id/IDINFOEXPO2005/.htm
a conference devoted to animal identification and systems information technology (proceeding papers and presentations)

Asian Beef Exportation: Status of Negotiations to Restore International Beef Trade

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Introduction

Albert Einstein said "the significant problems we face cannot be solved by the same level of thinking that created them." When an imported Holstein cow in Mabton, Washington tested positive for Bovine Spongiform Encephalopathy (BSE) on December 23, 2003, the U.S. beef industry encountered such a "significant problem." The problem was then exacerbated when, on June 24, 2005, a second 12-year old domestic cow—born and raised in Texas—again was diagnosed as positive for BSE.

Fortunately, BSE has not reduced domestic demand for beef. However, significant losses ensued due to closure of our export markets. Although some markets re-opened to U.S. beef quickly following detection of BSE (e.g., Mexico), our most prized markets—such as Japan and Korea—required substantial effort and time before re-opening, or continue to be inaccessible. On December 12, 2005, Secretary Johanns announced that, of 119 countries to which the U.S. exported beef pre-BSE, trade had been restored with 67—including the largest market of Japan. A total of 52 countries remained closed to U.S. beef products, including South Korea, Hong Kong, Russia, Australia, and China.

Randy Blach of Cattle-Fax estimated in 2004 that loss of U.S. exports resulted in approximately $13 to $15/cwt (live basis) price reductions for fed cattle, essentially costing the U.S. beef industry about $165 to $190 per head marketed. The USDA Foreign Agricultural Service reported in 2004 that, while the U.S. exported $3.1 billion in beef during 2003, only 15% of those levels were realized in 2004. In fact, restoration of trade with Japan will have the greatest impact on cattle value due to the fact that, pre-BSE, Japanese consumers accounted fully for $1.4 billion in beef sales. Restoration of trade with South Korea, Hong Kong, and China remains of paramount concern, and it is hoped that resumption beef exports to those countries will occur during the first half of 2006. Full resumption of beef export trade will require a new "level of thinking"; the U.S. beef industry cannot hope to maintain the *status-quo* (pre-December 2003 export levels) without proactively addressing the desires of export customers.

Production and Policy Differences

To understand what has transpired with respect to trade negotiations, it first is important to review U.S. beef production systems and BSE mitigation strategies, and how such strategies differ from those of other countries. All things considered, it now is apparent that risk in the U.S. for transmission of the BSE infectious agent to beef consumers via the food chain is extremely low. Furthermore, as additional BSE "firewalls" have been implemented to protect animal health and insure food safety, that risk has been further reduced. A list of U.S. beef production facts, policies, and additional intervention steps that have been implemented to protect animal health and to provide consumers confidence in the safety of the U.S. beef supply follows. In terms of risk assessment, effectiveness of mitigation strategies must be evaluated in aggregate before the true probability that consumers of U.S. beef might be exposed to the BSE infectious agent can be ascertained.

The Beef Industry

There are approximately 796,436 beef herds and 91,989 dairy herds in the U.S., which currently account for a national inventory consisting of 95.8 million head. According to Cattle-Fax, beef-industry concentration and consolidation through 2005 now means that the largest 9% of cow/calf producers, the largest 2% of feedlot operators, the top 5 packing companies, the top 10 supermarket companies, the top 10 foodservice distributors, and the top 10 restaurant chains account for 51%, 85%, 78%, 55%, 45%, and 30%, respectively, of total sector market share. One of the byproducts of the trend towards further concentration/consolidation has been dramatically improved efficiency of production and distribution, and improved effectiveness of BSE risk mitigation efforts.

Currently, U.S. packing plants harvest about 16.1 million young (12 to 18 months of age) steers and 10.3 million young heifers each year (USDA-NASS, 2004). The largest four packing firms account for about 81%, and approximately 29 plants operated by the largest five firms account for about 88% to 90% of the total number of young cattle harvested each year (Kay, 2004). The typical large packing plant harvests in excess of 5,000 cattle each day. Approximately 5.6 million culled beef and dairy cows, bulls, and stags also are harvested each year. Thus, about 32 million cattle are harvested each year in the U.S., of which only a small fraction (about 17.5%) are culled animals, and of which an even smaller number are of a chronological age to have contracted the BSE infectious agent and show clinical signs of the disease. Based on current international scientific knowledge, such a population should pose an extremely low risk—even if BSE is present—of transmitting a food safety threat.

Mainstream beef production systems in the U.S. differ substantially from beef production systems employed by producers in other countries, resulting in generally younger cattle at harvest in the U.S. Rarely are mainstream fed cattle harvested when chronologically older than 12 to 21 months of age. Available data suggest that the mean age of fed cattle at harvest is about 16 to 17 months of age, and 97% are harvested before 20 months of age (Carpenter et al., 2005). This can be contrasted, for example, with an average age at slaughter of 32 months in Japan where only about 1.2 million cattle are harvested each year. Management pressures (health and nutritional) in the U.S. beef production system, for economic reasons, result in more efficient growth performance and earlier weaning of calves as time proceeds when compared to production systems in other countries.

Animal Health Policies

Establishment of BSE mitigation procedures in the United States began in 1989 following scientific recognition of the disease as an infectious agent among cattle. The first "fire wall" erected against transmission of BSE in the U.S. cattle population, implemented in 1989, prevented importation of animal feeds, animals, and some animal products from countries with confirmed cases of BSE. In 1990, USDA-APHIS initiated a surveillance testing program which, for 13 years, yielded no positive cases of the disease. The surveillance testing program evaluated 20,526 cattle in 2003 (47 times the OIE's recommended surveillance level; Carpenter et al., 2005).

Following discovery of the single case of BSE in the U.S., a targeted surveillance program was implemented on June 1, 2004 that was to result in the testing of 268,000 high risk (> 30 MOA, non-ambulatory, exhibiting neurological disorders) cattle, plus an additional 20,000 low risk cattle, upon completion. This new surveillance program was designed to provide a 99% level of confidence that the disease would be diagnosed if it occurred at a rate of 1 positive BSE animal in 10 million cattle. To date (December 19, 2005), of 548,786 total animals tested (the program has continued to function past the targeted number of cattle to test), only a single (the "Texas" cow) additional BSE-infected animal has been detected in the U.S. Personnel of USDA-APHIS completed testing of 21,216 clinically normal adult animals on November 21, 2005—all animals tested negative for BSE. One primary source of dissention between the U.S. government (USG) and the government of Japan (GOJ)—where 20 cattle have been diagnosed with BSE since 2001—concerned the fact that, through April of 2005, Japan tested 100% of cattle offered for slaughter. This was true even though most Japanese packing plants continued to practice "pithing" (for worker-safety reasons), which severely disrupts the integrity of CNS that is to be tested. Nonetheless, even today, Japanese prefectures (states) are subsidized by the Federal government to continue the practice of 100% testing of slaughter cattle for BSE—this serves in Japan as a primary domestic means of insuring beef safety. Science has previously established that testing is best used for verification of production and process controls; testing cannot insure safety of food.

In 1997, the U.S. Food and Drug Administration, which is responsible for regulating the rendering industry and animal feed manufacturers, implemented a ban on feeding mammalian-derived feedstuffs to ruminant animals. Because epidemiological evidence from Europe indicated that BSE is primarily spread to cattle via consumption of feedstuffs that are contaminated with the infectious agent, monitoring and compliance enforcement by FDA-CVM of the regulated feed ban has generated historical documentation of more than 99% compliance with the regulation. The U.S. ruminant-to-ruminant feed ban is largely responsible for the fact that only a single U.S. born animal has ever been diagnosed with BSE, but such regulations were not imposed by GOJ in Japan until 2001.

Food Safety Policies

Additional public health policies were implemented by the U.S. on January 12, 2004 to further reduce risk of transmitting BSE to humans through dissemination of contaminated, or potentially-infectious, beef items in the human food chain. The first of these preventative laws, enacted jointly by USDA-FSIS and FDA-CVM, excluded non-ambulatory (downer) cattle from the human food supply. Any animal not able to walk at the time of antemortem inspection is condemned and not allowed to enter the food supply. Secondly, all parts of a carcass derived from an animal that was to be included in the BSE surveillance program is to be retained from the food supply until results of the test are returned. In practice, animals identified for testing in the surveillance program are not allowed into processing plants, but rather are diverted to inedible rendering facilities at the time of testing and are not included in the human food supply, regardless of the BSE surveillance test results. The third mitigation measure banned use of air-injection stunning practices and equipment as these devices can relocate central nervous system tissue into the circulatory system causing distribution within the carcass. This regulation was included for purposes of officially banning the practice and to insure compliance among countries which export beef products to the U.S.; the U.S. beef industry had recognized potential for such contamination and voluntarily eliminated these devices and practices during the late 1990s.

The final—and most important—piece of the January 12, 2004 regulation required removal and control of disposition of Specified Risk Materials (SRMs) from beef animals. USDA-FSIS stipulated that spinal cord, vertebral column, brain, skull, eyes, trigeminal ganglia, and dorsal root ganglia must be removed and properly disposed of (e.g., inedible rendering) from cattle that are 30 months of age or older, and tonsils and distal ileum must be discarded from all cattle regardless of age. Chronological age of cattle is determined via dentition or known date-of-birth (by individual animal or by lot of cattle) so that carcasses and carcass parts generated from animals 30 MOA or older are identified and segregated throughout production. All SRMs are removed from the human food chain, prevented from being processed in advanced meat recovery systems, and are disposed of through inedible rendering. Plants also were required to develop and implement Standard Operating Procedures preventing cross-contamination of carcasses and carcass parts with SRM tissues. In practice, most SRM tissues are discarded by packers irrespective of cattle age. In negotiations with GOJ, as one example, age became a sore subject. Two cattle, 21 and 23 months of age, previously were determined to be infected with BSE in Japan, although no third-party confirmation of the positives was ever allowed by GOJ. In lieu of verification, GOJ chose in 2004 to conduct a mouse bioassay with prions cloned from the two presumably-infected cattle; to date, no results of the bioassays have ever been provided to USG. Private conversations with Japanese scientists suggest that the mice infected with the BSE tissue "died of old age."

Negotiations to Restore Beef Trade with Japan

Table 1 provides a chronology of the primary events shaping negotiations to restore beef trade between USG and GOJ. Negotiations finally resulted in a "framework agreement" on October 23, 2004 that provided for resumption of beef trade via a special marketing program (Beef Export Verification; BEV) administered by USDA's Agricultural Marketing Service. According to the USDA press release, "the U.S. now will be permitted to sell beef and variety meats to Japanese importers from animals below 21 months of age." The agreement outlined that (a) SRMs must be removed from animals of all ages, (b) bovine animals included in the BEV Program must be traceable to live animal production records which indicate that they are 20 MOA or younger, and (c) experts would continue to consult "with a view to verifying physiological age to evaluate carcasses to be 20 MOA or younger" (USDA Maturity Study; Carpenter et al., 2005).

It is now clear that a verified system for determining fed cattle age is necessary if exporters are to comply with Japanese wishes over the long term. Today, estimates of the number of fed cattle in the U.S. for which birth dates are known at the time of harvest range between 5% and 20%. However, producers initially know birth dates for a much higher percentage of the population; that information needs to travel with calves in a verifiable, evidentiary fashion throughout the production chain. As USG/GOJ negotiations to restore trade progressed, many U.S. politicians and reporters displayed apparent frustration with the process. However, in retrospect, it is important that beef producers understand the complicated nature of the negotiations that ensued. Firstly, delays in progress did not result from "bad science" or politics; it was a cultural issue. Japanese people are very "precise," believe in "process," and are committed to detailed and very specific tasks—they do not waver outside the scope of those tasks. In conjunction, labeling fraud in 2001 had reduced consumer confidence in the Japanese Ministry of Agriculture, Forestry, and Fisheries (MAFF; analogous to USDA); this fact had to be addressed as negotiations with USG progressed because MAFF had to be concerned with domestic restoration of consumer confidence. Furthermore, Japanese

Table 1. Chronology of events leading to restoration of beef trade with Japan.

Event	**Date(s)**
Three GOJ/USG Director-General level consultations (J.B. Penn, Under Secretary; M. Pierson, Deputy Under Secretary; C. Lambert, Deputy Under Secretary; E. Terpstra, Administrator, FAS- USDA; L. Crawford, FDA; S. Sundlof, Director, CVM-FDA; P. Wall, Department of State; L. O'Connor, USTR).	Dec 2003, & Jan Apr 2004
Negotiations to address "Pipeline" beef product (K. Belk, CSU; B. Carpenter, USDA-AMS; P. Seng, USMEF).	Jan 2004
Three BSE Working Group technical meetings.	May-Jul 2004
GOJ/USG Summit Talks.	Sept 21, 2004
Japan Food Safety Commission (FSC) seeks recommendation to review domestic BSE measures.	Oct 15, 2004
4th GOJ/USG Director-General level meeting ("framework agreement" established).	Oct 21-23, 2004
Technical Expert Meetings on USDA Maturity Study.	Oct, Nov, Dec of 2004, & Jan 2005
GOJ Experts accept USDA Maturity Study findings.	Feb 8, 2005
FSC accepts domestic Japanese 20 MOA testing regulatory changes.	Apr 2005
Technical Expert Meeting; technical discussions completed.	Apr 2005
MAFF, MHLW, MFOA conducted on-site verification assessments/visits to assess USG BEV-enforcement capabilities.	May 2005
Diet (Congress) delegation visited U.S. to tour feed mills, renderers, packing plants, cow/calf & stocker operations, & feedlots.	Jun 2005
FSC approved "safety of U.S. & Canadian beef."	Nov 2, 2005
A GOJ 28-d public comment period on FSC recommendations ended.	Nov 29, 2005
FSC approves final conclusion relative to U.S./Canadian beef safety and delivers conclusion to MHLW/MAFF for rule-making.	Dec 8, 2005
MHLW & MAFF announced that the market was open for imports of U.S. & Canadian beef pending inspection of 10 plants in each country for compliance with FSIS & BEV rules.	Dec 12, 2005
Secretary Johanns reciprocally announced from Hong Kong that Japanese beef could be imported by the U.S.	Dec 12, 2005

“experts” and the Food Safety Commission (FSC) had to accept the proposed BEV before Japanese politicians could do anything to restore trade—political pressure from the U.S. could never have accelerated the “process.”

Secondly, it now is apparent that USDA made some mistakes. However, in USDA’s defense, they were initially given nothing by the U.S. industry to work with; this BSE-generated situation was new to the U.S. and a “learning curve” was to be expected. During the first “Director General” level meetings in January 2004, Dr. J.B. Penn (USDA Under Secretary for Farm and Foreign Agricultural Services and lead negotiator on behalf of USG) was given a “white paper” consisting of a PowerPoint presentation that provided industry’s offer to re-open the market; that “offer” consisted of “accept what we produce under the conditions that we produce it” and essentially served to tie his hands with respect to a rapid resolution of the issue. This latter event typified how Americans are perceived by other countries (i.e., arrogant), and served to actually slow progress.

Thirdly, many reports and comments by U.S. politicians suggested that the U.S. was the absolute authority with respect to insuring public health, and that our policies should be adequate to elicit confidence among Japanese consumers relative to beef safety. However, resumption of beef imports from the U.S. into Japan was not a decision that could be made by USG; GOJ was responsible for determining when U.S. beef could again be imported. Under Uruguay Round GATT and WTO multilateral agreements, each sovereign nation has the right to implement requirements that protect their population, so long as those same requirements are founded in scientific principles and also imposed domestically; Japan never tried to deviate from this and, in fact, adjusted domestic policy to pave the way for trade restoration. Because of our heritage, American citizens sometimes forget that the “customer” is always right; should similar situations arise in the future, we would all be best served to remember this “golden rule” of business.

Lastly, where did critics of the process between USG and GOJ believe that the policies of Japan originated? With the exception of the 100% domestic testing requirement, Japanese beef trade policies at the time that negotiations originated were based on U.S. policies that were in place before BSE was detected here—albeit under consideration for revision when the Washington cow was detected.

In order to ship beef to Japan, suppliers must now be approved by USDA-AMS under the requirements of the BEV. Pertinent (for purposes of this presentation) requirements of the BEV for Japan are as follows:

5.2 Eligible products must be derived from cattle that are 20 months of age or younger at the time of slaughter using either one of the following methods (5.2.1 or 5.2.2):

5.2.1 Cattle must be traceable to live animal production records. Verification activities for age requirements must be conducted at the slaughter, feedlot, & producer levels as required by the submitted QSA Program:

5.2.1.1 Individual Animal Age Verification. Animals must have a unique individual identification. Records must be sufficient to trace the individual animal back to ranch records. Records must indicate the actual date of birth of the animal & must accompany each animal through the process.

5.2.1.2 Group Age Verification. All animals within a group and born during the same birthing season must be individually identified. Records must indicate the *actual date of birth of the first calf of the birthing season. The age of all calves within a group must be derived from the actual date of birth of the first calf born within the group. Records indicating the date the bulls are given access to the cows may be used as a supplementary measure verifying the oldest age of animals in the group which is determined in 5.2.1.2.2.*

5.2.1.3 USDA Process Verified and USDA Quality System Assessment Programs. USDA Process Verified Program must include age verification as a process verified point as defined in 5.2.1.1 and 5.2.1.2. The USDA Quality System Assessment Program for feedlots and producers must include age verification as a specified product requirement as defined in 5.2.1.1 and 5.2.1.2. All animals must be individually identified.

5.2.2 Age Verification through Carcass Evaluation. Official USDA evaluation at the slaughter facility must be conducted as required by the submitted QSA program & meet each of the following criteria (5.2.2.1, 5.2.2.2, and 5.2.2.3):

5.2.2.1 Cattle must be determined to be A40 physiological maturity or younger by an official USDA evaluation. Official USDA evaluations must determine carcasses to be A40 physiological maturity or younger using the U.S. Standards for Carcass Beef http://www.ams.usda.gov/lsg/stand/standards/beef-car.pdf and the description of maturity characteristics within A maturity (Physiological Maturity Determination Guidelines Appendix F).

5.2.2.2 USDA Evaluators must meet or exceed accreditation performance standards for determining physiological maturity as outlined in Meat Grading and Certification Branch Instruction 709 in order to ensure the accuracy of the evaluation.

5.2.2.3 USDA Evaluators must keep records for each of the determining factors (skeletal, lean, and overall maturity) for each carcass which is determined to be A40 or younger for exportation to Japan.

Other Asian Trade

Negotiations between USG and the governments of other Asian nations to restore beef trade continue as this paper is written. By the time of this presentation, it is likely that U.S. beef will again be allowed in Hong Kong (personal communications with USG officials suggest that Hong Kong may restore beef trade access by the last week of 2005). Likewise, it appears that South Korea will again accept U.S. beef early sometime in 2006. China—an extremely large potential U.S. beef market—has expressed little apparent willingness to negotiate beef trade restoration with USG; the Chinese government appears to be waiting for a *quid-pro-quo* trade offer, and it is unlikely that U.S. beef producers will have access to China during the first part of 2006.

Summary

Substantial progress was made during 2005 to restore U.S. beef export trade, but it is important that cattlemen understand—and not become frustrated with—the complexity and time required for negotiations with other governments to yield results; the U.S. beef industry has never been in the position that it now finds itself. After two years of banning U.S. beef, Japan finally agreed in December of 2005 to again allow imports—within a week, U.S. beef already was available to many Japanese consumers in Tokyo, Osaka, and other major cities. Nonetheless, it will require considerable effort and time to re-establish the market share that U.S. beef enjoyed in Japan before December 23, 2003. Negotiations with other major Asian beef export markets will continue, and it is expected that South Korea and Hong Kong will again allow beef from the U.S. into their countries during the early part of 2006.

It is likely that fed cattle prices now will reflect a need to document age of birth. Starting in 2004, BSE began to influence fed cattle prices; USDA Market News reported, at the time, discounts of up to $35/cwt (carcass basis) for cattle classified as over 30 months of age via dentition. Market pressure to conform to Japanese BEV requirements already has resulted in premiums of up to $7/cwt on a live basis for fed cattle originating from USDA-approved Quality System Assessment programs. Producers can take advantage of requirements to provide fed cattle that are less than 21 months of age as such source-verification information could result in premiums in contrast to prices that will be provided for cattle that do not conform to the Japanese BEV.

Producers should implement a verifiable program to retain birth dates with calves during the upcoming calving season. This will be important regardless of operation size. If you need help, several private companies have USDA Process Verified Programs that are recognized as meeting Agricultural Marketing Service requirements for achieving such objectives. You may also contact Cooperative Extension or your State Cattlemen's Association(s).

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Age and Source Validation

William L. Mies
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The evolution taking place in the beef industry is the movement from generic retail counters to branded programs. This movement requires that the beef used to create brands must be able to stand higher scrutiny in terms of its age, production practices, origin, or any combination of these factors. The detection of two case of BSE in the U.S. has created awareness among our domestic consumers and our foreign consumers that age can be a possible food safety hurdle. The U.S. does not agree with Japan on which age is the proper barrier, but is willing to supply their customer with whatever is demanded. McDonalds corporation was the first large U.S. domestic customer to demand and pay for product that could be traced back to the ranch of origin. This "Source Validated" product represented an effort to create an infrastructure that could simply reduce the amount of generic undocumented product in our meat supply and create product, which would increase consumer confidence in beef.

The initiation of these efforts created a concern among some cattle producers that they would have increased liability if product could be traced back to the ranch of origin. They felt that in this world of continuous lawsuits, they would be the least able to withstand legal challenges should serious defects be found in the product. To some extent, these fears are lessening as producers realize that the strongest defense to an accusation of having created a defect in the product is to have records that document the production practices of the ranch or feedlot. These priciples are taught as part of any Beef Quality Assurance program. While a producer may not like to keep records, it is possible with almost no investment except in time. The investment in time can pay dividends in both sleeping sound at night and possibly in marketing programs in the future.

The USDA is responsible for creating the rules for products, which are exported to our foreign customers. USDA has created rules for each of the countries to which we currently export beef. The rules for the Japanese market are dictated by the need to create an auditable trail that can be inspected at any time. The Japanese requirement is that beef exported to Japan must all come from animals that can be proven to be 20 months or less.

The Japanese have agreed to two methods for determining that age is less than 20 months or less. The first method involves looking at a carcass and determining its maturity by visual inspection of chine bones and cartilage. The designation A40 or younger has been agreed to by the Japanese to insure ages less than 21 months. The problems with this method are that only a small percentage of cattle with sufficiently high quality grades with this maturity score occur in most populations. The other disadvantage is that by the time the carcass can be viewed for maturity score, the offal parts removed on the harvest floor have been comingled and identity lost. Thus, tongue, tripe, etc cannot be saved for the Japanese market because at harvest time, the packer cannot tell which cattle will qualify for the Japanese market.

The second method that can be used to qualify cattle for the Japanese export market is the use of records from the farm or ranch of origin. In order to create an auditable trail, the USDA has made use of two programs, the Quality System Assessment (QSA) and Process

Verified Programs (PVP). The following is taken from the USDA draft ARC 1030 published April 26, 2005:

5.2 Eligible products must be derived from cattle that are 20 months of age or younger at the time of slaughter using either one of the following methods (5.2.1 or 5.2.2):

5.2.1 Cattle must be traceable to live animal production records. Verification activities for age requirements must be conducted at the slaughter, feedlot, and producer levels as required by the submitted QSA Program. Records used to verify this requirement must meet any one of the following criteria (5.2.1.1. to 5.2.1.3):

5.2.1.1 Individual Animal Age Verification

5.2.1.1.1 Animals must have a unique individual identification.
5.2.1.1.2 Records must be sufficient to trace the individual animal back to ranch records.
5.2.1.1.3 Records must indicate the actual date of birth of the animal and must accompany each animal through the process.

5.2.1.2 Group Age Verification

5.2.1.2.1 All animals within a group and born during the same birthing season must be individually identified.
5.2.1.2.2 Records must indicate the actual date of birth of the first calf of the birthing season.
5.2.1.2.3 The age of all calves within a group must be *derived from* the actual date of birth of the first calf born within the group.
5.2.1.2.4 Records indicating the date the bulls are given access to the cows may be used as a supplementary measure verifying the oldest age of animals in the group which is determined in 5.2.1.2.2

5.2.1.3 USDA Process Verified and USDA Quality System Assessment Programs.

5.2.1.3.1 The USDA Process Verified Program must include age verification as a process verified point as defined in 5.2.1.1and 5.2.1.2.
5.2.1.3.2 The USDA Quality System Assessment Program for feedlots and producers must include age verification as a specified product requirement as defined in 5.2.1.1 and 5.2.1.2.
5.2.1.3.3 All animals must be individually identified.

The use of the QSA and PVP programs is designed to make the purchaser of a product responsible for documenting the audit trail of the product that he is buying and moving through the production chain. For example: if a feedyard has a QSA documented by USDA, the feedyard must visit the ranches of origin of the cattle it wished to qualify for Japan in order to inspect records and record keeping in order to qualify that ranch to supply calves under the feedyard QSA program. It must periodically reinspect a percentage of these suppliers each year in order to maintain the QSA program. In a company such as eMerge Interactive; we hold a PVP designation from USDA. It is our responsibility to audit each of our rancher customers to be sure that records are sufficient to withstand an audit should one occur. We have to document the audit and the eartags of the calves so qualified. Once this is accomplished these cattle are acceptable under any QSA so long as they retain their eartags. Both QSA and PVP programs are strict no-nonsense programs. The penalty for failure to comply is to lose a valuable foreign market.

Quality Manual
For
Age and/or Source Verification
Of
Cattle

____
(Feedyard)

____
(Mailing Address)

____
(Physical Address, if different)

____
(Phone)

____
(Contact Person)

____
(Date)

In Accordance with the
USDA—Quality Systems Assessment Program

4. Cattle Supplier Evaluation/Audit

Cattle Supplier Training Form

Quality Systems Assessment—Age and/or Source Verification Program

(Records must be maintained for 3 years)

Cattle Supplier:________________________________

Contact person:________________________________

Address:____________________________________

____

For feedyard use:

Date approved:________________

Signature:____________________

Date delisted:_________________

Signature:____________________

As a supplier of cattle to _______________________________, I agree to meet the requirements of cattle age and/or source verification as outlined by the United States Department of Agriculture. I understand that for some export markets, cattle must be harvested at 20 months of age or younger (a maximum of 638 days). The employees with responsibilities for age and/or source verification of cattle are trained on the requirements for cattle identification procedures and recordkeeping. A log of employee training will be maintained.

I understand that one of the requirements of this program is to complete and sign the Chain of Custody for Age and/or Source Verified Cattle. I also understand that by agreeing to provide age and/or source verified cattle that I am subject to audits by the feedyard and/or USDA and must keep records for three years.

The following method is used to document the age of cattle:

☐ **Individual cattle identification** (calving book or electronic records of birth dates and corresponding individual identification). Records must include calving season start date, calving season end date, and total number of calves born.

OR

☐ **Group cattle identification** (calving book, calendar or electronic records of calving season dates and corresponding group identification). Records must include calving season start date, calving season end date, and total number of calves born.

Although not specifically required by the feedyard or USDA, examples of additional information that may be requested from a cattle supplier during an audit could include:

- Business classification of supplier
- Maps and/or legal descriptions of property
- Number of acres
- Feeding records (invoices, tons fed, etc.)
- Date that bulls had access to heifers/cows
- Purchase of outside cattle
- Name of veterinarian
- Cattle identification procedures
- Number heifers/cows exposed to bulls

In the event of an audit, the burden of proving age and/or source using either of the methods outlined above ultimately rests on the cattle supplier. If a supplier is delisted by a feedyard, the feedyard must report the supplier’s name to Texas Cattle Feeders Association.

Optional

☐ I have received additional training on the requirements associated with age and/or source verified cattle from a third party (i.e., extension service, BQA meetings, veterinarian, etc.).

Cattle supplier signature:_________________________ **Date:**____________

Chain of Custody for Age and/or Source Verified Cattle (PAGE 1)

The information contained in this document must be completed each time cattle change custody.

ORIGINAL RANCH (PLACE OF BIRTH)

COMPANY INFORMATION	CATTLE INFORMATION ☐ Age & Source ☐ Age only ☐ Source only	
Company name:	Description of cattle:	
Contact person:	**No. head born:**_________ **No. head shipped:**______	Method of Identification: ☐ group ☐ individual
Address: City, State & Zip:	Details of identification: Brand and location:____________________ ☐ Hanging Tag ☐ Electronic ID ☐ Both Tag color:__________ Right or left ear:________ Tag numbers:________________________ Other information on tag:__________________	
Phone:		
I have records to support the information provided above and will keep these records for three years. **Signature:**______________________________ **Date:**___________________________________	**Birth date of oldest animal:** **Co-mingled sources:** To maintain “source” claim, two or more sources of cattle must be uniquely identified as a group or individually (i.e., additional ear tag or EID) prior to co-mingling.	

FIRST CHANGE OF CUSTODY AFTER RANCH

COMPANY INFORMATION	CATTLE INFORMATION ☐ Age & Source ☐ Age only ☐ Source only	
Company name:	Do the cattle match the description above? ☐ Yes ☐ No	
Contact person:	**No. head received:**_____ **No. head shipped:**______	Method of Identification: ☐ group ☐ individual
Address: City, State & Zip:	CHANGES MADE TO IDENTIFICATION, IF ANY: Brand and location:______________________ ☐ Hanging Tag ☐ Electronic ID ☐ Both Tag color:__________ Right or left ear:________ Tag numbers:________________________ Other information on tag:__________________	
Phone:		
I have records to support the information provided above and will keep these records for three years. **Signature:**______________________________ **Date:**___________________________________	**Birth date of oldest animal:** **Co-mingled sources:** To maintain “source” claim, two or more sources of cattle must be uniquely identified as a group or individually (i.e., additional ear tag or EID) prior to co-mingling.	

Chain of Custody for Age and/or Source Verified Cattle (PAGE 2)

The information contained in this document must be completed each time cattle change custody.

SECOND CHANGE OF CUSTODY AFTER RANCH

COMPANY INFORMATION	CATTLE INFORMATION ☐ Age & Source ☐ Age only ☐ Source only	
Company name:	Do the cattle match the description above? ☐ Yes ☐ No	
Contact person:	**No. head received:**_____ **No. head shipped:**______	Method of Identification: ☐ group ☐ individual
Address: City, State & Zip:	CHANGES MADE TO IDENTIFICATION, IF ANY: Brand and location:______________________ ☐ Hanging Tag ☐ Electronic ID ☐ Both Tag color:__________ Right or left ear:________ Tag numbers:____________________________ Other information on tag:__________________	
Phone:		
I have records to support the information provided above and will keep these records for three years. **Signature:**______________________________ **Date:**__________________________________	**Birth date of oldest animal:**	
	Co-mingled sources: To maintain "source" claim, two or more sources of cattle must be uniquely identified as a group or individually (i.e., additional ear tag or EID) prior to co-mingling.	

FEEDYARD

COMPANY INFORMATION	CATTLE INFORMATION ☐ Age & Source ☐ Age only ☐ Source only	
Company name:	Do the cattle match the description above? ☐ Yes ☐ No	
Contact person:	**No. head received:**_____ **No. head shipped:**______ (Explain difference in lot file)	Method of Identification: ☐ group ☐ individual
Address: City, State & Zip:	CHANGES MADE TO IDENTIFICATION, IF ANY: Brand and location:______________________ ☐ Hanging Tag ☐ Electronic ID ☐ Both Tag color:__________ Right or left ear:________ Tag numbers:____________________________ Other information on tag:__________________	
Phone:		
I have records to support the information provided above and will keep these records for three years. **Signature:**______________________________ **Date:**__________________________________	**Birth date of oldest animal:**	
	Co-mingled sources: To maintain "source" claim, two or more sources of cattle must be uniquely identified as a group or individually (i.e., additional ear tag or EID) prior to co-mingling.	

Cattle Supplier Employee Training Log

Quality Systems Assessment—Age and/or Source Verification Program

(Example only--Any format of a training log is acceptable)

As appropriate, cattle suppliers shall provide training for those employees that have responsibilities for the development, implementation and review of the QSA—Age and/or Source Verification Program.

EMPLOYEE			AREA OF TRAINING	
Name (printed)	**Signature**	**Role/ Responsibilities**	**Training Topic**	**Comments**

To be completed by cattle supplier representative:

Trainer name (printed):________________________________ Title:______________________

Trainer signature:____________________________________ Date:______________________

Keep all documentation a minimum of 3 years

Cattle Supplier Procedures for Co-mingled Cattle (PAGE 1)

Quality Systems Assessment—Age and/or Source Verification Program

(Required for stockers, backgrounders, dairy calf operations, etc.)

Date:____________________________________

Supplier:__________________________________ City, State:____________________

Contact person:____________________________

Type of supplier: ☐ Cow/calf ☐ Stocker ☐ Backgrounder ☐ Dairy calf ☐ Other_______

Any supplier of QSA—Age and/or Source Verified Cattle that manages multiple sources of cattle and/or co-mingles cattle must have written procedures to address:

Receiving cattle. Describe the procedures used to receive age and/or source verified cattle and explain how cattle are segregated from other cattle:________________________________

____

____

____

Determination of age and/or source of incoming cattle. Describe the process used to confirm the identification and age of incoming age and/or source verified cattle:______________

____

____

____

Identifying and tracing cattle. Explain the procedures used to identify age and/or source verified cattle vs. "normal" cattle and how cattle are traced:____________________________

____

____

____

Control of non-conforming cattle. Explain how cattle that have lost identification are removed from the age and/or source verified cattle (i.e., cattle that have lost tag and are not branded) and how cattle that are not age and/or source verified are kept separate:______________________

____

____

____

Cattle Supplier Procedures for Co-mingled Cattle (PAGE 2)

Quality Systems Assessment—Age and/or Source Verification Program

(Required for stockers, backgrounders, dairy calf operations, etc.)

Date:____

Supplier:____________________________________ City, State:______________________

Training of employees. Describe how employees are trained on age and/or source verified cattle procedures and that this is documented in a cattle supplier employee training log:________

____

____

____

Shipping of cattle. Describe the procedures used to confirm the identification and number of head of age and/or source verified cattle shipped:____

____

____

____

Records. List the documents used to:

(1) confirm cattle received and identification of incoming cattle:

____

(2) prove the age and/or source of cattle:

____

(3) document changes made to cattle identification:

____

(4) record non-conforming cattle (i.e., lost all identification):

____

(5) training of employees:

____

(6) shipping:

____

Additional comments:____

____

____

____

Cattle supplier signature:____________________________________ Date:______________

Cattle Supplier Initial Evaluation and Annual Audit Checklist (PAGE 1)

Quality Systems Assessment – Age and/or Source Verification Program

(Initial evaluations can be conducted off-site or on-site.
Annual audits must be conducted on-site using this checklist)

ALL ANSWERS MUST BE SUPPORTED WITH WRITTEN DETAILS TO PROVE HOW THE INFORMATION PROVIDED BY THE SUPPLIER WAS EVALUATED.

Date of audit by feedyard:____________________

Supplier:______________________________ City, State:____________________

Contact person:____________________________

Type of supplier: ☐ Cow/calf ☐ Stocker ☐ Backgrounder ☐ Dairy calf ☐ Other________

	Yes	No
Information on the supplier's signed Cattle Supplier Training Form is current?	☐	☐

- **Attach copy of the supplier's signed Cattle Supplier Training Form.**

Verify the information on the Form with the supplier and check "Yes" if it is current. If the information is not current, check "No" and obtain a new Cattle Supplier Training Form from the supplier before continuing this evaluation. **Describe actions taken during the evaluation process to ensure that the supplier is meeting this requirement:**

____

____

____

	Yes	No
Supplier has copy of Chain of Custody for Age and/or Source Verified Cattle?	☐	☐

- **Attach copy of the supplier's most recent signed Chain of Custody.**

Review all the information on the Chain of Custody to ensure that the document has been completed correctly and verify the information with the supplier. If it is complete and correct, check "Yes." If the Chain of Custody is incomplete or inaccurate, check "No." **Document how the information on the Chain of Custody was verified with the supplier:**

____

____

____

	Yes	No
Are the supplier's employees trained on the QSA procedures and records?	☐	☐

- **Attach copy of the supplier's employee training documentation.**

If the supplier's employee training log includes all those employees with QSA responsibilities and the log has been dated and signed by the employees and the person conducting the training, check "Yes." If the supplier training log is incomplete, check "No." **Describe how the supplier conducts employee training and confirm that the main contact person with the supplier has been trained on QSA requirements:**

____

____

____

Cattle Supplier Initial Evaluation and Annual Audit Checklist (PAGE 2)

Quality Systems Assessment – Age and/or Source Verification Program

ALL ANSWERS MUST BE SUPPORTED WITH WRITTEN DETAILS TO PROVE HOW THE INFORMATION PROVIDED BY THE SUPPLIER WAS EVALUATED.

	Yes	No
Does the supplier have a method of identifying birth dates (group or individual)?	☐	☐

Evaluate the supplier's method of identifying birth dates and verify that the supplier is using a method of group or individual identification that meets QSA requirements for age and/or source verified cattle. If the method meets the requirements, check "Yes." If the supplier does not have a consistent or accurate method of identifying birth dates for age and/or source verified cattle, check "No." **Describe and evaluate the supplier's method of identifying birth dates:**

____

____

____

	Yes	No
If the supplier has multiple calving seasons, are cattle identified differently?	☐	☐
	☐--N/A	

Check "Yes" only if the supplier has procedures for uniquely identifying different groups of cattle and that the supplier can relate the identification of specific groups of cattle to the birth date records. If the supplier has multiple or continuous calving seasons and does not identify cattle differently, check "No." Check "N/A" if the supplier has only one calving season or if this supplier is not a cow/calf operation—AND explain on the lines below. **Describe the cattle identification procedures used by the supplier and document how the procedures meet the QSA requirements for identification:**

____

____

____

	Yes	No
Does the supplier have records to support age and/or source verification?	☐	☐

- **Attach copy of the supplier's calendar, day planner, etc. where birth date of first calf was recorded. "Bull dates" alone are not sufficient.**

If the supplier's records indicate the birth date of the first calf for each calf crop (single calving season vs. multiple calving seasons), check "Yes." If the supplier has not recorded the birth date of the first calf or has only recorded "bull dates", check "No." **Describe the method of birth date records kept by the supplier and explain how this information meets the QSA requirements for age and/or source verified cattle:**

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Cattle Supplier Initial Evaluation and Annual Audit Checklist (PAGE 3)

Quality Systems Assessment – Age and/or Source Verification Program

ALL ANSWERS MUST BE SUPPORTED WITH WRITTEN DETAILS TO PROVE HOW THE INFORMATION PROVIDED BY THE SUPPLIER WAS EVALUATED.

Yes **No**

If cattle are co-mingled, does the supplier have written procedures in place? ☐ ☐

- **Attach copy of cattle supplier procedures for co-mingled cattle.** ☐--N/A

Evaluate the supplier's procedures to determine if receiving, determination of age and/or source, identification and traceability, control of non-conforming cattle, training of employees, shipping and records meet the QSA requirements and check "Yes." If the supplier's procedures are incomplete, inaccurate or do not reflect the actual procedure verbally described by the supplier check "No." Check "N/A" if the supplier does not co-mingle cattle AND explain how this was determined on the lines below. **Describe how the supplier's procedures were reviewed and evaluated:**

____

____

____

Yes **No**

If the supplier purchases outside cattle, are they managed/identified differently? ☐ ☐

☐--N/A

Confirm with the supplier that outside purchases of cattle are not considered age and/or source verified unless cattle are purchased from another supplier approved by the feedyard and the Chain of Custody document has been completed. If the supplier purchases outside cattle, verify that the supplier has procedures in place to manage and identify age and/or source verified cattle separately from "normal" cattle. If so, check "Yes." If no distinction is made between "normal" cattle and age and/or source verified cattle, check "No." Check "N/A" if the supplier does not purchase any outside cattle and explain on the lines below. **Describe the supplier's procedures for managing/identifying outside cattle and how these procedures meet QSA requirements:**

____

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____

Yes **No**

Does the supplier have procedures in place to maintain the identity of cattle? ☐ ☐

The supplier must have procedures to manage cattle that have lost all means of identification as "non-conforming" cattle. The supplier must also document how and when these cattle are kept separate or are removed from the group of age and/or source verified cattle at the time of shipping. If the procedures meet the QSA requirements, check "Yes." Check "No" if the procedures are inadequate. **Describe the supplier's identification procedures and explain how non-conforming cattle will be managed:**

____

____

____

Cattle Supplier Initial Evaluation and Annual Audit Checklist (PAGE 4)

Quality Systems Assessment – Age and/or Source Verification Program

ALL ANSWERS MUST BE SUPPORTED WITH WRITTEN DETAILS TO PROVE HOW THE INFORMATION PROVIDED BY THE SUPPLIER WAS EVALUATED.

	Yes	No
No operational changes have been made which affect age and/or source verification since initial approval or the last audit conducted by the feedyard?	☐ ☐--N/A	☐

Discuss any changes made to the operation by the supplier and evaluate whether or not the changes affect the supplier's ability to provide age and/or source verified cattle. If the supplier has not made any operational changes which affect age and/or source verification, check "Yes." If the supplier has made significant operational changes that are not in accordance with the QSA requirements for identification, recording of birth dates, control of non-conforming cattle, or other QSA requirements, check "No." Check "N/A" if this is an initial supplier evaluation and explain on the lines below. **Describe any operational changes made by the supplier and explain whether or not the changes affect age and/or source verification of cattle or state that no changes have been made:**

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Additional comments or observations:

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Cattle Supplier Initial Evaluation and Annual Audit Checklist (PAGE 5)

Quality Systems Assessment – Age and/or Source Verification Program

To be completed by feedyard representative:

For Initial Evaluations:

- ☐ All questions on this checklist have been answered "Yes" and the information collected from the supplier and evaluated by phone demonstrates that the supplier is meeting the QSA requirements for age and/or source verified cattle. This supplier is considered low risk and is approved without an on-site audit.
- ☐ One or more questions have been answered "No" and/or the information collected from the supplier and evaluated by phone does not adequately meet the QSA requirements for age and/or source verified cattle. The supplier fails the audit and is considered moderate risk. An on-site audit must be conducted prior to approval by the feedyard.
- ☐ An on-site audit was conducted at the supplier's location. Questions on this checklist have been answered "No" and/or the information collected from the supplier does not adequately meet the QSA requirements for age and/or source verified cattle. This supplier fails the audit and is considered high risk. The supplier cannot be approved until the supplier implements correctives actions and the supplier passes an audit by the feedyard.

For Annual Audits:

- ☐ All questions on this checklist have been answered "Yes." The supplier is meeting the requirements of the QSA Program as an approved supplier.
- ☐ One or more questions have been answered "No." If this is an annual audit, the supplier is not meeting the requirements of the QSA Program and must be delisted. All cattle on the feedyard's list of QSA-Age and/or Source Verified Cattle from this supplier must be removed from the list until deficiencies have been addressed and the supplier has passed a second audit by the feedyard. If the supplier fails a second audit by the feedyard (conducted within 14 days from the first audit), the feedyard must report the supplier's name to TCFA as a delisted supplier.

  Date Delisted:__________ Date Reported to TCFA:__________ Initials:______

Verification of Information:

If an approved supplier has not provided age and/or source verified cattle for more than one year, the feedyard must verify the information on the most recent audit/evaluation with the supplier by phone to confirm that the information is still correct.

- ☐ The supplier was contacted by phone to verify that the information on this most recent audit is still correct.
- ☐ Based on a phone conversation with the supplier, operational changes have been made which affect age and/or source verification. The supplier must be audited and evaluated in accordance with this checklist to be re-approved.

Auditor name (printed):______________________________ Title:____________________

Auditor signature:__________________________________ Date:____________________

Grazing Stocker Cattle on Small Grains

Ted McCollum III
Texas A&M University-Texas Cooperative Extension, Amarillo

Introduction

Grazing stocker cattle on small grains pasture offers a good profit potential because of high forage quality and seasonal appreciation in calf prices. However production risks can often make it difficult to project daily gains and hence affect the reliability of breakeven projections and marketing decisions.

Forage availability and winter weather are the two primary production management risks. Bloat is another unpredictable risk that can have major consequences. Agronomic practices affecting forage accumulation and cattle management practices that reliably influence performance can aid in the predictability of forge production and cattle performance.

Forage Availability and Cattle Performance

Forage allocation to cattle is a primary determinant of weight gain. Any other management practice we implement (i.e. implants, additives, supplemental feed) is simply modifying the conditions that are set by the relationship between cattle and their forage supply. Figure 1 illustrates observed relationships between forage allowance and estimated weight gain on wheat pasture. From this one can easily see that daily gain can be manipulated simply by manipulating forage allowance. How do we manipulate forage allowance? Adjust the stocking density (hd/ac) and rate ([hd*days]/ac).

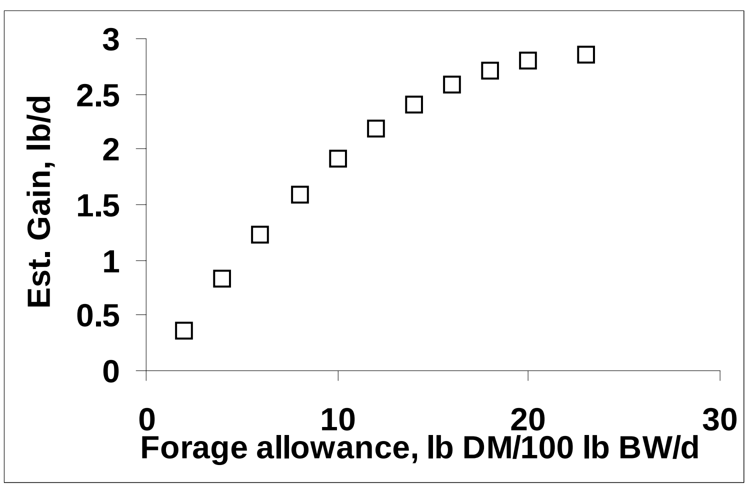

Figure 1. The estimated relationship between forage allowance (lbs DM/100 lb/d) and weight gain for a 5-6 cwt stocker calf on wheat. This is adapted from data collected in central Oklahoma (Redmon et al. 1995).

The estimates from figure 1 were used to generate the data in table 1. Table 1 presents estimated daily gain over an 80 d period when pastures with varied forage accumulation (lb DM/ac) are stocked at different rates (ac/hd). This assumes no forage accumulation during the 80 d period. At any given stocking rate, daily gain declines as forage availability declines. Likewise, at any given forage availability daily increases as stocking density declines (more ac/hd). So, much of our success in hitting desired gains rests first on allowing an adequate amount of forage for the cattle. This is difficult to project in many situations for several reasons - unpredictable growing conditions and purchase of cattle before we know how much forage is available - among others.

Table 1. Estimated relationship of forage availability and 80-d stocking rate (ac/hd) to daily gain over an 80 d period on wheat pasture. This assumes no forage accumulation during the grazing period. Based on data from Redmon et al. 1995.

	Forage availability, lb DM/ac						
ac/hd	**250**	**500**	**750**	**1000**	**1250**	**1500**	**1750**
0.5	-	-	0.1	0.2	0.3	0.3	0.4
1	-	0.2	0.3	0.5	0.6	0.8	0.9
1.5	0.1	0.3	0.6	0.8	1.0	1.2	1.3
2	0.2	0.5	0.8	1.0	1.3	1.5	1.7
2.5	0.3	0.6	1.0	1.3	1.6	1.8	2.0
3	0.3	0.8	1.2	1.5	1.8	2.1	2.3

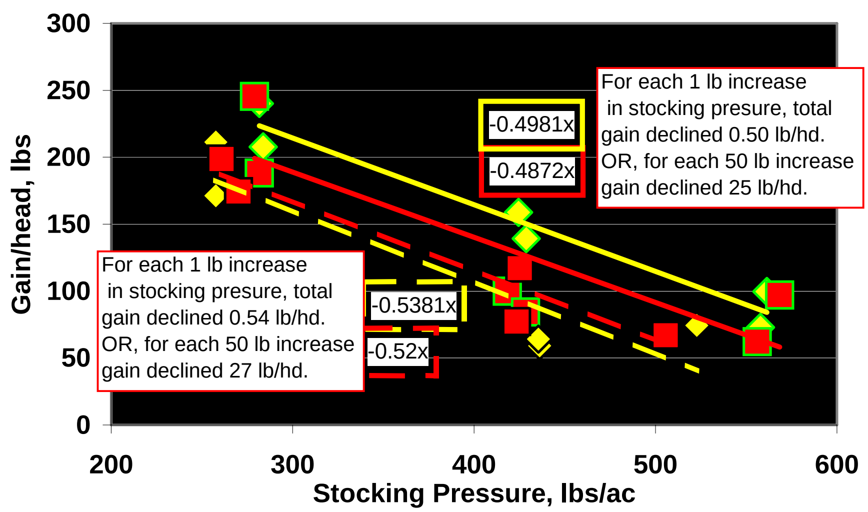

Figure 2. Weight gains of stocker cattle on wheat pasture during the November to March period in 2000-01 and 2001-02 at the Texas A&M University Bush Farm, Bushland, TX.

Stocking Rate and Profit Potential

Actual gains of stocker cattle on wheat at Bushland, Texas during the November-March period are shown in figure 2. These cattle were stocked at different rates to determine gain response to stocking pressure. Gain varied from 250 lb/hd to as little as about out 60 lb/hd. Once again this range of responses is the result of manipulating daily forage supply for the cattle by stocking practice. Our decisions affect the gain.

Which level of performance in the range shown in figure 2 is most desirable? The answer depends on your criteria. If maximum gain per head is the objective then stock lightly. If maximum gain per acre is the objective, then stock heavier because although gain/hd declines as stocking pressure increases, gain per acre is moving the other direction. If however, you own the cattle and your objective is profit-based, then the more profitable stocking rate ($/ac) is somewhere between maximum gain/hd and maximum gain/ac.

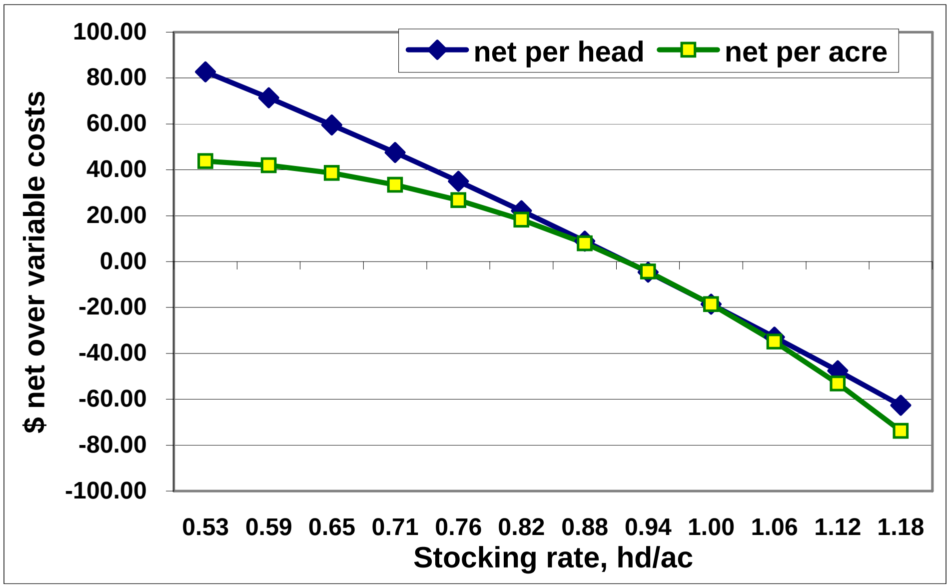

Figure 3. Returns over variable costs, $/acre and $/hd, at different stocking rates on wheat during the winter. Based on gain relationships from Bushland, Texas (see figure 2) using a $140/cwt purchase price for calves and a flat $63/hd pasture rental cost.

Figure 3 illustrates the relationship between stocking rate (hd/ac) and returns over variable costs using the relationships shown in figure 2. As stocking rate increased, net return/head declined (less weight gain to cover the variable costs). Net return/ac began to decline as stocking passed about 0.60 hd/ac.

The relationship in figure 3 changes as the inputs on a partial budget change. If costs of production increase, then the relationship between stocking rate and profit change. As costs increase, stocking rate must decline to maintain profitability. As costs decline, stocking rate can increase and maintain profitability.

For instance, figure 3 assumed that purchase cost was $140/cwt for the steers. For a point of reference, note that profit per acre maxed out at about 0.60 hd/ac and was a little over $40/ac. If we hold all costs equal but assume a purchase price of $125/cwt for the steers, then profit/ac maxes out at about 0.71 hd/ac and just under $80/ac. This may not sound like a tremendous change in stocking rate but it is an 18.3% adjustment. If we were happy with the $40/ac that we had with $140 calves then we could have stocked 1 hd/ac and made $40/ac with $125 calves.

Managing for Forage Accumulation

Hopefully by now we can see that forage availability and forage allocation to grazing have a great bearing on cattle performance. Given this fact, the first step in managing production risk for stocker cattle systems on small grains is managing to grow forage.

Seeding rate, planting date, and fertilization

Seeding rate and planting date affect forage production (Figure 4). Earlier planting provides more time for the plant to develop and produce forage. Recommended planting

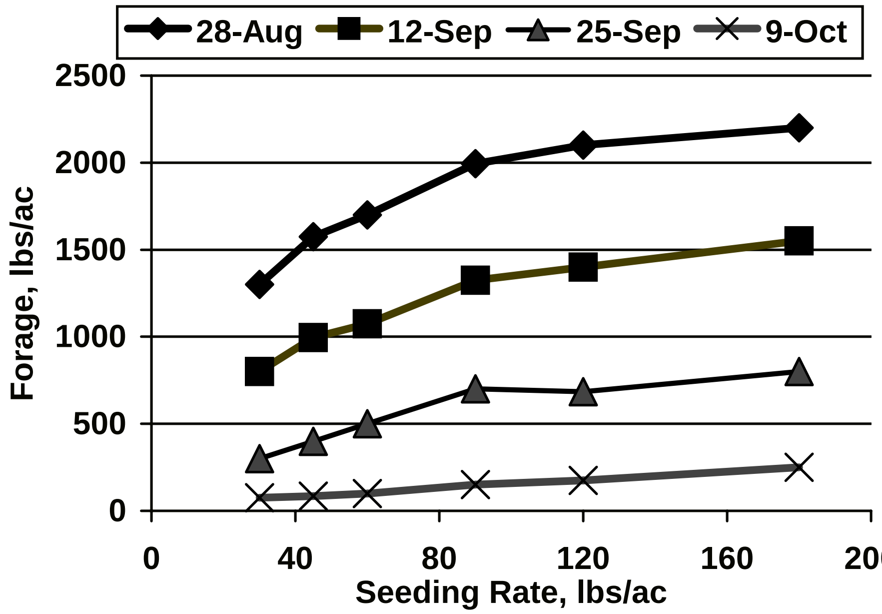

Figure 4. Fall forage production and seeding rate and planting date. From Krenzer (1995) Oklahoma State University.

dates for the High Plains region are before mid-September. Planting date is a of a two-edge sword. If planted too late there will be little if any forage available for grazing in the fall and winter. Feeding cattle then becomes the management program because turnout will be delayed until spring or the short supply of forage will be utilized rapidly by the cattle if they are turned out in the winter. On the otherhand, early planting requires more soil moisture which can result in higher irrigation costs and may affect grain yields if grain production is an objective.

Higher seeding rates produce more forage. Increasing seeding rates to at least 90 lb/ac is generally recommended. When planting conditions are not optimal it is also recommended to increase the seeding rate.

Fertilization should be based on soil tests. Recommendations are to apply about 60-80 lbs of N per ton of forage production. So it is necessary to estimate forage production and apply N to meet those needs. Phosphorus can also be required for forage production. Deep placement of P has been shown to increase forage production. This places the P in the root zone so it is available as the plant develops. Studies at Vernon, TX have shown increases in stocker carrying capacity following P applications.

Forage type

Different types of small grains are available to producers. Wheat, rye, triticale, oats and barley can all provide excellent grazing. However, some have limitations. Oats are not as cold hardy as the others and should not be planted to survive through the winter. Barley may have the same problem. Rye produces better in colder temperatures but matures earlier than wheat and triticale. Triticale may provide a longer grazing season than wheat or rye. However, studies to date have shown no real forage production advantages for triticale. The production of varieties within a forage type is possibly more important than general differences among the forage types.

Cattle Management

Growth promotants

A number of practices can be used to improve or maintain cattle performance. Implants have been around for many years. These have dependably increased daily gains 0.15-0.20 lb/d on stocker cattle. Many do not use implants because of handling cattle one additional time to place the implant before turnout. But the implant will provide advantages during the time before turnout. So unless your marketing program limits implant use, the implants will be economically beneficial.

Feed additives such as Bovatec and Rumensin have also dependably increased weight gains 0.20-0.30 lb/d on small grains stocker cattle. The problem with feed additives is delivery to the cattle. These must be fed. The alternatives for self feeding are limited to mineral supplements and some blocks.

Another facet of the ionophores is bloat prevention. Data from Clayton Livestock Research Center demonstrated that Rumensin is an effective means of reducing the incidence and severity of bloat in wheat stockers. It is not a cure but it aids with the problem.

Feed ing cattle on wheat

Feeding cattle on wheat can be beneficial for weight gain and achieving gain targets. There are three basic reasons to feed cattle on wheat: (1) enhance gain, (2) carry cattle through periods of short forage supply without sacrificing performance, and (3) deliver feed additives to the cattle.

Grain or energy dense feeds will be the feedstuff of choice on small grains. These forages are typically high in protein and the ruminal microorganisms utilize the energy substrates to capture more of the forage protein. In situations where we simply desire to enhance gain efficiently, we will be delivering a supplement that contains a high percentage of grain or grain byproducts. The feeding rate will be relatively low, about 0.20-0.40% of BW. We keep the feeding rate low to provide the desired amount of supplemental energy without sacrificing forage intake. This also maintains our supplement efficiency (lb added gain/lb of supplement) at a low rate. If possible, include an ionophore in these feeding programs.

In situations where forage is short (we are overstocked), we can either use the same supplement type mentioned above and feed at a higher rate or some may have the ability to feed silage. With the grain-based feeding program, increase the feeding rate to over 0.65% BW. This will curtail forage intake, stretch the forage supply for the cattle but maintain weight gain. The efficiency on a per head basis is relatively poor, but the efficiency per acre is attractive in most cases.

Silage feeding is a way to increase stocking rate and maintain gains. The energy level in good silage is about equivalent to small grains forage. So the silage intake displaces intake of the small grains but the energy intake of the cattle is not compromised.

Bloat

Bloat is a sporadic problem and usually occurs in the late winter. It is attributed to high levels of soluble protein in the forage and possibly low mineral availability (calcium). There is no 100% effective means for preventing bloat. However, there are a number of tools such as ionophores, poloxalene, roughage feeding that can reduce bloat incidence. We know when bloat typically happens and the best one can do is be prepared to act early when bloat starts to occur. Realize one preventative measure will not work on all the cattle in a group; so a variety of approaches may be required.

Summary

Forage production and allocation is under our control and is the first factor affecting stocker performance. Our first objective must be to use appropriate planting methods at the appropriate time. Once the forage is growing we can monitor the accumulation and adjust our stocking rates or develop feeding programs to overcome forage shortages.

Management of Summer Stocker Programs

Jason E. Sawyer, Ph.D.
Texas A&M University, College Station, TX

Introduction

Management of the summer range stocker enterprise involves a complex set of interactions between economics, weather, rangeland management, and animal husbandry. Managers are faced with a nearly infinite variety of specific circumstances and must allocate time and resources to those that are most likely to generate sustainable profits in the business. Many of the factors that influence productivity in this system are beyond managerial control (like weather), but these extrinsic factors demand dynamic management responses in areas that are malleable to management decisions (stocking rate, input selection and application). The objective of this presentation is to describe high-leverage management points and their evaluation and implementation for profitable stocker cattle production enterprises in the Southwest.

Sensitivity Analysis

Enterprise budgets provide a valuable tool for projection of enterprise viability, and can also be used to identify critical management areas. By systematically varying individual elements of the budget, the relationship between particular production characteristics and profitability can be evaluated. This simple single factor sensitivity analysis yields information about factors which are most important to profitability, and therefore, indicate areas that more management effort should be allocated toward. McNeill (1994) demonstrated the use of a sensitivity analysis, and indicated that market prices (purchase and sales), duration of the gazing season, animal health (death loss), and average daily gain were key drivers of profitability. Market risk is an important consideration in the stocker enterprise, and price risk management strategies should be considered. However, once the decision to operate is made, the operator has accepted the market risk, and must focus on management of production attributes.

A sensitivity analysis was conducted to evaluate the impact of average daily gain, calf morbidity and mortality, and duration of the grazing period on profitability. An example of the budget utilized is given in Table 1. Base values in this budget reflect current prices to the extent possible; it is important to use values that are applicable to your operation. Calf cash purchase price was obtained from the Dalhart market for the week ending January 6, and August feeder cattle futures prices were used to anchor the sales price slide. Current market calculated value of gain was used to construct the selling weight price slide (centered on 750 lb steers). Base average daily gain was assumed at 1.75 lb/d in a summer stocker program with adequate forage availability and quality; and supplement costs were included as an estimate of potential expenditures.

Individual production values were varied to examine the change in profitability. These changes in profit estimates (sensitivity) can be used to identify major impact areas and provide insight into drivers of profitability and managerial focus on these important factors.

Table 1. Base values for a summer stocker cattle enterprise sensitivity analysis.

Item	Unit	Quantity
Revenue		
Cattle Selling wt.	lb	723
Sales price, $/cwt.	$/cwt	115.81
Expenses		
Cattle Purchase wt.	lb	450
Cattle Purchase price	$/cwt	140.00
Equity amount	$/head	175.00
Interest rate	$	6.5
Production Estimates		
Grazing period	days	160
Average daily gain	Lb/day	1.75
Morbidity rate	% of cattle	20
Mortality Rate	% of cattle	1.5
Operating Expenses		
Pasture lease	$/cwt/month	3.50
Processing charges	$/head	14.00
Feed costs	$/head	28.00
Labor, daily	$/head/day	0.07
Freight	$/head	4.00
Vehicle and equipment	$/head	6.00
Management Fee	$/head	15.00
Interest, operating	%	6.5

Table 2. Budget summary, base values, for a summer stocker program.

Item	Units	Unit Price	Quantity	Extension
Sales	lb	$115.81	723	$837.31
Purchase	lb	$140.00	450	$630.00
Pasture lease	season	$84.00	1	$84.00
Processing and treatment costs	Head	$17.60	1	$17.60
Death loss	Head	$651.33	0.015	$9.77
Other operating	Head	$65.20	1	65.20
Interest (cattle and operating)	Head	$15.69	1	$15.69
Total costs	Head	$822.27	1	$822.27
Returns	Head	$15.38	1	$15.38

Animal Health Management

Death loss was varied initially as a single trait, and the sensitivity of profit to death loss is shown in Figure 1. The slope of the line in figure 1 shows that for a 1% increase in death loss, there is a $6.63 reduction in profit (i.e., 1% of purchase price). It is obvious to producers that death loss is negative to profit, and that management efforts to reduce death loss are valuable. However, death loss rarely varies independently. In most situations, death loss is related to morbidity rate; the more cattle that get sick, the higher the death loss. Case fatality rate (the proportion of sick cattle that die) defines the relationship between morbidity and mortality. Case fatality rate is variable, and a range of values have been reported. Texas A&M Ranch to Rail reports case fatality rates of 2-7% in feedlot steers (McNeill et al., Various years) while others have estimated case fatality rates of 10% (Thomson, 2005). In a backgrounding program, Reece and Smith (1996) observed case fatality rates of 8.7% in mass-medicated calves and 27.7% in untreated calves. In the current example, a case fatality rate of 7.5% was assumed, so that an increase in budgeted morbidity rate was reflected by an increase in death loss. Morbidity also increases the costs of veterinary treatments (assumed to be $18 per morbid calf) and reduces overall average daily gain. Pinchak et al (2004) conducted several experiments with stocker calves on summer range in the Rolling Plains, and observed an average of 12% reduction in overall ADG for calves that were treated for illness. Therefore, in this budget, an increase in morbidity rate was also reflected as a decrease in overall average daily gain as a weighted average of the expected gain of healthy calves and sick calves.

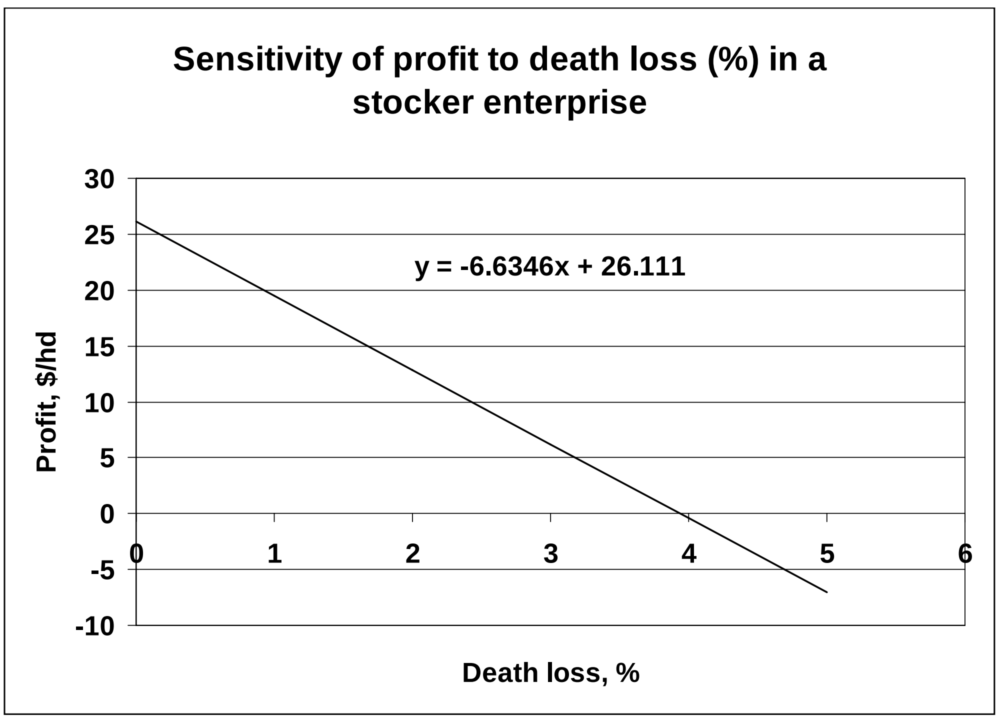

Figure 1

Figure 2 depicts the relationship between profitability and morbidity in a summer stocker program. The slope is negative, as with death loss, and is interpreted that a 1 percentage unit increase in morbidity rate reduces per head profits by 87 cents. This is equivalent to suggesting that an individual steer that remains healthy returns $87 per head more than an individual that becomes morbid. This is a large difference, and is equivalent to a 50% return on equity in this example! Note if only the costs of treatment were considered, the difference would only be estimated at $16 per head. Accounting for the impacts of morbidity on performance and death loss demonstrates the powerful leverage of improving animal health. This relationship also provides quantifiable management guideposts.

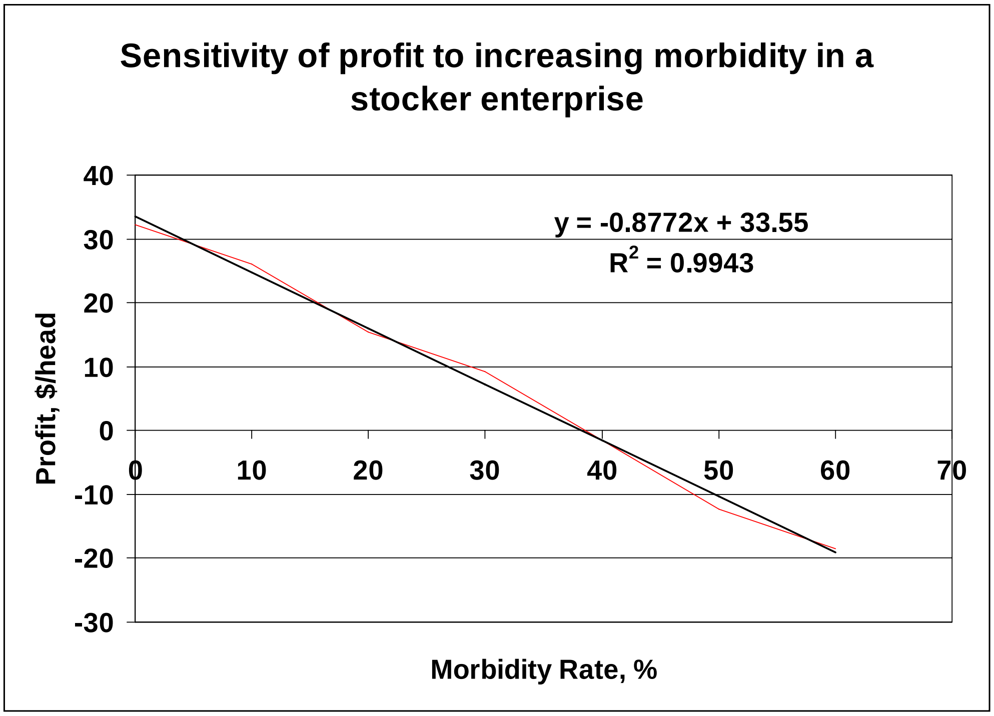

Figure 2

For example, application of metaphylaxis at arrival can reduce morbidity in high risk calves (expected 50% morbidity) by an average of 30 percentage units. Based on the sensitivity of profit to morbidity, the breakeven cost for this intervention is $26.10 per head. In other words, if the treatment can be applied with this effect for less than $26 per animal, it will generate a positive return. Currently, the most popular metaphylactic treatments (tilmicosin, ceftiofur crystalline suspension) cost $8-13 per head. Alternatively, buying calves from a known source or from a certified value-added program in which morbidity may be reduced by half could command a premium value of $21.75 per head, or about $4.83 per cwt if morbidity is reduced from 50% to 25% by this selection. Altering base values in the budget influence this relationship, and the manager can use these values to determine desired premium values, and the value of other interventions to improve animal health.

Average Daily Gain

Although productivity is intuitively important to profitability of the stocker enterprise, the sensitivity analysis quantifies this importance (Figure 3). The slope of the line in figure 2 indicates that a 1 lb/d increase in ADG increase profit by $112.80 per head. Increases of this magnitude may be hard to achieve, but this also means that an increase (decrease) of 0.1 lb/d ADG will increase (decrease) profit by $11.28. This represents a direct rate of return of 6.4%- so an increase in ADG of 0.15 lb per d generates a return greater than the long-term appreciation of the stock market! The negative intercept also indicates that if ADG is zero, a loss of over 100% of the equity in the enterprise will occur. Managers have multiple methods to manipulate ADG. Above, the relationship between health and ADG was discussed. Other high leverage inputs that influence average daily gain include anabolic implants and ionophores.

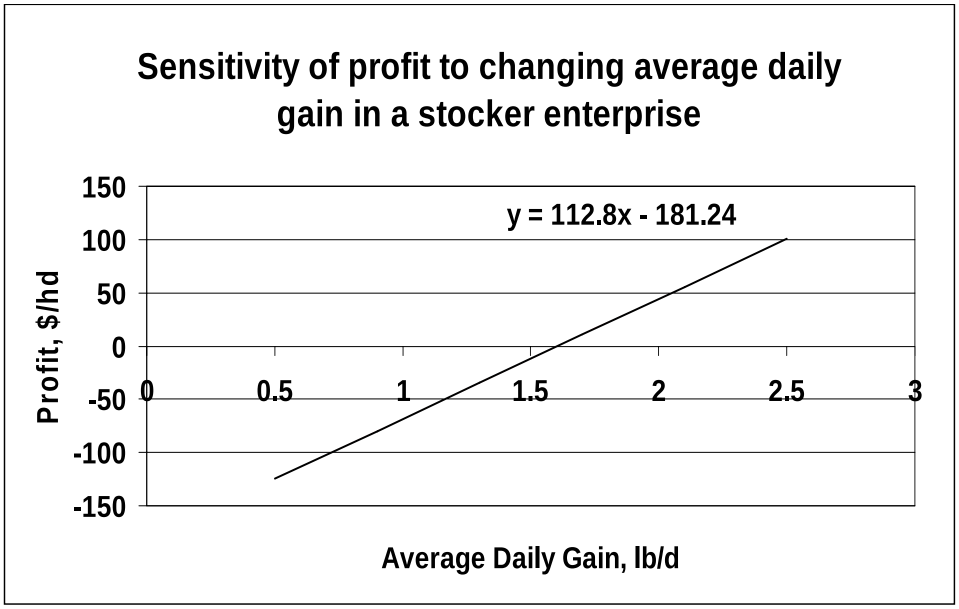

Figure 3

Implants have been demonstrated in numerous studies to be highly efficacious at increasing average daily gain. A compilation of studies suggests that the improvement in ADG is a function of the rate of gain that is supported by the resource. As the gain potential increases, the improvement due to implanting also increases (Figure 4). The improvement in ADG is thus best estimated as a percentage increase, and averages about 14% (Figure 5). On a base rate of gain of 1.75 lb/d, this equates to 0.24 lb/d. Due to the sensitivity of profit to ADG, an implant will increase profitability by $27.64. The return on investment to implants is well over 1500%, even if additional labor is charged. Alternatively, if management chooses to forego the use of growth promotants to capture a marketing advantage, then a premium over market price of at least $3.80 per cwt. must be paid to offset the loss of not using the implant.

Ionophores such as monensin or lasalocid offer another mechanism to enhance ADG. Ionophores act via different mechanisms than implants and therefore their effects are additive. Effects of ionophores have been studied extensively, and can be expected to improve ADG in stocker cattle by 8-12%, with similar impacts on profitability as expected for implants. The largest challenge to extensive operators is consistent delivery of the product, and the expense of the carrier. Self-fed, small package mineral supplements containing ionophores are available and can reduce the delivery costs associated with providing the product. Considerations for alternative marketing strategies are similar to implants.

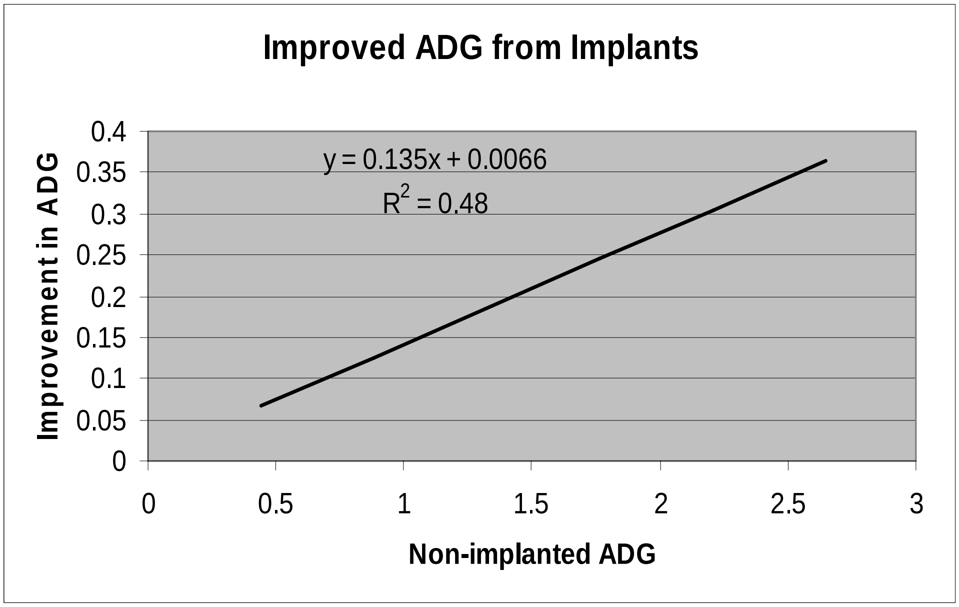

Figure 4

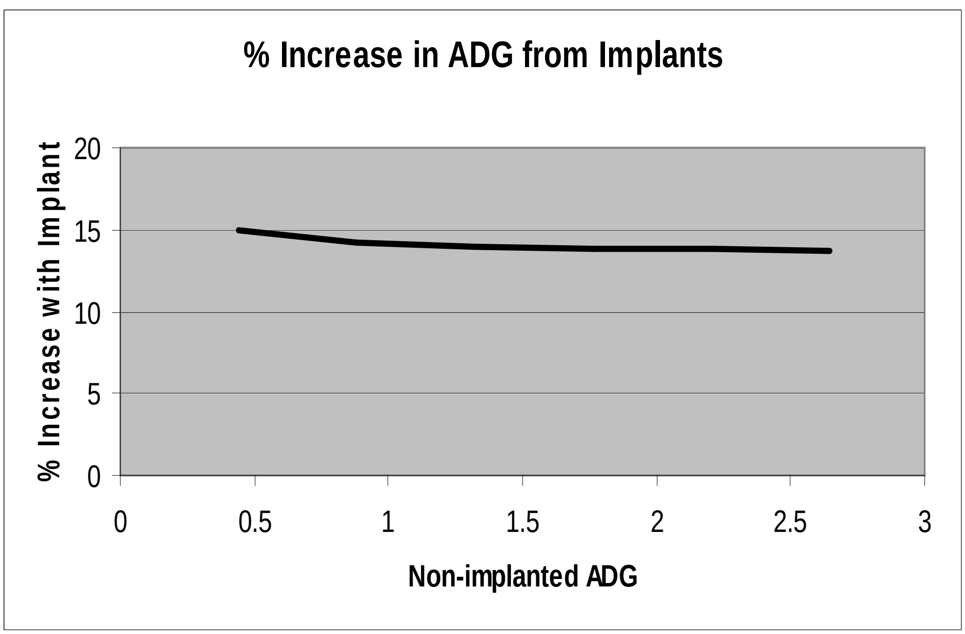

Figure 5

Forage Management

Despite the improvements in ADG that are achievable with the use of growth promoting technologies, the forage base that underpins the stocker system is the primary driver of productivity. Therefore, managers must consider impacts of grazing management on ADG and the influence of forage availability on decisions about liquidation or intervention to offset declining forage availability.

Forage availability is closely related to ADG. Studies conducted on various pasture types have indicated that maximum individual ADG is achieved at forage availability of 25% of the live weight of the animal per d. Estimates of forage production during a growing season can be used to establish preliminary stocking rates, but environmental variation often mandates adjustments in forage demand. Monitoring forage availability to determine when threshold allowance levels have been exceeded and intervention should occur. Restricted availability results in reduced rate of gain, and thus reduces profits; however, removing animals from pasture earlier than budgeted also reduces income. Managers often assess the cost of early removal by assuming a constant ADG and determining the difference in production from the targeted grazing duration to the early withdrawal date. Profit sensitivity under this scenario is depicted in Figure 6 as a straight line (constant ADG). In this example, profit accrues at 51 cents per day for every additional day that the animals remain on pasture. Gain will only remain constant as long as forage availability is adequate.

The curve in Figure 6 depicts the sensitivity of profit to grazing duration when forage is being depleted (or growth rate is below expectations). In this example, forage was presumed adequate until day 100, and became limiting after that. Reduced forage availability was presumed to reduce performance by 1% per day. The disparity between these estimates is dramatic, and illustrates the criticality of forage management in the enterprise. If forage does become limiting, the manger can establish that a supplement that would exactly replace forage would increase daily revenue by 51 cents; thus, the cost of the supplementation program (total, not only feed) cannot exceed this value and be profitable unless gain is also increased.

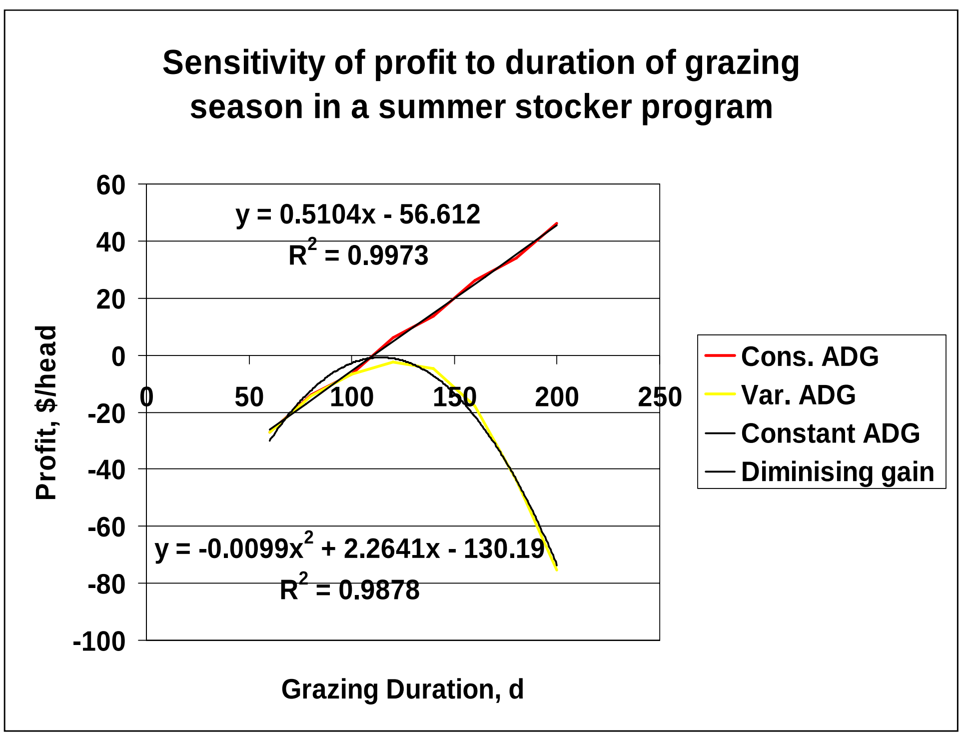

Figure 6

If forage is limited, the manager must either remove the cattle, accept the declining performance if justified by sensitivity analysis, or intervene with substitution feeding. Substitution feeding is the replacement of energy typically obtained from forage with purchased feeds. Although standing forage is almost universally less expensive than purchased feedstuffs, substitution feeding can be economically justified in certain situations. Effectively, the manager is moving animals from the curve in Figure 6 to the line (keeping gain constant or increasing rather than allowing a decline). When evaluating substitution feeding, managers must estimate the efficiency of supplementation and the costs of added gain with supplementation versus the marginal value of gain.

Conclusion

These approaches provide managers with quantifiable methods to manipulate profits by focusing on high-leverage production points and determining cost effective solutions to enhance profitability. Focus should be applied to grazing management, animal health management, and to direct manipulation of performance. Because profit is highly sensitive to ADG, and most other factors influence gain, this is a good metric to base management evaluations upon.

Early Weaning Beef Calves in the Southwest

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Introduction

In the Southwest, precipitation is highly variable, and drought situations are common (Figure 1). Cow-calf producers in this region undoubtedly have to manage cattle and pastures through times of drought. Periods of below average precipitation challenge producers to: 1) maintain appropriate stocking rates and levels of forage utilization, and 2) maintain acceptable reproductive performance of the cow herd. Early weaning of calves is a management tool that producers can implement to reduce forage needs of the cow-calf enterprise and improve cow condition and reproductive performance.

"Early weaning" is weaning calves anytime earlier than "normal." Calves in the Southwest are typically weaned when they are 6 to 8 months old; however, calves can be weaned as early as 6 weeks of age. Early weaning can reduce the forage needed by the cow herd when implemented in response to a forage shortage. The magnitude of the shortage and extent of other management changes required dictates when calves should be weaned in order to balance forage supply and forage demand. When calves are weaned early to improve reproductive performance, they may be weaned just prior to the breeding season to impact reproduction in the breeding season that immediately follows. Or they may be weaned 30 to 90 days earlier than normal in attempt to reduce the postpartum interval during the breeding season that follows 6 to 8 months later.

This paper will outline how early weaning can be used to help maintain reproductive performance and manage grazing pressure.

Reducing Forage Needs

When forage production is low and it becomes necessary for producers to make management adjustments to reduce forage needed for the cow-calf enterprise, there are several options that can be employed:

- Sell cows
- Lease additional pasture
- Feed additional energy to reduce grazing
- Wean calves early

It can be challenging to cost effectively lease pasture, feed energy, or sell cows just to buy them back when forage production improves. Early weaning, especially when combined with one or more of the other options listed, can be a useful tool to manage forage supply while minimizing the need to feed energy or dramatically liquidate cattle.

By September, or maybe even August for ranches at higher elevations, most producers in the Southwest have a fairly good idea of how much forage will be available at the end of the growing season. For example, in southern New Mexico precipitation that falls after the middle of September generally has minimal impact on forage production because temperatures are too cool for warm season forages to grow substantially. Thus, as early as the middle of September a forage budget can be developed in this region. If adequate forage is available to support the current stocking rate, no change is needed. However, if estimated forage supply by the end of the growing season is not sufficient to meet the demands of the cow herd until forage growth is expected to resume, producers must decide what management practices to implement to balance forage supply and forage demand.

A forage budget can be developed mathematically (See TCE publications: L-151 “How much forage do you have” and B-1606 “Balancing forage demand with supply”) or visually estimated by experienced producers. Regardless of the method employed, during years of low forage production, producers should calculate or estimate stocking rate reductions needed to balance forage supply and demand.

Forage needs are reduced by early weaning because calves are removed from the ranch (sold, placed in a feedlot, or moved to leased pasture), cow energy requirements decline when they stop lactating, and culls are sold earlier than normal. In the short-term, less income is generated from calf sales when they are sold at a lighter weight than normal; however, there is some price per pound advantage to selling lighter calves. Regardless of the weight of the early weaned calves or culled cows, July, August and September prices have historically been higher than the normal low prices of the year in October and November.

Example 1 shows how early weaning can be used in combination with reducing cow numbers to lower forage needs of the cow-calf enterprise. In this example, selling early weaned calves and cull cows 45 days earlier than normal saves 62,000 and 13,000 pounds of forage, respectively. Not purchasing replacement females reduces forage needs by another 100,000 pounds. The total forage savings in this example is an estimated 175,000 pounds, surpassing the estimated reduction needed by more than 8,000 pounds. To achieve the same level of forage demand reduction by lowering stocking rate alone at normal weaning time would require removal of approximately 25 percent of the females. Using the same example and assuming a greater forage shortage, calves could be weaned 90 days early to save an estimated 240,000 pounds of forage. This level of forage savings is equivalent to a 35 percent reduction in cow numbers. Regardless of how early calves are weaned to save 175,000 or 240,000 pounds in this example, the cow inventory is only reduced by 15 percent, and reproductive performance is likely to improve.

Improving Reproductive Performance

The relationship between reproductive success and body condition at calving is based on energy. Cows must have energy to support all bodily activities, but some functions have a higher priority for energy use than others. Cows can only direct energy toward resuming the estrous cycle after calving if energy intake exceeds the combined requirements for maintenance, growth and lactation. Energy demands of a lactating cow can be very high. It is important that the cow is in adequate body condition at calving so that stored energy can be used to support some of her needs. If she does not have enough stored energy at calving, she must gain weight during lactation so that she will have enough energy to begin cycling again. However, it is difficult to cost effectively increase body condition of cows in early- to mid-lactation with supplemental feed. This is why body condition at calving is strongly related to the length of the postpartum anestrous period (time between calving and first heat) in beef cattle. Cows that are thin at calving take longer to resume cycling after calving and are less likely to become pregnant during the breeding season. This relationship is illustrated in figure 2.

Since body condition at calving influences reproductive performance, early weaning can be utilized to improve the chance that a cow is in acceptable body condition. Figure 3 shows the lactation and total energy requirement of an 1100-pound cow on specific days from calving until the calf is weaned at 210 days of age (7 months). It is evident in this example that weaning calves early can greatly lower a cow's nutrient requirements by ceasing lactation. More specifically, if the calf is weaned at 60 days of age (2 months), the cow's daily energy requirement declines by 37 percent. If the calf is weaned at 6 months of age (30 days early), the cow's daily energy requirement declines by 18 percent. Reducing the nutrient requirements of lactation by weaning the calf makes early weaning an option to manage thin cows to achieve short- and long-term improvements in reproductive performance.

Weaning Prior to or During the Breeding Season

When calves are weaned prior to or during the breeding season (45 to 100 days of age), reproductive performance can be improved. Weaning prior to breeding is practiced among females that are at high risk of conceiving late in the calving season or not conceiving at all. These are usually thin cows or first-calf heifers. Table 1 shows that weaning calves of very thin (body condition score 3 to 4) first-calf Hereford heifers as early as 6 to 8 weeks of age can increase conception rate and reduce the postpartum interval. First-calf heifers whose calves were weaned early had a 38-percentage unit advantage in conception rate during the breeding season that immediately followed; plus, the first-calf heifers were 87 pounds heavier on the normal weaning date. Average calving date was 18 days earlier the following calving season; thus, their calves were 18 days older at weaning the next year. In addition to raising more calves, there is substantial long-term benefit to maintaining a relatively short calving season that in some cases may only be practically achieved by early weaning. Assuming 1.75 pounds average daily gain for the last 18 days prior to weaning, this would equate to 32 more pounds per calf at weaning the following year. If the calves were worth $100/cwt., females whose calves were early weaned would produce 38 more calves per 100 females, plus generate over $30 more per calf weaned the following year.

The improved reproductive performance comes at a cost. Calves must either be sold at a very light weight, or retained and sold later. Neither of these options will likely generate as much short-term net income as leaving the calves with their mothers until normal weaning time; however, the long-term benefits of early weaning may well exceed the reduction in short-term profit.

Weaning 30 to 90 Days Earlier than Normal

Reproductive performance may also be improved by weaning calves less than 90 days earlier than normal. For example, weaning calves in August or September when they would normally be weaned in October or November. This approach allows the cows to gain extra weight before winter. In turn, cows are in better body condition on the normal weaning date, and the need for supplemental feeding to maintain adequate body condition at calving is reduced. Figure 4 illustrates the impact of weaning calves 60 days early on cow body weight. In this study, cows whose calves were weaned in August weighed 40 pounds (about half a body condition score) more the following February than cows whose calves were weaned at the normal October date.

By weaning early, but after the breeding season, improved reproductive performance is not realized until the following breeding season. By expanding the scenario introduced in Example 1, a financial comparison of calf income can be made with the following assumptions.

- A 500 lb calf is worth $100/cwt on November 1st
- A 421 lb calf is worth $108/cwt on September 17th (based on historical relative monthly prices at New Mexico auctions)
- Cows gain 0.6 BCS (~50 lb) by normal weaning date if the calf is weaned 45 days early (calculated from Story et al., 2000)
- Increase of 1 BCS increase pregnancy rate by 9 percentage units if cows are initially thin (estimated from Bowman and Sowell, 1998)
- Increase of 1 BCS increases calf age at weaning by 10 days if cows are initially thin (estimated from Houghton et al, 1990)

Based on these assumptions, weaning calves 45 days early yields $45/cow less gross income initially, but the calf crop conceived during the breeding season following early weaning generates 32 more pounds of calf weaned/cow (about $32/cow). Therefore, the monetary benefits of early weaning are a reduction in winter feed cost, and an increase in weaning rate and calf weaning weight two years after early weaning. The important point to note is that on the financial side, the difference in gross income is quite small, being less than $13 per cow in this hypothetical example. However, the risk of poor reproductive performance and costs associated with broad herd liquidation and expansion is reduced when early weaning is employed. In this scenario, early weaning provides enterprise stability by reducing risk.

Management Options for Early Weaned Calves

Producers have several options for managing early weaned calves. The strategy chosen depends upon the availability of alternative resources and the reason that early weaning was implemented. Some options are:

- Place calves on another owned pasture
- Sell the calves immediately
- Growing calves on lease pasture
- Growing calves in a feedlot
- Finishing calves in a feedlot

If the calves are weaned early to reduce forage needs by the herd, then the calves need to be removed from the ranch. It is generally less expensive to grow calves on grass than feeding them in a feedlot; however, calf gain on pastures is usually lower as well. Figure 5 illustrates difference in weaning weight on the normal fall weaning date for early weaned calves managed on pasture verses calves weaned at 210 days of age. Early weaned calves were weaned at 65 days of age and grazed native range pasture and fed 2.5 pounds per day of a 25% protein pellet. The early weaned calves weighed 62 pounds less than calves weaned at 210 days of age.

On the other hand, early weaned calves placed in a feedlot can be fed to weigh more on the normal weaning date, especially if they are weaned more than 90 days early. Figure 6 shows the difference in calf weights on the normal weaning date for calves weaned at three or five months of age and placed on feed in a feedlot compared to calves that remained with their mothers until the normal weaning date. Rate of gain for early weaned calves placed in a feedlot can be programmed to most cost-effectively take advantage of feed commodity prices and market seasonality. It is also important to note that early weaned calves often have improved feed efficiency when placed on feed and finished immediately after weaning, but usually have lighter carcasses when harvested.

Conclusion

Early weaning is a management tool that producers can use to balance the forage needs of the cow-calf enterprise and avoid overgrazing, while reducing supplemental feed costs and the need for herd liquidation. At the same time, early weaning reduces nutrient requirements of the cows and enables them to recover body weight more easily. The additional weight gain achieved by early weaning shortens the postpartum interval and can improve pregnancy rate among cows that are otherwise nutritionally stressed. It can be difficult to justify implementing a management practice that reduces income in the short-term; however, overuse of forage resources, an extended calving season, and/or rebuilding a liquidated cowherd may have greater long-term financial consequences.

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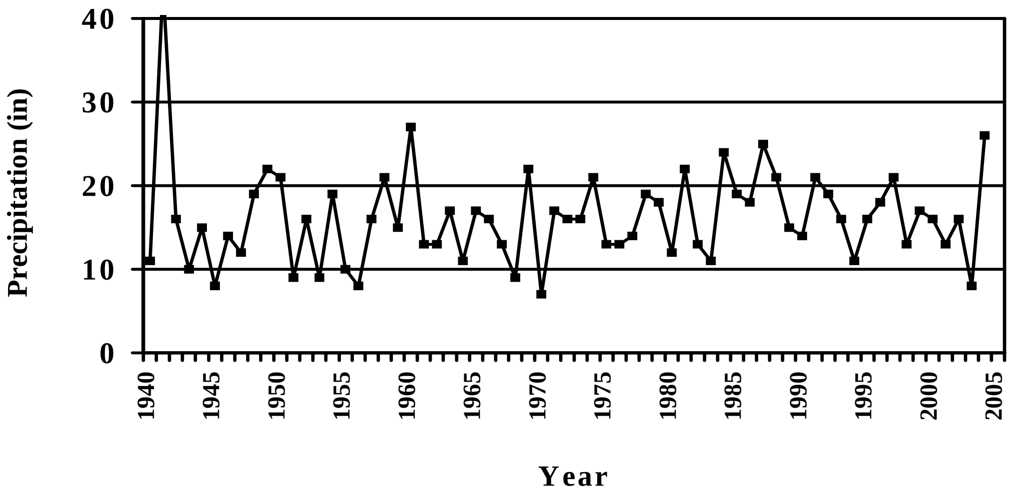

Figure 1. Historical annual precipitation for Portales, NM from 1940 to 2004 (Average = 16.8 inches; data compiled by Floyd McAlister)

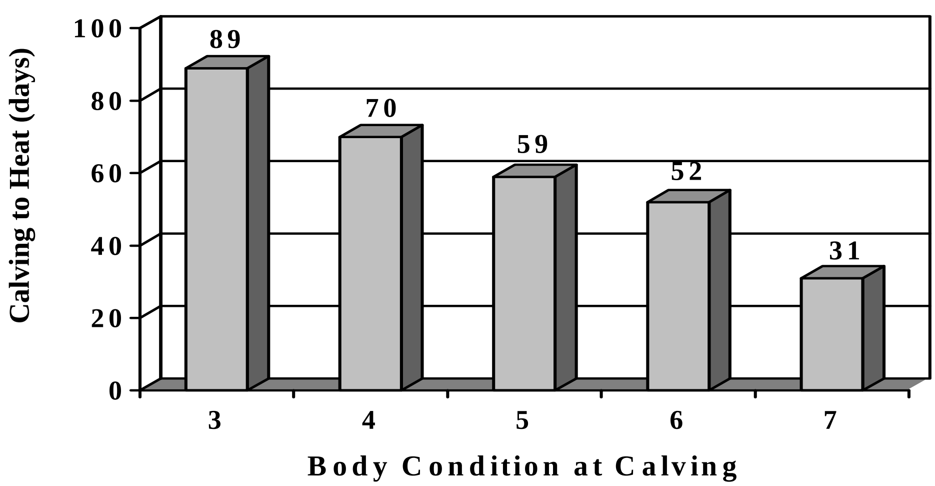

Figure 2. Effect of body condition at calving on postpartum anestrus duration (Houghton et al., 1990)

Example 1. Responding to below normal forage production by weaning calves early

Scenario:

It is September 1, 2006 and your ranch got less rain than "normal". You expect that forage available for the winter and spring will be about 25% lower than that required to support your current stocking rate until September 1, 2007. You have 100 cows and typically get 85% pregnant and wean 85% calf crop. In the fall you typically sell the 15 open cull females and replace them with 15 purchased bred females. Therefore, you wean 100 calves. Your average calving date is February 15, and you wean on November 1. Calves average 500 pounds at weaning.

Management Response:

Wean calves and sell cull cows 45 days early (Sept. 17th). Do not buy any replacement females.

Weight at each marketing date

Weaning on Nov. 1		=	**500 lb calves**
Weaning on Sept. 17 (45 days early)		=	**421 lb calves**
Assumptions: Calf ADG for last 45 days	= 1.75 lb/day		
1.75 lb/day * 45 days	= 78.8 lb		
500 lb – 79 lb	= 421 lb		
Cull cows on Sept. 17		=	**1050 lb culls**
Cull cows on Nov. 1		=	**1100 lb culls**
Assumptions: Cows gain 50 lb during late Sept. and Oct.			

Forage Intake Estimates

Cows + calf annual forage intake*	=	**8030 lb/pair**
1100 lb cow * 365 days * 2% of BW/day		
Cows + calf forage intake from Nov. 1, 2005 to Sept. 1, 2006	=	**6688 lb/pair**
1100 lb cow * 304 days * 2% of BW/day		
Weaning 45 days early reduces cow + calf annual intake**	=	**621 lb/pair**
(500 lb + 421 lb)/2 = 460 lb average wt. Sept. 17 to Nov. 1		
460 lb * 3% of BW/day * 45 days = 621 lb		
Sell cull cows 45 days early reduces forage intake***	=	**871 lb/cull**
1100 lb + 1050 lb)/2 = 1075 lb average wt. Sept. 17 to Nov. 1		
1075 lb * 1.8% of BW/day * 45 days = 871 lb/cow		

Intake Assumptions

* Annualized daily dry forage intake for a cow-calf pair is 2% of cow avg. wt (22 lb/day for 1100-lb cow).

** Early weaning reduces forage intake 3% of calf avg. wt (13.8 lb/day for pair with a 460-lb calf). The estimated 3% incorporates calf forage intake plus the decrease in forage intake by the cow.

*** Cull, non-lactating cow eats 1.8% of avg. wt. in dry forage (19.4 lb/day for 1075-lb cow).

Normal Forage Needed to last from Nov. 1, 2006 to Sept. 1, 2007	=	**668,800 lb**
100 cow-calf pairs * 6688 lb usable forage needed/pair		
Budgeted Forage for this Year	=	**501,600 lb**
668,800 lb * 75%		
Forage Usage Reduction Needed	=	**167,200 lb**
668,800 – 501,600		
Total Forage Usage Reduction		
100 pairs weaned early * 621 lb forage saved/pair	=	**62,100 lb**
15 culls sold 45 days early * 871 lb forage saved/cull	=	**13,065 lb**
15 replacement females not purchased * 6688 lb forage saved/replacement	=	**100,320 lb**
Total Forage Savings	=	**175,455 lb**

Table 1. Conception rate, postpartum interval, and calf weight at normal weaning time (October 11) for very thin first-calf Hereford heifers and their calves[a]

	Treatment[b]			
	Normal Weaning (7 months)	**Early Weaning (6-8 weeks)**		**Difference**
Conception rate (%)	59	97		38
Calving to conception (days)	91	73		18
Cycling at 85 days postpartum (%)	34	90		56
First-calf heifer weight at normal weaning (lb)	788	875		87
	Normal	Pasture	Drylot	Norm. – Past.
Calf weight at normal weaning (lb)	373	330	374	43

[a]Lusby et al, 1981.
[b]Early weaned calves were managed in a drylot or on pasture.

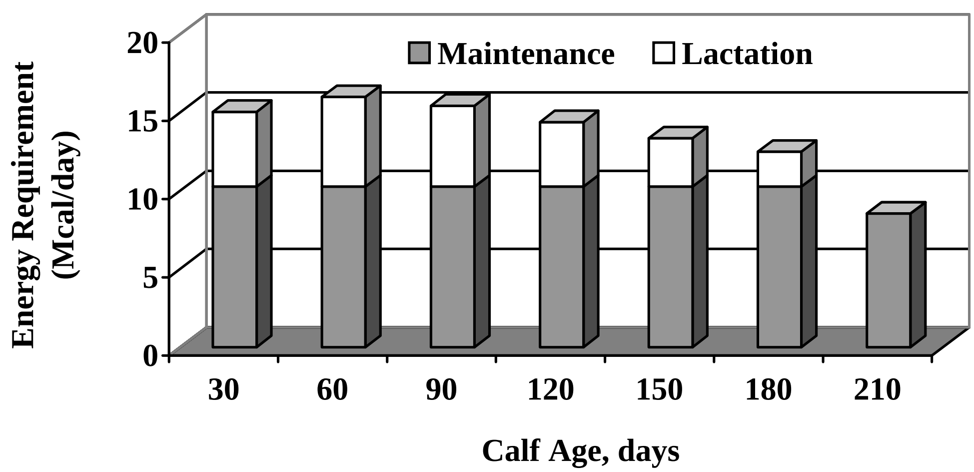

Figure 3. Maintenance and lactation energy requirement of a 1,100-pound Angus cow with 17.5-pound peak milk yield on specific days between calving and weaning (NRC, 1996)

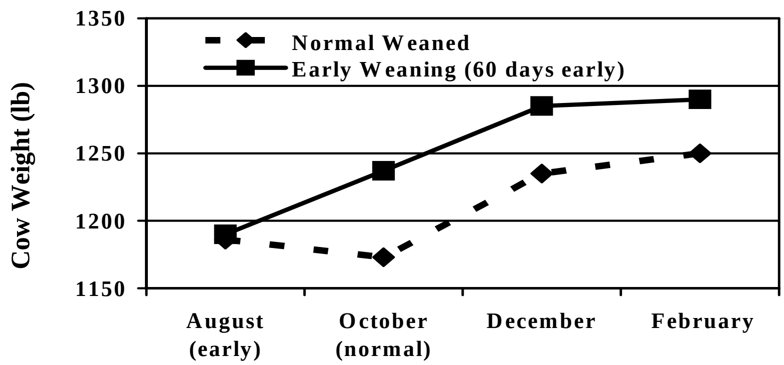

Figure 4. Influence of weaning calves 60 days early on cow body weight (Story et al., 2000)

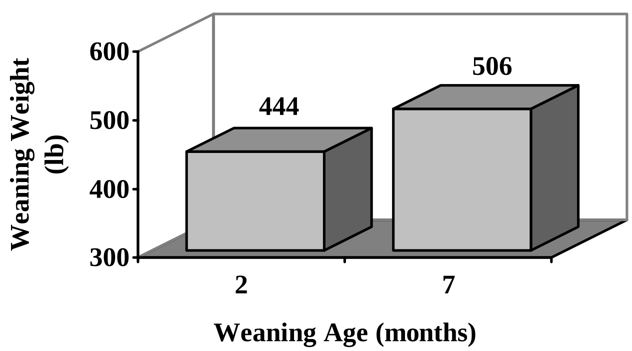

Figure 5. Weaning weight on the normal weaning date (October 10) for calves weaned at 2 months of age managed on pasture verses calves weaned at 7 months of age (Purvis et al., 1995)

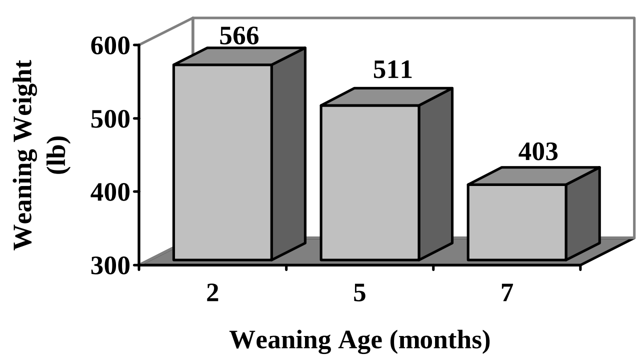

Figure 6. Calf weights on the normal weaning date for calves weaned at 3 and 5 months of age and placed in a feedlot versus calves normally weaned at 7 month of age (Myers et al., 1999)

Putting BVD Control on Your Radar Screen

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The impact of BVD on beef cattle production

Bovine viral diarrhea virus (BVDV) is a major viral disease impacting beef cattle reproduction and performance. The key source of BVDV infection is the BVDV PI animal. PI animals are the result of fetal exposure to the virus prior to the development of its immune system approximately between day 18 and day 125 of gestation. Exposure to the virus prior to day 18 may result in embryonic death and apparent infertility, while exposure after day 125 is more commonly associated with abortion, stillbirths or congenital abnormalities. BVDV not only lessens reproductive performance but also produces disease in cattle including diarrhea, respiratory insult, mucosal ulcers, and death. The virus suppresses the immune system making the animal more susceptible to infection by other viruses and bacteria therefore those infected with BVDV are less likely to recover. Work to place an economic cost associated with herds infected with BVDV is limited but a US study of the breeding herd indicated a cost of $10.00 to $14.00 per cow while more dramatic results were observed in a study conducted in Great Britain where estimates of €58 ($60) per cow were made. Additional studies within the feedlot have estimated the cost per cwt of gain to be $7.60 or approximately $30 if the animal is expected to gain 400 lbs. during the feeding period. PI calves are more efficient than transiently infected animals in spreading BVDV to other animals. Current initiatives by the National Cattlemen Beef Association (NCBA), American Association of Bovine Practitioners (AABP), the Academy of Veterinary Consultants (AVC), and state livestock associations to develop effective BVDV control programs are underway. Control programs hinge on removal of the PI animal to eliminate the most important source of exposure, effective vaccination programs, and herd level biosecurity.

Infection types

BVD may present itself as one of two distinctly different types of infection. Animals may be infected with the virus from another animal and become ill, horizontal transmission. Infections of this type are also called transient infections (TI) or acute infections. Animals that are transiently infected may show clinical signs of illness then recover or they may succumb to other infectious agents especially respiratory bacteria such as Pasteurella, Mannheimia, Mycoplasma, and Histopholis. Non pregnant transiently infected cows most frequently recover with only minimal clinical signs, while cows infected during gestation undergo a loss of reproductive efficiency or may produce the other type of infection, persistent infection (PI).

Persistent infections occur when the cow is exposed to the virus between day 18 and 125 of gestation, and since the virus is transmitted from the dam to her offspring is referred to as vertical transmission. Persistent infections result when the developing fetus is exposed to the virus prior to the time when its immune system is fully developed. When the immune system is not developed the virus is not recognized as foreign to the fetus and no attempt by the developing fetus is made to eliminate the infective virus. The developing fetus and later

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the calf make an ideal incubator for the virus producing large numbers of viruses and therefore becomes a reservoir that efficiently leads to the infection of other animals. When compared to transient infections persistently infected animals shed viruses at levels 1000's of times higher and are therefore very efficient at spreading the disease. PI's most frequently result from an immune competent pregnant cow being exposed during gestation (most common source of PI's, >90%), however if a female PI lives to adulthood every calf she ever has will be a PI (least likely source of PI's, <10%). A calf that is born as a PI will always be a PI and no cattle that are not PI at birth will become a PI. PI's are considered to be the major reservoir for BVD in our cowherds. When PI's are removed from a cowherd the risk of BVD is minimized, but when a PI is left within the herd vaccinations are ineffective in preventing other cattle from becoming acutely infected, and if pregnant females are present more PI's may be created. The ineffectiveness of vaccines in preventing BVD infection in the face of challenge by a PI is the result of the high number of viruses that are shed by the PI overwhelming the immune system of even the well-vaccinated animal.

What has to happen to make BVD control possible or what must we assume if we are going to try and control BVD?

When implementing a BVD control program some assumptions have to be made. The first of these assumptions is that BVD is economically important to the cattle industry. Economic data is difficult to assess in the livestock industry, the industry falls victim to price fluctuations in feed and wide swings in market values resulting in a constantly moving target. As cited above the cost of BVDV infections may range from as low as $10.00 to near $60.00 per head for the cow-calf producer and over $7.00 per cwt of gain in the feeding environment. If looking strictly from an economic vantage point we would assume that we have at least $10.00 per cow to invest in BVDV control. This $10.00 would be used for any prevention program such as vaccinations, laboratory tests to monitor the herd health and additional management requirements to insure that the risk of BVDV infection is minimized. However, when the cost of BVD infections reach the top of the range it is much easier to be convinced of the need for BVD control. With the variability of market conditions and the predicted down turn in cattle prices the need to return every dollar back to the operation during lean times is equally important as during robust market conditions. Economics alone is an adequate force to drive a BVD control program. Beyond the economic concerns another component that is not directly an economic component of the need for BVD control is animal welfare. As cattle producers we all empathize with our cattle, none of us enjoy seeing an animal waste away due to a chronic illness, and now through instant media the consuming public, although often misguided, are equally concerned that animals receive proper care, and the animal sick with BVD does not present a positive industry perception.

The second assumption is that the PI animal is the primary source of BVD infection. If the PI is removed can we rely on vaccines and other biosecurity measures to avoid infecting our cowherd? The current hypothesis of BVDV researchers is that without the PI there would be no BVDV present, and if we accept this hypothesis then a test and slaughter process would eliminate BVDV infections from our cowherds.

A third assumption necessary to approach BVD control is that we can design a biosecurity program that can protect the cowherd from infection. When we design a BVD biosecurity program there are several points to include, e.g. quarantining and testing new entries, minimizing contact with other animals including the neighbors and wildlife, effective vaccinations, and monitoring and evaluating our herd for the success of the program. If we are successful at eliminating all PI's theoretically BVD vaccinations would no longer be necessary, but there are still some questions that must be answered, such as the role wildlife plays in the disease and how can we be certain that all animals are tested and any positive animals properly handled, until these questions are answered vaccines will play a vital role in BVDV control.

A fourth assumption is that we can test effectively in a timely and affordable manner for BVD and most importantly BVD PI's. Because of the low prevalence figures 1% of all cattle in the U.S. and only 4% of all herds contain PI's, large numbers of cattle are tested without identifying any PI's.

BVD PI Testing or Looking for that Needle in the Hay Stack

To this point the detection of PI's has been on an individual basis either through the use of immunohistochemistry (IHC) or antigen capture ELISA (AC-ELISA). The first test widely accepted was the IHC on skin samples. IHC is considered the "Gold Standard" for PI detection. Frequently in diagnostics being the "Gold Standard" does not mean the best just the first. IHC does have some limitations, it will on occasion falsely classify an animal as positive, it is a time consuming process and is a subjective test with the potential for human error. The AC-ELISA has been criticized for lacking sensitivity and for misclassifying some animals as positive. The AC-ELISA is more rapid than the IHC in identifying suspect PI animals. Both tests have similar costs with prices between $3.50 and $4.00 per sample and at that price the expense for whole herd tests become discouraging if not prohibitive. So if we are to consider bringing BVD under control we must look for a method that can economically screen cattle at a moderate cost yet provide a means of efficiently detecting PI cattle.

The basic requirement of any screening test is that it always detects the presence of the disease. The better a test is at detecting disease the more sensitive it is considered to be. Being highly sensitive results in an increase in the likelihood of falsely classifying an animal as positive. Another requirement of screening tests is that they should provide answers quickly so that management decisions can be implemented.

Serological studies have been suggested that would allow the presence of an elevated blood titer on a subset of a herd population to suggest the presence of exposure to the virus. These studies have proposed using sentinel animals, those that have never received a vaccination, or a sample of calves at weaning prior to vaccination. Either method is used to monitor the potential exposure to BVD. In theory these concepts should work but in reality studies have not supported their validity in detecting PI's.

New technology using pooled testing of blood or skin using reverse transcriptase PCR (RT-PCR) are now being used. The technique allows as many as 100 samples to be pooled together and has shown to be able to detect the presence of the virus 100% of the time. This test can be accomplished in 48 hours at a cost of $50.00 per pool and may be done on whole blood or skin samples. This process does offer a cost effective approach to screening large numbers of cattle in a rapid time. When the test is accomplished on tissue samples the tissue may be retained for further testing using IHC or AC-ELISA. However, due to the extreme sensitivity of the process it does detect the virus from acute infections and may give positive results when animals are recently vaccinated using a modified live BVD vaccine. Studies indicate that false positive pools result less than 4% of the time. The high sensitivity and low misclassification rate indicates this test may be the key to development of a BVD control program.

What and When to Test

To enter into a BVD control program and the required diagnostic tests for the program the first animal to test should be the calf. A negative calf means the dam was negative and she would not need to be tested, essentially a two for one test. If the calf is positive the mother will require testing but with such few expected PI's in the population the need will only rarely occur. The time for testing is before breeding, to wait until after the cows have been turned out with bulls will only result in the potential of producing more PI's in the next years calf crop plus exposing the breeding herd to the virus which may result in a loss of reproductive performance.

Conclusion

With the availability of added technology, the better understanding of epidemiology of BVDV and implementation of good herdsmanship through biosecurity we can address bringing BVD under control and its potential eradication.

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Essential Components of a BVD Cow-calf Bio-security Program

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Below are listed four essential components of a BVD Bio-security program. Each component may expand to define the limit of the producers concern and any program must be under constant review and be adaptable to current environmental and market situations. The essential components are basic requirements and without addressing each of them a bio-security program cannot exist.

1.) Minimize exposure to other cattle.
- a. Quarantine all new arrivals for at least 21 days.
- b. Separate show stock from main herd.
  - i. Separate feeding, housing and watering areas from the main herd
  - ii. When doing chores do the main herd first.
  - iii. Practice good sanitation between cattle groups, i.e. clean and disinfect clothes, boots and equipment.
- c. Limit visitors including people and other livestock or animals and don't hesitate to ask about someone else's operation before allowing them to see yours.
- d. Buy certified free or tested livestock.

2.) Establish a good vaccination program.
- a. Follow label instructions on vaccine.
  - i. Route of administration
  - ii. Dose required
- b. Handle vaccine carefully keep it protected from excessive heat, cold, and sunlight.
- c. Follow quality assurance guidelines

3.) Keep herd and individual records
- a. Reproductive records
- b. Health records
- c. Financial records

4.) Address health problems
- a. If a calf becomes sick determine why
- b. If a cow aborts determine why
- c. If an animal dies determine why

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BVD Decision / Management Guidelines for Beef Cattle Veterinarians

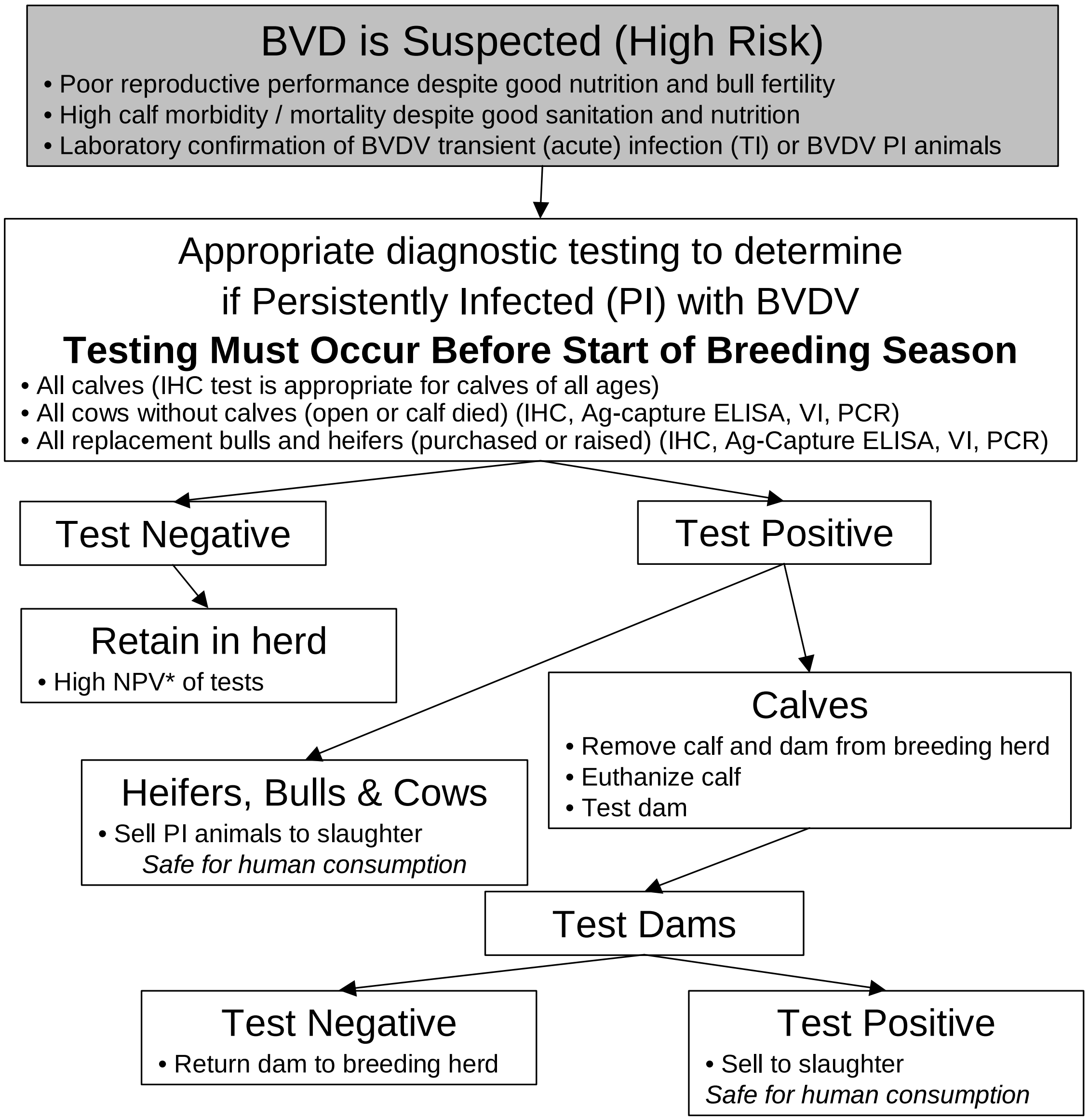
Academy of Veterinary Consultants

Adopted July 31, 2003

BVD Decision / Management Guidelines for Beef Cattle Veterinarians

- Bovine Viral Diarrhea Virus (BVDV) can cause a variety of clinical and subclinical reproductive, enteric and respiratory syndromes, and immune dysfunction.
- BVDV is unique in that a fetus that is infected from its transiently or persistently viremic dam prior to formation of a competent immune system can become persistently infected (PI) with the virus.
- PI cattle will shed BVDV from body secretions throughout their life.
- PI cattle are considered the primary reservoir for BVDV in both cow herd and feedlot situations.
- A current estimate is that about 10% of beef cow herds have at least 1 PI animal, and about 0.25 to <1% of calves born are PI.
- Veterinarians should have a surveillance strategy to determine level of herd risk for the presence of PI animals (High vs. Low Risk).
- Herds that are considered high risk for containing PI animals should utilize laboratory tests to do whole-herd screening to find all PI animals and then remove them.
- PI cattle should be removed from herds immediately and marketed directly to slaughter or euthanized. BVDV is not a human health risk, but PI cattle are a health risk to other cattle and are often in poor health themselves.

Cow-Calf Herd (BVDV-Suspect Herd)



- All cows still pregnant at time of testing must be removed from breeding herd because fetus is of unknown BVDV PI status
- Absence of confirmed PI calves does not guarantee absence of BVDV problem. If you are still suspicious, testing the next calf crop is recommended.
- Use IHC (immunohistochemistry), pooled PCR, ELISA of skin samples, or Virus isolation (VI)
- Implement complete vaccination program prior to breeding in replacement animals and appropriate boosters in adults
- Prevent direct contact with cattle of unknown BVDV control status

* NPV = negative predictive value, i.e. likelihood that a test negative animal is truly PI negative

Cow-Calf Herd (Healthy Herd)

BVD is Not Suspected (Low Risk)

- Good reproductive performance
- High percentage of cows exposed to a bull wean a calf
- No laboratory evidence BVDV transiently infected (TI) or BVDV PI animals

Surveillance Strategy I – Monitor production and health

- Low cost / low sensitivity strategy
- Slow diagnostic response to PI introduction (production must be negatively influenced before PI presence is detected)
- Monitor overall pregnancy proportion and percent pregnant in first 21 days
- Monitor stillbirths, neonatal morbidity, neonatal mortality, and weaning %
- Necropsy and submit tissues (thymus, Peyer's patches, spleen, skin, blood) for laboratory analysis on high % of abortions, stillbirths, and mortalities.
- If unexplained suckling calf losses occur (pneumonia, scours, etc.) send appropriate samples to diagnostic labs to identify TI and PI calves
- Positive test results should be confirmed with other supporting evidence

Surveillance Strategy II – Serology (type I and II) of herd sub-set

- Low cost / low sensitivity strategy
- Serology of non-vaccinated, sentinel animals has been used to identify PI animals in dairies in published studies.
- Differentiation of titers due to vaccination or field virus exposure (height of serologic titers) is difficult and subjective and must include consultation with laboratory diagnosticians for interpretation assistance.

Surveillance Strategy III – Pooled PCR of blood (entire calf crop)

- High cost / high sensitivity strategy
- Identifies PIs prior to breeding season if done before bull turn-out
- Delayed response to PI introduction if done after breeding season
- Pool samples of 20-30 with re-pooling and re-running of positive pools
- Positive PCR does not differentiate between TI and PI, therefore, must do other confirmatory testing (IHC)

Surveillance Strategy IV – IHC skin samples (entire calf crop)

- High cost / high sensitivity strategy
- Identifies PIs prior to breeding season if done before bull turn-out
- Must confirm positive tests if BVDV is not suspected because of poor PPV (positive predictive value) in herds with no prior evidence of PI presence

Cow-Calf Herd

Other Biosecurity Concerns

Purchased Open Females

• Heifers and cows must be PI test-negative (IHC, PCR, VI or other appropriate tests) prior to introduction to herd

• Quarantine for 30 days prior to introduction to herd

Purchased Bred Females

• Heifers and cows must be PI test-negative (IHC, PCR, or VI) and quarantined until after calving and calf is proven non-PI because PI status of fetus is unknown

• Introduce purchased pair to herd after calf is proven non-PI

Bulls

• Persistently and transiently infected bulls will shed BVD virus in semen as well as other body secretions

• Transmission of BVDV can occur following insemination with raw, extended or cryo-preserved semen

• Semen used for AI should be collected according to Certified Semen Service (CSS) guidelines

• BVDV-infected semen will not directly cause PI calves, but contact with BVDV-infected bulls or maternal viremia following virus transmission via infected semen can cause fetal infection and PI calves

• Purchased bulls should be isolated for 30 days and PI test-negative prior to contact with cow herd

Fomites

• Virus can survive in fecal matter and other body secretions in the environment for hours to days depending on temperature, humidity, and exposure to sunlight

• BVDV has been experimentally transmitted from PI animals to susceptible via nose tongs, injection needles, and palpation sleeves

Embryo Transfer

• Donor and recipients should be PI test-negative

• Recipients should be quarantined for 30 days prior to transfer

• All laboratory fluids of bovine origin must be free of BVDV

Wildlife ? (significance of risk is unknown)

• BVDV has been serologically identified to infect buffalo, pigs, sheep, deer, and elk.

• Deer and Elk – experimentally-infected deer and elk shed virus for several days

• Unknown if PI state can be induced in deer or elk (or other species)

Stocker and Feedlot Operations

Screening Incoming Cattle for BVDV PI animals

- Low prevalence of PI animals (<0.5%) makes single-test strategies (vs. test/confirm test-positive strategy) expensive for each true positive identified
- Low prevalence causes even a test with high specificity to have more false positives than true positives (test/confirm positive strategy has high PPV)
- More information about high-prevalence populations such as age, weight, and geographic origin may provide guidance for screening only higher prevalence populations
- Commingling and transportation of PI cattle prior to arrival at stocker or feedlot operation begins virus transmission and negative effects of BVDV infection prior to screening at arrival

Purchasing PI-Free Certified Cattle

- All cattle in group being test negative to IHC of skin samples or pooled PCR
- Economic benefit is determined by multiplying the cost of having a PI calf present (increased pen morbidity, mortality, treatment failure, and performance) by the expected prevalence for similar cattle
- *i.e. $2000 cost × 0.5% = $10 / head value over groups of unknown status*

Purchasing PI-Low Risk Cattle

- All cattle in group originating from farm(s) with complete vaccination program and BVD PI surveillance protocol

Purchasing Cattle of Unknown PI Risk

- Cost of unknown status is determined by multiplying the cost of having a PI calf present by the expected prevalence for similar cattle
- Cost of unknown PI risk is added to other costs for break-even calculation

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Communication / Feedback for Cattle of Known Origin

- When cattle of known origin are identified as PI at a feedlot or stocker operation, the consulting veterinarian should notify the feedlot manager, herd owner, and herd veterinarian and should forward this document

BVD Misconceptions

- PI calves will be killed by MLV vaccination

Fact – Controlled experiments have not been able to induce morbidity or mortality in PI calves following MLV vaccination. However, case reports indicate that MLV vaccination can cause a PI animal to become moribund or to die - though far less than 100% are negatively affected..

- PI calves are thin, have rough haircoats and are poor-doers

Fact – While many PI animals are unthrifty, reports have indicated up to 50% will appear normal and may enter the breeding herd or feedlot pen in excellent condition. PI calves cannot be identified visually.

- Calves are PI because their dam is PI

Fact – Recent research has shown that 7% of PI calves' dams were PI, the other 93% of calves have dams with a normal immune response to BVDV and are not persistently infected.

- The greatest cost associated with a PI calf is the death of that calf

Fact – The reproductive loss associated with lower pregnancy proportions, more abortions, and higher calf mortality are the greatest economic costs of exposure to PI animals. In addition, increased morbidity, treatment costs, treatment failure, and reduced gain in feedlot or stocker penmates greatly exceed the cost of PI death in feeder cattle.

- BVDV problems will always be obvious

Fact – If BVDV was introduced into the herd via a PI animal several years previously, after an initial period of noticeable losses, the herd may currently experience only low reproductive loss and BVDV-associated morbidity. This low loss however, may not be compatible with economic sustainability.

- BVDV won't affect my herd because I vaccinate

Fact – The tremendous amount of virus secreted by a PI calf can overwhelm a level of immunity that is protective under less severe exposure. There are documented cases of herds with vaccination protocols in place for several years that have endemic BVDV because of the presence of PI animals.

Vaccination alone will not solve BVDV problems

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Opportunities for Production of Natural or Organic Beef

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Market Trends

A 2004 Whole Foods Market Organic Food Trends Tracker Survey reported that 27% of Americans are eating more organic foods than a year ago, 54% have tried organic foods and 9% use organic products regularly or several times per week (Food Product Design, 2004). Fifty-eight percent cited "better for the environment, 57% cited "supportive of small or local farmers", 54% "better for my health", 42% better tasting and 32% "better quality". According to the Food Marketing Institutes (2001) survey of U.S. shoppers, 37% of respondents purchase organic foods, 55% purchase foods that are free of additives and preservatives to maintain their health and 60% of American shoppers believe that organic foods are better for their health. According to a 2004 American Demographics/Harris Interactive Survey of 2,289 respondents: (a) 39% say they "always" or "often" inspect food labels to find out how the product was produced. (b) 33% believe organic or natural foods are safer. (c) 31% would like a greater assortment of organic and natural foods in their local supermarket (Food Systems Insider, 2004). The trend of purchasing foods that are not only nutritious and wholesome, but which are also perceived to be beneficial to their health has been a rising trend among U.S. consumers over the past decade (Health-Focus, 2001). Although organic food sales have grown 25% per year for the last 10 years, only 2% of each dollar US consumers spend is for organic food and only 0.3% of US crop and pasture land is devoted to organic food production (Food Systems Insider, 2004). Accompanying this trend is marked growth in all U.S. organic food sales with meat products growing 19.1% annually (NBJ, 2001). In conjunction with rising demand for organic products, increased availability of "Natural" and "Organic" products, unique label claims and the variety of "Natural" and "Organic" food offerings has also increased. In the late 1980's, the U.S. organic industry attempted to establish a voluntary labeling and certification program, to clarify and standardize label claims, which failed spurring the organic food producing community to petition Congress to develop a national organic program which later resulted in the Organic Foods Protection Act of 1990. This legislation was developed with three main goals 1) establish national standards for marketing, 2) provide assurances to consumers that organic foods were consistently produced and defined and 3) facilitate commerce of fresh and processed organic foods (USDA-AMS, 2000). On December 20, 2000, the National Organic Program Standards were published in the Federal Register, giving producers until October 2002 to be in full compliance with the standardized definitions and production standards for food products that are to bear a "Certified Organic" label (USDA-AMS, 2000).

Labeling Conflicts

Prior to the National Organic Program being published in the Federal Register, there was no consistent, standardized definition for foods labeled as "Natural" or "Organic". Presently, USDA-FSIS defines a "Natural" meat product as any item that is not more than minimally process and contains no artificial flavorings, colorings, chemical preservatives, or synthetic ingredients (USDA-FSIS, 1982). A definition that allows all conventionally prepared fresh meats to bear a "natural" label. It does not limit producers to specific feeding regimes, prohibit the use of pharmaceuticals, pesticides, fertilizers, or growth promotants, and does not specify animal handling or environmental management standards. As a result of this broad definition, almost all "natural" labeled meat products carry specific label claims (i.e. pesticide free, no antibiotics, no growth promoting hormones etc.) which currently do not have standardized meanings or requirements.

National Organic Program

With the passage of the Organic Food Act of 1990, it was mandated that USDA develop uniform standards and regulations for the production of certified "Organic" foods. The National Organic Program (7 CFR part 205) outlines the definitions, requirements and verification processes required to produce and label foods as certified "Organic". In order for a meat or food product to be Certified "Organic", producers must 1) comply with "Organic" production and handling regulations of the Act; 2) establish, implement, and update annually an production and handling system plan that is submitted to an accredited certifying agent; 3) permit on-site inspections with complete access to the operation, including non-certified areas; and 4) maintain all records applicable to the "Organic" operation for not less than 5 years. Under these requirements, products that are labeled as "100% Organic" or "Organic", must be produced using 100% or 95%, respectively, organic, whole, raw or processed ingredients and requires that producers describe and document all practices and procedures, characterize and list all inputs, establish a monitoring program, establish barriers to prevent "non-organic" contamination, and maintain the identity of all products from certification to delivery. In addition to these stated requirements, individual site certifying agents may require additional information, records or procedures as deemed necessary (USDA-NOP, 2000). Specific inputs and production methods which are prohibited under the program include 1) Synthetic substances and ingredients; 2) ionizing radiation, except for the purpose of USDA/FDA x-ray inspection; 3) use of sewage sludge; 4) use of growth promotants or hormones; 5) genetic engineering or modification; 6) utilization of mammalian or poultry slaughter byproducts; and 7) withholding medical treatment from sick animals to preserve their "organic" status (USDA-NOP, 2000). In order to verify compliance with these regulations, USDA, as of April 2002, had issued accreditation to 28 private, domestic certifying agents in 10 states and 4 foreign certifying agents for the purpose of auditing and verifying compliance with these standards.

Perceptions of Safety

Sloan (2002) indicated that consumers who purchase "Natural" and "Organic" food products are doing so predominantly to improve their long term health and to avoid harmful chemical residues (61% and 63% of purchasers, respectively). However, comparisons of "Conventional", "Natural" and "Organic" labeled food and meat products have not unveiled differences in the chemical attributes of these products. Smith et al. (1994) compared muscle, adipose, kidney and liver from "Conventional", "Natural", and "Organic" raised steer/heifer carcasses and reported that out 0 of 1,780 tests for residues of anabolic steroids (diethylstilbestrol, zeranol, trenbolone acetate and melengestrol acetate), environmental contaminants (lead or cadmium), beta-blockers (carazolol), beta-agonists (clenbuterol), tranquilizers (azaperone and propiopromazine) or sulfa-drugs (sulfamethazine, sulfadimethoxine, sulfabromomethazine, sulfaethoxypyridazine, sulfachloropyridazine and sulfamethoxypyridazine) contained violative residues, and in cases where non-violative, but detectable levels were found, there were no difference (P > .05) between the "Conventional", "Natural", and "Organic" tissues. Smith et al. (1997) again compared tissues (muscle, adipose, liver and kidney) from 60 "Conventional" beef carcasses, 63 "Natural" beef carcasses, and 63 "Organic" beef carcasses. There were no detectable residues of anabolic-steroid hormones or xenobiotics in any of the tissues assayed; however, there were violative residues of chlorinated-hydrocarbon pesticides (CHP) in 3 "Conventional", 3 "Natural" and 3 "Organic" liver tissue samples and violative residues of organophosphate pesticides in 3 "Natural" and 3 "Organic" liver tissue samples (Smith et al., 1997).

An evaluation by the Consumers Union of pesticide residues collected by USDA, the California Department of Pesticide Regulation and private test of the Consumers Union by Baker et al. (2002) concluded that fresh fruits and vegetables produced under "Conventional" or integrated-pest management with no detectable residues (IPM/NDR) systems were more likely to contain detectible pesticide residues (73 and 47%, respectively) than fruits and vegetables "Organically" grown (23%). Although "Conventional" and IPM/NDR produced fruits and vegetables were more likely to contain detectable residues, USDA reported residue levels from 22 "Conventional" and "Organically" produced crops indicated that 12 of 22 detectable residues from "Conventionally" grown crops and 11 of 22 detectable residues from "Organically" grown crops were above the "typical" non-detectible residue standard of 0.05 ppm (Baker et al., 2002).

In addition to concerns with pesticides and antibiotics, 44% of consumers were extremely/very concerned about growth hormones in meat, poultry and milk products (CMF&Z, 2000). Collins and coworkers (1989) characterized the levels of estrogen, progesterone and testosterone in beef compared to levels that are endogenously produced in the human body and concluded that the amount of estrogen produced daily by a non-pregnant female (480,000 ng), and a "normal" adult male (118,000 ng) were 252,631 and 62,105 times higher than the amount of estrogen found in a 3 oz. serving of beef from a steer implanted with a growth-promoting hormone. In comparison, by consuming beef from a non-implanted steer, these same individuals could reduce there intake of estrogen by 0.6 ng, or 0.000125% and 0.000508% of their endogenous daily production, respectively.

Along with consumer's perceptions that "Natural" and "Organic" food products are lower in chemical residues, better for their health and more environmentally conscience, 59% of consumers also perceived these products to be "safer" to eat (HealthFocus, 2001). Contrary to their beliefs, FDA and Health Canada have recently stated that "Organic" and "Natural" food products are 8-times more likely to be recalled for food safety-related problems compared to "Conventional" products (FDA, 2002) and a CDC listing of 488 *Escherichia coli* illness reported that nearly 25% of these cases were a result of consuming "Natural" or "Organic" foods (Forrer et al., 2000). Regardless of debate surrounding the chemical and nutritional composition of "Organic" or "Natural" products, the fact that food safety risks of bacteria, viruses, parasites, insects and foreign objects are not addressed in "Organic" food production standards and in many cases, due to limited processing can be more prevalent, producers, processors and consumers of "Organic", "Natural", and "Conventional" food products must work diligently to produce safe products and avoid propagation of misinformation.

Production Efficiency

By 2050, the worlds population will grow 50% to nine billion people (U.S. Census Bureau, 2000), but according to Nestle Executive Vice President Michael Garrett "organic farming could, at best, feed four billion people." Following the 1989 crumble of Cuba's trading relationship with the Soviet bloc and the longstanding U.S. trade embargo, Cuban food producers were forced to abandon modernized agricultural practices (tractors, chemical fertilizers, herbicides and pesticides) due to input shortages (fossil fuels, machinery, rubber, chemicals and seed) and were perceived to implement "sustainable" agricultural practices. Between the years of 1989 to 1993, and corresponding to their shift towards "sustainable" production practices, Cuba's production efficiency (food produced per capita) dropped 44.2% (FAO, 2002). A comparison of 3.9 million conventionally reared pigs and 3483 "Organically" reared pigs indicated that conventionally reared pigs yielded more red meat than "Organically" reared pigs (Hanson et al. 2000). Inevitably, their will always be demand for "Organically" produced food products, however, it is doubtful that this system of agriculture could supply sufficient quantities of food to a growing World population, on shrinking amounts of arable land.

Conclusions

Consumer trends in the U.S. and Worldwide will continue to direct food producers to produce not only safe, palatable food products, but also to do so in an ecologically conscience fashion. The development of standard regulations for "Organic" food production may clarify some disparities among "Organic" food products, but ultimately, as in all food products, they will be judged upon tangible characteristics of safety, nutrition, taste and environmental impacts/benefits. Currently "Organic" food products match the chemical and nutritional composition of "Conventional" products and there is little evidence to suggest differences in palatability. Producers and consumers of "Organic" food products will need to allocate resources to improve the safety of their products and the "Organic" industry must strive to educate consumers that although produced under different standards, "Organic" foods carry the same, if not greater, risks of food-borne illness. It remains to be seen whether an "Organic" systems approach to production agriculture has the potential to keep pace with the worlds growing population and need for food.

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Alternative Beef Production: What Are the Trade-offs

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Introduction

Current industry trends indicate a growing percentage of the total beef cattle population harvested in the United States is designated for a USDA certified, "branded-beef", program. Although the majority of branded programs represent quality and/or yield grade target endpoints, more recent "hot topic" issues regarding beef production seem to revolve around beef produced for a "Natural or Organic" label. Federal regulations for natural or organic produced beef limit or completely restrict the use of antibiotic and hormonal growth promoters, as well as other feed substances. It is reasonable to assume that much of the increased interest in natural or organic produced beef is related in part to main stream media coverage of the link between estrogen and cancer, increased concern regarding antimicrobial resistant microorganisms arising from subtherapeutic use of antibiotic feed additives, and perceived safety assurances for products marketed with a natural or organic label. As such, a brief discussion concerning antibiotics, hormones, and beef is warranted.

Antibiotics and Hormones

In an executive summary of the risk assessment conducted by Bezoen et al. (1999) concerning the use of antibiotic growth promoters (**AGP**) the following conclusions were reported: 1) The human health risk concerning the use of AGPs cannot be properly assessed for lack of data; 2) The contribution to human bacterial antibiotic resistance from animal bacterial antibiotic resistance cannot be fully assessed for lack of data; 3) Thus far, AGP use has not compromised the human therapeutic use of related antibiotics; and 4) Epidemiological data do not show an increase of infectious diseases as a result of the use of AGPs. In 1997 the Food Safety Inspection Service (**FSIS**) launched a year long nationwide data collection program to establish a microbiological baseline for cattle carcasses under that time period's current system of production. Results from that program are presented in Table 1. Generic E. coli was chosen to serve as an indicator of general hygiene and process control, whereas Salmonella was chosen because of its relevance to human illness as a result of food born infections.

Table 1. Prevalence of generic Escherichia coli and Salmonella from cattle carcass sponge samples

Microorganism	Samples	Positives	Prevalence	Standard Error
generic E. coli	1881	312	16.6	0.9
Salmonella	1881	23	1.2	0.3

Similarly, the FSIS conducts an annual domestic monitoring program designed to quantify veterinary drug residues in consumable meat products from various classes of livestock (FSIS, 2005). A summary of antibiotic residues in beef animals is presented in Table 2.

Table 2. Assessment of antimicrobial residues in consumable beef products

	Number of Samples[a]	Violation Rate, % (10 Yr)[b]	Violation Rate, % (3 Yr)[c]
Steers	3884	0.03	0.00
Heifers	3623	0.06	0.08
Beef Cows	4013	0.12	0.11
Bulls	2596	0.00	0.00

[a]Total number of samples analyzed in FSIS national residue program scheduled sampling plan (1/1/1994 to 12/31/2003).
[b]The percent of samples with antibiotic residue concentrations exceeding the tolerance level for the previous ten years.
[c]The percent of samples with antibiotic residue concentrations exceeding the tolerance level for the previous three years.

Table 3. Hormones produced naturally in the human body.

Total daily production	Estrogen, nanograms	Progesterone, nanograms	Testosterone, nanograms
Prepubescent girl	54,000	250,000	32,000
Prepubescent boy	41,600	150,000	65,000
Non-pregnant women	192,000 – 1,192,000	420,000 – 19,600,000	240,000
Men	136,000	410,000	6,400,000

Table 4. Hormone concentrations in common foods

	Estrogen, nanograms	Progesterone, nanograms
Oral Contraceptive, one pill	20,000 – 50,000	100,000 – 500,000
Beef from non-implanted cattle, 100 g or 3.5 oz	1.5	27
Beef from implanted cattle, 100 g or 3.5 oz	2.2	44
Soybean oil, 15 mL or 0.5 Fl. oz	28,773**	NA
Cabbage, 100 g or 3.5 oz	2,381**	NA
Milk, 250 mL or 8.5 Fl. oz	35.9	NA

**estrogen equivalent activity (i.e. in the form of phytoestrogens)

In addition to the antibiotic issue, beef produced with the use of hormonal growth promoters (**HGP**) receives negative press. In 1988 the European Community prohibited trade of meat and meat products obtained from animals treated with hormonal substances (Pasut, 2003). In that same article, a thorough discussion of various sources of hormones for humans was presented (Tables 3 and 4).

Given the previous data, it is easy to argue that beef produced in the United States is safe and wholesome for human consumption, and there is little evidence to suggest that the use of antimicrobial or hormonal growth promoters present any danger to the national or global community that consumes US produced beef. Furthermore, if conventional production of beef is more efficient, what costs are associated with producing organic beef when technological advances such as growth promoting substances are not utilized?

Conventional vs. Organic Production

The impact of hormonal implants on performance and carcass characteristics of beef cattle is well documented (Owens et al., 1997). Selk (1997) compiled data regarding a single dose of 36 mg of zeranol (Ralgro®, Schering Plough Animal Health) from 23 trials that demonstrated implanted suckling steer calves gained 0.097 pounds per day more from implant to weaning when compared to their control counterparts. That could easily equate to an increase of $16.00/steer in today's market (assuming 120 days from implant to weaning), and would represent over a $14.50 return on investment. Duckett et al. (1997) compiled literature for feedlot finishing steers indicating that a single strong estrogen implant would result in a 14.2% increase in daily gain when compared to steers that received no estrogen implant. Moreover, a single dose of a strong estrogen and androgen combination implant resulted in a 23% increase in daily gain, and an 18.5% improvement in feed conversion over steers that received no hormonal treatments. Although anabolic implants increase production efficiency, it should be noted that cattle who do not receive hormonal growth promoters typically have higher quality grades than steers that receive just a single implant at the feedlot. Morgan (1997) concluded the percentage change relative to controls for a mild estrogen or a strong combination implant would approximate a 4.9 to a 20% decrease, respectively, in the percent of cattle grading choice.

Sub-therapeutic use of antibiotic feed additives in feedlot diets is considered beneficial for the prevention or reduction in severity of digestive and metabolic upsets for cattle consuming high concentrate feeds. Sawyer et al. (2003) demonstrated that the use of antibiotic feed additives increased average daily gain 4.3% and improved feed efficiency 5.6% for feedlot finishing steers when compared to cattle that received no antibiotic supplementation in their feed. In that study, not including antibiotic feed additives resulted in an 8.9 percentage point reduction in the number of cattle grading Choice or better. When both AGP and HGP are utilized at the feedlot level, marked improvements in performance and efficiency are realized. Brethour and Bock (2005) conducted two feedlot finishing trials comparing natural vs. conventional management schemes and demonstrated that conventionally managed cattle gained on average 1.01 pounds per day more (37.4% increase) than the naturally managed cattle. In addition, the conventionally managed cattle converted feed to body weight gain 28.6% more efficiently than the cattle from the naturally managed group.

The previous discussion clearly demonstrates the performance enhancing ability of antimicrobial and hormonal growth promoting substances for beef cattle. If we produce beef without these substances what economic impacts are realized?

Case Example

Utilizing data from published research (Brethour and Bock, 2005; Sawyer et al., 2003; Fernandez and Woodward, 1999; and Woodward and Fernandez, 1999) simple means were calculated for performance and carcass characteristics of conventional vs. organically produced beef (Table 5). In order to complete an economic analysis, information from the 2004 Annual Meat Trade Review (AMS, 2004) was used to determine the average carcass price. Because both groups were similar in yield grade no adjustments were made to the base price as a result of yield grade premiums or discounts. The base choice carcass price of $140.75/cwt was adjusted according to each group's percent average Choice and greater premium ($2.21/cwt carcass), and percent Select and lower discount (-$8.63/cwt carcass). In order to estimate the additional cost of production for the conventional cattle, a price of $4.65/steer was used for Rumensin® (Elanco Animal Health; assuming 360 mg of Monensin/hd/d), a price of $5.44/steer was used for Tylan® (Elanco Animal Health; assuming 90 mg of Tylan/hd/d), and a price of $4.20/steer for a two implant protocol in a 150 day feeding program. The economic data are presented in Table 6.

Table 5. Performance and carcass characteristics of conventional and organic managed feedlot finishing beef steers.

Item	Conventional	Organic
Dry Matter Intake, lb	22.41	21.35
Average daily gain, lb	3.8	3.1
Gain:Feed	0.170	0.145
Hot Carcass Wt., lb	823	764
% Choice or >	76.8	87.0
% Select or <	23.2	13.0
% Average Choice & >	38.0	58.0
Calculated Yield Grade	3.27	3.36
Grade Fat, in	0.48	0.46

With few exceptions, all other direct costs of production should be similar for both groups. However, because of feedstuff limitations for organically produced cattle it is reasonable to assume that the potential exists for ration costs to be greater with an organic management protocol. The most obvious example would be feed-grade urea, which is an economically desirable source of supplemental crude protein in high concentrate feedlot diets. Because urea is not allowed in diets designated for organic beef production producers are forced to utilize natural/organic feedstuff sources for supplemental protein, which are typically more expensive per unit of protein than urea.

Table 6. Economic comparison of conventional and organic produced beef

Item	Conventional	Organic
Base Price, $/cwt carcass	140.75	140.75
Average Choice Premium, $/cwt carcass	0.84	1.28
Select Discount, $/cwt carcass	(2.00)	(1.12)
Adjusted Carcass Price, $/cwt carcass	139.59	140.91
Gross Receipts, $/carcass	1148.83	1076.55
Added Production Costs		
Rumensin®, $/steer	(4.65)	-
Tylan®, $/steer	(5.44)	-
Implants, $/steer	(4.20)	-
Adjusted Gross Receipts, $/carcass	1134.54	1076.55
Additional Gross Receipts, $/carcass	57.99	-

Conclusion

Every segment of the beef cattle industry relies on pounds of production to generate income. Whether a producer sells on a live or carcass basis, the major determinant of profitability (excluding purchase price) is the total pounds of animal produced. With that in mind, producer's who retain ownership and sell their cattle "in the beef" should strive to maximize pounds of non-discountable carcass. For producers who strive to maximize quality or yield grade premiums it should be considered that the premium structure of many value-based marketing programs does not offset losses in carcass value as a result of light carcass weights. Although conventionally produced cattle often have fewer carcasses grading USDA Choice or above, their increased hot carcass weights more than offset losses in quality grade premiums.

In the previous example, conventionally produced steers had hot carcass weights that averaged 59 lbs more than steers managed using and organic protocol. In addition, the grade fat measurement of both groups indicates they had reached mature size and additional days on feed would result in weight gain primarily as fat, which eventually would lead to an increase in discountable carcass weight. Furthermore, conventionally produced beef generated $57.99 more per carcass (accounts for the direct costs of the conventional production) than beef from the organically managed group. This price difference means that organically produced beef would need an additional $7.59/cwt of carcass in order to generate the same amount of gross revenue. If the estimate of the required increase in $/cwt of carcass is accurate what should the premium be to justify or entice producers to pursue organic or natural programs?

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Evaluating the Premium
Comparisons Between Natural/Organic and Commodity Beef

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Background

What is the premium? That is a common question being asked around the state and the country as producers seek ways to capture more dollars through niche beef marketing channels.

For the purpose of this paper, "niche" beef marketing is going to be centered on natural/organic beef production and although entirely different, they will be talked about as one group. There are two reasons why producers are interested in niche beef marketing: (1) as costs of production increase, many producers are trying to find ways to generate more dollars per cow calf unit and (2) it seems that some producers are driven by a sense of "cleanliness" and want to produce a product that is free of antibiotics, implants, ionophores, etc. for the better of their environment, health, etc.

This paper will not address *why* producers are choosing to produce niche beef products, or *net* profitability. Nor will it debate the issue of whether natural/organic beef is better for consumers. However, it will address the *premium* associated with niche beef from a cow calf and a retail beef level. Although still a very small part of total beef sales, natural and organic beef products are on the rise because consumers in some areas of the nation are willing to pay more for them.

Calves and feeders

Data suggests that there are currently 16 official natural beef programs available to producers (Cattle-Fax, 2004). Many of these are USDA verified, breed specific, or are retained ownership programs. However, they are in the market for calves and are forming partnerships with growers to supply cattle. Producers have caught on to this and today you will see calves selling over video and traditional auctions that have been verified "natural". Are these folks seeing more money? Data suggests that premiums range between $4 and $8 cwt for calves and $2 to $4 for feeder cattle (Cattle-Fax, 2004). However, producers must realize that producing cattle that qualify as "natural" won't make up for lack of quality. Cattle lacking quality, or pens with a lot of variation, won't bring a premium just because they have the natural label. Many producers have been raising "natural" calves for years, but have never marketed them as such. If you sell calves at auction that are not implanted and have not received antibiotics, you should probably consider labeling them as natural.

The organic beef market is limited. Most producers marketing organic beef are going straight to the retailer or consumer because of the additional regulations associated with producing the product. Some are selling calves private treaty to growers who have an outlet for the product. This author does not know of any certified "organic" calves selling through mainstream auction channels.

Live to Retail Spread

Some data suggests that retail beef prices for natural/organic beef do not follow the normal supply/demand curve that commodity beef follows (Oregon Country Beef, personal communication, 2005). For example, the demand for natural/organic (niche) beef should stay constant, or grow, as demand for boxed and case ready beef lessens as the industry generates more tonnage during an increasing cattle supply. Consequently, programs that allow producers to capture retail premium (meat value) receive a favorable price for their cattle (beef) regardless of the cattle cycle.

It is difficult to determine what natural/organic calves or live cattle should be valued at. Most value-based marketing systems follow a grid pricing schedule where the cattle will earn premiums and discounts on their ability to hit certain yield and quality grade specs, weight windows, and branded programs. These premiums and discounts are tacked on to a regional average base price. Furthermore, some natural programs follow the same path, tacking on bonuses for verifying natural, or hitting certain carcass parameters (i.e. rib eye size 12-14in). For example, Oregon Country Beef, a very successful natural beef company, bases their natural premium on a cost of production model derived from their members. Their target is to return a dollar per pound on an 800 lb steer, regardless of what the market is for 800 lb steers. Members retain ownership to the packer and then their "natural" premium is tacked on to a regional average carcass price based on how the cattle hit certain carcass targets. Years when the market is high, the premium is not much more than market, years when the market is low, the natural premium is significant.

Table 1. Yearly premium and net return comparisons from 8 weight steers harvested through Oregon Country Beef.

Year	Head shipped	Feeder Weight	Ave generic price	Ave return to ranch	OCB minus Generic	OCB Adv. p/hd	OCB dollars to ranch
03-04	23902	804	$0.96	$1.01	$0.06	$44.70	$818.47
02-03	18043	815	$0.81	$0.93	$0.12	$94.46	$755.75
01-02	15097	810	$0.74	$0.81	$0.08	$60.91	$658.69
00-01	13923	802	$0.81	$0.89	$0.08	$63.20	$716.67
99-00	10518	811	$0.67	$0.85	$0.18	$148.09	$693.00
98-99	6865	818	$0.71	$0.81	$0.11	$87.53	$664.95
97-98	5498						
96-97	4995						

For example, in 1999-2000, the premium per head was $148.09, or $18/cwt above the average market price of $67/cwt for 800lb steers. The premium was still earned even though the market was bad, because the demand for the beef was growing.

Other programs offer no distinction between quality or yield grade and just give a natural bonus. It often seems that "natural" cattle do not earn any more than "non-natural" cattle, particularly in times of limited supply. Therefore, it is necessary to go from a retail price and work down to establish a threshold of what natural, and particularly organic cattle, should be bringing. Imagine yourself as a producer selling sub-primals directly to a retailer.

To do this, producers must understand the percentage of retail cuts (pounds) and the percent value ($) that these cuts produce from a carcass. The cuts that produce the fewest

Table 2. National Weekly Boxed Beef Cutout and Boxed Beef Cuts-December 9th, 2005.
Choice vs. Select Price, %Yield, %Value, and Total Value Comparison.

Friday December 9 2005	Select					Choice				
	Price $/cwt	**Total lbs**	**% yield**	**Total $**	**% value**	**Price $/cwt**	**Total lbs**	**% yield**	**Total $**	**% value**
112A RIBEYE <11 lbs	$561.78	21.29	3.55%	$119.61	13.38%	$756.18	21.29	3.55%	$161.00	16.63%
112A RIBEYE 11> lbs										
114 SH CLOD	$148.64	34.90	5.82%	$51.87	5.80%	$145.91	34.90	5.82%	$50.92	5.26%
116A CHUCK ROLL	$170.33	49.78	8.30%	$84.80	9.48%	$171.86	49.78	8.30%	$85.56	8.84%
120 BRISKET	$133.72	18.75	3.13%	$25.08	2.80%	$135.62	18.75	3.13%	$25.44	2.63%
167 KNUCKLE	$166.29	17.97	3.00%	$29.89	3.34%	$167.07	17.97	3.00%	$30.03	3.10%
168 INSIDE RND	$176.32	36.43	6.07%	$64.24	7.18%	$176.57	36.43	6.07%	$64.33	6.65%
170 GOOSENECK	$163.43	46.91	7.82%	$76.67	8.57%	$162.03	46.91	7.82%	$76.01	7.85%
180 STRIP LOIN <12 lbs	$359.45	23.62	3.94%	$84.92	9.50%	$420.00	23.62	3.94%	$99.22	10.25%
180 STRIP LOIN 12-13.9 #										
180 STRIP LOIN 14> lbs										
184 TOP BUTT <12 lbs	$210.10	20.86	3.48%	$43.83	4.90%	$234.05	20.86	3.48%	$48.83	5.05%
184 TOP BUTT 12> lbs										
185A BOT SRLN FLAP	$264.55	5.35	0.89%	$14.15	1.58%	$275.09	5.35	0.89%	$14.72	1.52%
185B BOT SRLN BALL TIP <2	$162.77	3.52	0.59%	$5.73	0.64%	$165.23	3.52	0.59%	$5.82	0.60%
185B BOT SRLN BALL TIP 2>								0.00%		
185C BOT SRLN TRITIP	$254.05	4.92	0.82%	$12.50	1.40%	$248.43	4.92	0.82%	$12.22	1.26%
189A TENDERLOIN <5 lbs	$1,004.35	10.08	1.68%	$102.37	11.45%	$1,140.64	10.08	1.68%	$114.76	11.86%
189A TENDERLOIN 5> lbs										
193 FLANK STEAK	$333.13	2.98	0.50%	$9.93	1.11%	$348.31	2.98	0.50%	$10.38	1.07%
INSIDE SKIRT	$272.68	7.01	1.17%	$19.12	2.14%	$272.68	7.01	1.17%	$19.12	1.98%
CAP & WEDGE MEAT	$193.92	20.46	3.41%	$39.67	4.44%	$193.92	20.46	3.41%	$39.67	4.10%
BACK RIBS	$37.98	13.01	2.17%	$4.94	0.55%	$37.98	13.01	2.17%	$4.94	0.51%
93% Ground	$199.00	94.50	15.75%	$104.89	11.73%	$199.00	94.50	15.75%	$104.89	10.84%
50% LEAN TRIM	$0.00	0.00	0.00%	$0.00	0.00%	$0.00	0.00	0.00%	$0.00	0.00%
EDIBLE TALLOW---->>		80.76	13.46%		0.00%	$80.76	80.76	13.46%		
BONE--------------------->>		87.18	14.53%		0.00%	$87.18	87.18	14.53%		
Average	*$2.53*	*28.59*	*4.76%*	*$47.06*	*4.76%*	*$2.58*	*28.59*	*4.55%*	*$50.94*	*5.26%*
Total		**$600.31**	**$1.00**	**$894.21**	**$1.00**		**$600.31**	**$1.00**	**$967.86**	**$1.00**

pounds on a percentage basis (middle meats) generate the most value on a percentage basis. Cuts with lower value (end meats) generate more pounds. It is usually easier to move the middle meats than the end meats. Therefore, the trick in selling organic beef to a retailer is moving the majority of the carcass that has less value.

Table 2 represents national weekly boxed beef cutout and boxed beef cut prices (UDSA, 2005) for December 9th 2005 and cutout percentages from the Oklahoma State University Box Yield Calculator (Dolezal et al., 1996).

The data is based on a 600 lb USDA Yield Grade 3 carcass, dressing 63%, and grading USDA Choice or Select. For example, a 112A Select rib-eye <11 lbs is valued at $561.78/cwt, or $5.61/lb. This boneless cut(s) would weigh 21.29 lbs and represent 3.55% of the carcass. Its value would be $119.61 representing 13.38% of the value of the carcass. The average price for all Select cuts going to retail would be $2.53/lb. The whole carcass would be worth $894.21. Therefore, based on an $8.03 drop credit, and $86.00/hd kill/fab cost, the packer could give $147.45/cwt for that 600 lb carcass or $92.89/cwt live. Remember, this is the Select price equivalent and would account for most product going to supermarkets (i.e. Wal-Mart). Or, this is what a producer could expect to receive for a 600lb carcass sold directly to a retailer on December 9th.

In comparison, the following retail prices were obtained from various stores in the Albuquerque area in February of 2005 that market natural/organic beef (prices are probably higher now). Cuts from the chuck and round were grouped as just “chuck” or “round” because the selection varied and there were very few items to choose from. These prices were then reduced by 75%, to account for retail margin associated with natural or organic beef. In other words, anticipating a 75% retail markup, this is the price you could sell to the retailer. This retail markup could be 50% or 150%.

Table 3. Natural/Organic Beef Retail Prices and Prices Reduced 75% from February, 2005

Item	Price/lb	Price/lb less 75% margin
Chuck	$4.99	$2.85
Round	$5.99	$3.42
Sirloin	$12.99	$7.42
Top loin	$16.99	$9.71
Rib eye	$14.99	$8.57
Tenderloin	$24.99	$14.28
Brisket	$5.29	$3.02
Flank	$5.99	$3.42
95% Ground Beef	$5.99	$3.42
Simple Average	**$11.53**	**$6.23**

The prices above were then put into the Oklahoma State University Box Yield Calculator and yielded the results in table 4.

For example, a 112A Select rib-eye <11 lbs is valued at $857.00/cwt, or $8.57/lb. This boneless cut(s) would weigh 21.29 lbs and would represent 3.55% of the carcass. Its value would be $182.46 representing 9.88% of the value of the carcass. Therefore the average price for all cuts going to retail would be $5.04/lb. The whole carcass would be worth

$1711.68. Therefore, based on an $8.03 drop credit, and $86.00.hd kill/fab cost, the packer could give $283.69/cwt for that 600 lb carcass or $178.73/cwt live. Remember, this is what a producer could expect to receive for a 600lb carcass (natural/organic) sold directly to a retailer anticipating a 75% retail markup in February 2005.

Table 4. Natural/Organic Retail Prices, %Yield, %Value, and Total Value as Reflected in the Oklahoma State University Box Yield Calculator

Feb-05			**Natural/Organic**		
	Price $/cwt	**Total lbs**	**% yield**	**Total $**	**%value**
112A RIBEYE <11 lbs	$857.00	21.29	3.55%	$182.46	9.88%
112A RIBEYE 11> lbs					
114 SH CLOD	$285.00	34.90	5.82%	$99.46	5.38%
116A CHUCK ROLL	$285.00	49.78	8.30%	$141.88	7.68%
120 BRISKET	$302.00	18.75	3.13%	$56.64	3.07%
167 KNUCKLE	$342.00	17.97	3.00%	$61.47	3.33%
168 INSIDE RND	$342.00	36.43	6.07%	$124.61	6.75%
170 GOOSENECK	$342.00	46.91	7.82%	$160.44	8.69%
180 STRIP LOIN <12 lbs	$971.00	23.62	3.94%	$229.39	12.42%
180 STRIP LOIN 12-13.9 #					
180 STRIP LOIN 14> lbs					
184 TOP BUTT <12 lbs	$742.00	20.86	3.48%	$154.81	8.38%
184 TOP BUTT 12> lbs					0.00%
185A BOT SRLN FLAP	$742.00	5.35	0.89%	$39.69	2.15%
185B BOT SRLN BALL TIP <2	$742.00	3.52	0.59%	$26.14	1.42%
185B BOT SRLN BALL TIP 2>					
185C BOT SRLN TRITIP	$742.00	4.92	0.82%	$36.50	1.98%
189A TENDERLOIN <5 lbs	$1,428.00	10.08	1.68%	$144.00	7.80%
189A TENDERLOIN 5> lbs					
193 FLANK STEAK	$342.00	2.98	0.50%	$10.19	0.55%
INSIDE SKIRT	$272.68	7.01	1.17%	$19.12	1.04%
CAP & WEDGE MEAT	$193.92	20.46	3.41%	$39.67	2.15%
BACK RIBS	$37.98	13.01	2.17%	$4.94	0.27%
93% Ground	$342.00	94.50	15.75%	$180.27	10.53%
50% LEAN TRIM	$0.00	0.00	0.00%	$0.00	0.00%
EDIBLE TALLOW---->>		80.76	13.46%		
BONE--------------------->>		87.18	14.53%		
Average	*$5.04*	*28.59*	*4.76%*	*$97.22*	
Total		**600.31**	**1.00**	**$1711.68**	**1.00**

As you can see, rib-eyes, strips, and tenderloins generate the highest percent value (accept for ground beef because of volume), yet have low percent yields. Cuts from the chuck and round generate the least value, yet provide more yield. Prices would have to be adjusted based on what retailers wanted in the case if someone were to sell directly to the retailer.

Table 5 represents approximate break-even prices for 550 lb steers considering the total carcass values from the above Select, Choice, and Natural/Organic carcasses. This assumes a 600 lb carcass, 60% dressing percent, and a cost of gain of $0.60/lb and $0.50/lb for natural/organic and commodity beef, respectively.

Table 5. Break Even Comparison among Natural/Organic, Select, and Choice 550 lb Calves

	C/G	Carcass Value	550 Calf BE
Natural/organic	$0.60	$1711.68	$2.62
Select	$0.50	$894.21	$1.21
Choice	$0.50	$967.86	$1.35

Summary

In conclusion, one must realize that the data presented in this paper for natural/organic beef is based on producers selling their product directly to the retailer and avoiding the middlemen. This was done particularly for the growing organic market in New Mexico. There are no large, conventional feedlots or packers buying and slaughtering organic cattle, so one must raise, grow, finish (grass or grain), custom slaughter, and then market the beef to retail markets selling this product. Price discovery is limited in the natural and organic beef industry, especially for organic. However, based on the information above, it seems small premiums can be earned selling calves/yearlings labeled as "natural" into conventional markets and larger premiums can be earned selling beef to retailers (especially organic). Producers must realize that the natural/organic premiums above do not take into consideration additional expenses such as transportation, organic feed, or custom processing costs. Opportunity exists to market natural beef into branded or integrated systems for an added premium. However, producers must make sure that added premiums coincide with added profits to their operation.

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