Virginia Tech Shenandoah Valley Agricultural Research and Extension Center

1955 – 2005
"Celebrating Fifty years of Agricultural Research"

2005 Field Day Proceedings

August 3, 2005

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Virginia Tech Shenandoah Valley Agricultural Research and Extension Center

Celebrating 50 years of Agricultural Research 1955 -2005

Next year, 2006, will officially mark the 50th anniversary of agricultural research and extension programs at the Shenandoah Valley Agricultural Research and Extension Center. Although 2006 will mark the 50th year of formal agricultural research by Virginia Tech, the McCormick Farm has been a "research center" since the late 1700's.

Known historically as "Walnut Grove Farm", this 620 acre farm is the ancestral home of Robert McCormick and his son, Cyrus Hall McCormick. Born on this farm in 1809, Cyrus Hall McCormick is famous for building the first practical grain reaper. The first reaper was successfully demonstrated in a field of oats owned by John Steele in nearby Steeles Tavern in 1831. Patented in 1834, this invention is credited for starting the mechanical revolution in agriculture that would forever change agricultural production world wide. From a meager beginning in the small blacksmith shop in Steeles Tavern evolved a company that would grow to become one of the world's manufacturing giants, the International Harvester Company.

The descendents of Cyrus McCormick retained ownership of the farm until 1954 when they donated the farm to Virginia Tech. In July, 1956, the 620-acre farm was officially opened as the Shenandoah Valley Research Station, a branch of the Virginia Agricultural Experiment Station.

Soon after the farm was acquired by Virginia Tech, the two-acre site where the grist mill and blacksmith shop are located were set aside as the McCormick Memorial Plot. The buildings and grounds are now visited by thousands of people annually. In 1956, the Cyrus McCormick exhibit located in the Virginia State Museum in Richmond, was relocated to the museum on the second floor of the blacksmith shop. Included in this display are 14 miniature models of the McCormick reaper and are similar to the those used by McCormick salesmen in the late 1800's. In June, 1966, the site was officially designated as a National Historic Landmark.

Although the station officially opened in 1956, Virginia Tech's first research project started in 1955. Drs. Charles Kincaid and Robert Carter conducted a crossbreeding project with British breeds of cattle. This project continued until 1978 and gained acclaim as the largest and most complete crossbreeding project involving British breeds of cattle at that time.

Over the past 50 years, many innovative agricultural research projects have been conducted that have provided needed information for agricultural producers across the country. The primary areas of study have been beef cattle and sheep production, forages and grazing management, crop and forage nutrient management, entomology, tree fruits, and forestry. Currently, the Appalachia Pasture-Based Beef Production Systems Regional Project is the largest and most intense project ever conducted at the Center. This project is a cooperative effort between Virginia Tech, West Virginia University, University of Georgia, and USDA-

ARS. The main goal of this project is the development of innovative concepts/practices to enhance the efficiency, profitability and sustainability of grassland-based beef production systems in the Appalachian Region that are economically viable and environmentally sound.

Over the past 50 years, many faculty, students, interns, employees, and visitors have passed through the wrought iron gates of the Manor House driveway. From the early "mechanical" research in the 1800's to the present high-tech approaches, this farm has played an important role in developing new and innovative ideas for production agriculture. This Center continues to tell the story of the resourceful McCormick family and the impact they had on the world.

Field Day Program

Shenandoah Valley Agricultural Research and Extension Center

August 3, 2005

1:00 – 1:30 **Registration**

1:30 – 1:40 **Welcome**, *David Fiske, Superintendent*

1:40 – 1:50 Load wagons and travel to B facility

1:50 – 2:20 **Pasture-Based Beef Systems for Appalachia – Present and Future Project** - *Dr. Joe Fontenot, John W. Hancock Jr. Professor, Virginia Tech*

Cow / Calf Forage Systems Project – Four Year Results – *Dr. Guillermo Scaglia, Department of Animal and Poultry Sciences, Virginia Tech*

2:20 – 2:40 **Pasture Measurements and Evaluation** – *Dr. Ozzie Abaye, , Crop and Soil Environmental Science, Virginia Tech*

2:40 – 3:30 **Urban Interface Forestry Project** – *Dr. Rein Visser, Forestry Department, Virginia Tech*

Is Silvopasture Management an Option? – *Dr. John Fike, Crop and Soil Environmental Science, Virginia Tech*

Future Forestry Demonstration Project – *Karen Stanley, Virginia Department of Forestry*

3:30 – 3:40 Load wagons and travel to Ram Barn

3:40 – 4:00 **Use of Technology in Ram Evaluation and Selection** – *Dr. Scott Greiner, Extension Animal Scientist, Virginia Tech*

4:00 – 4:20 **Observations on Backgrounding Home Raised and Purchased Calves** - *Dr. Terry Swecker, VA-MD Regional College of Veterinary Medicine, Virginia Tech and Dr. Guillermo Scaglia, Department of Animal and Poultry Sciences, Virginia Tech*

4:20 – 4:40 **Impacts of Long-Term Nutrient Management Strategies of Grazing Systems on Soil Chemical Properties and Soil Quality** - *Dr. Greg Mullins, Crop and Soil Environmental Science, Virginia Tech*

4:40 – 4:50 Load wagons and travel to Feeding Barn

4:50 – 5:05 **Performance and Carcass Quality of Finishing Steers** - *Dr. Jim Neel, USDA ARS*

5:05 – 5:20 **Composition and Health Benefits of Pasture Finished Beef** – *Dr. Susan Duckett, Department of Animal and Dairy Science, University of Georgia*

5:20 – 5:50 **National Animal ID Program Update** - *Dr. Scott Greiner, Extension Animal Scientist, Virginia Tech and Steve Hopkins, Extension Agent, Animal Science, Orange County*

5:50 – 6:00 Return to the Memorial grounds for dinner

6:00 – 6:30 Introductions and Comments from Special Guests

6:30 – 8:00 Dinner

PASTURE-BASED BEEF SYSTEMS FOR APPALACHIA - A COORDINATEDAPPROACH TO MEET REGIONAL NEEDS

J. P. Fontenot, W. A. Clapham[a], W.B. Bryan[b] and S. Duckett[c]

The project at the Shenandoah Valley Research and Extension Center is part of a larger initiative, cooperative with USDA-ARS, Beaver, WV, West Virginia University and the University of Georgia (UGA).

Hill land, characteristic of much of Appalachia, is ideally suited for grassland based beef production. In West Virginia and Virginia some 4.3 million acres are in pasture. Most farmers raise some beef cattle, primarily in relatively small cow/calf operations. Off-farm sales in 1996 of beef cattle and calves in WV and VA amounted to $260 million. However, beef systems in Appalachia deserve a much broader consideration than purely production economics. Keeping hill land open and productive has large benefits to both rural and urban society. These include aesthetic attributes as well as wildlife habitat, which represent real but hard to measure contributions of grassland agriculture to the surrounding community and to society. Yet these benefits can only accrue if the economic stability of the small farm in Appalachia is insured.

The overall goal of the Appalachia Pasture-Based Beef Production Systems Regional Project is: development of innovative concepts/practices to enhance the efficiency, profitability and sustainability of grassland-based beef production systems in the Appalachian Region that are economically viable, and environmentally sound. Major components include cow-calf, post-calving, and pasture finishing systems; product quality; and marketing strategies. The different phases of the initiative are shown in Figure 1.

Research by WVU is conducted at Morgantown. The ARS research includes work at Beaver, Morgantown, and Willow Bend, WV. Most of the VA Tech research is conducted at the Shenandoah Valley Agricultural Research and Extension Center and some at Blacksburg.

The planned timetable for the different components is shown in Figure 2. The project is in the fifth year, which will complete the first phase of the cow/calf systems. The cycle is complete for the first 3 yr, including all phases of production, and evaluation of the meat. Results of the different phases will be presented by other speakers. The project progressed smoothly, although there were problems with forage establishment and droughts.

Plans for the next phase are being developed. For the cow/calf phase, the numbers of systems will likely be reduced. Variables which are being considered include biological

[a] USDA/ARS, Beaver, WV.
[b] West VA University, Morgantown.
[c] University of Georgia.

types of cattle, warm and cool season forages, early weaning of calves, forward creep grazing, time of calving and fenceline weaning.

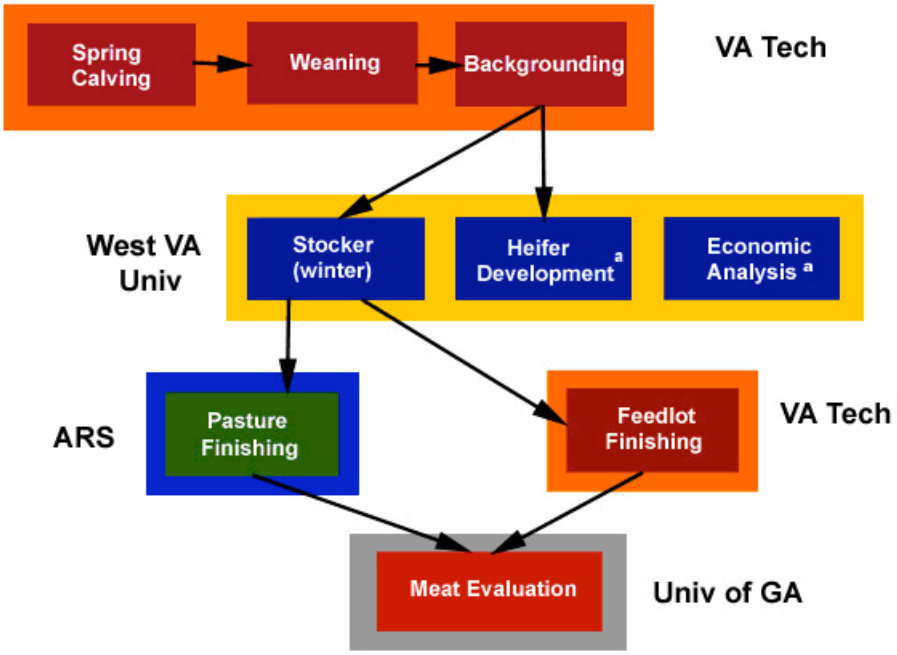
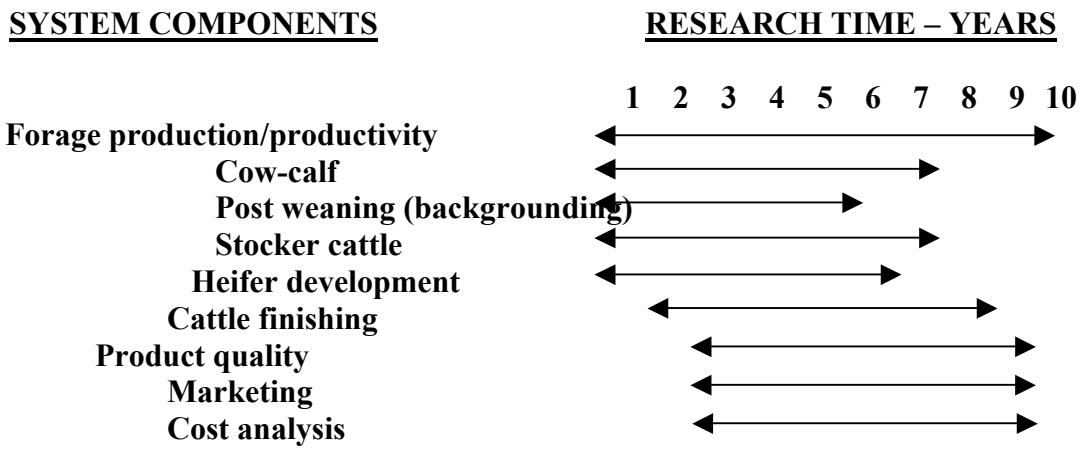


Figure 1. Pasture-based production systems and division of responsibilities

a. Heifer development research and economic analyses are being conducted by VA Tech, also.

Figure 2. Forage-based Beef Systems for Appalachia



Cow/Calf Forage Systems Project – Three Year Results

G. Scaglia, D. Fiske, J. P. Fontenot, J. B. Hall, W. S. Swecker, and J. H. Fike

Introduction

Beef cow-calf production systems in the eastern United States are traditionally spring calving with the calves typically weaned and sold in the late Summer to early Fall. Some calves are retained beyond weaning in stocker systems, but only limited numbers of cattle are finished and harvested in the eastern United States. In Virginia there are 1,540,000 head of beef cattle (ranking 20 in the US) which generated $339,260,000 in cash receipts. Beef cattle production ranks second to broiler production within the state and 29th when compared to cash receipts from beef cattle in the rest of the country (VDACS, 2003).

One of the components of the "Pasture Based Beef Systems for Appalachia" Initiative is the development and evaluation of Cow/Calf Forage Systems with the main objective of increasing profitability and environmental sustainability in forage-based livestock systems. The working hypothesis is that a combination of forages can be used to supply adequate nutrients for efficient cow-calf production systems and produce calves that will move directly into a pasture finishing program.

Procedure

The main SVAREC cow herd consists of 108 Angus and Angus-cross brood cows (average age for the three years = 4.5 years). It was used to evaluate six different forage systems. Each system is replicated three times and there are six cows per replicate. Cows are bred to calve in a 65-d period between late-February and early May. They are synchronized, bred AI, and then exposed to a clean-up bull. Angus bulls are used for AI and natural service. Calves are weaned in early October and moved to the backgrounding phase (42 days) of the Project.

The forage systems treatments that were evaluated are:

System 1 – Fescue, fescue/clover, 2.25 acres/cow (Middleburg 3-paddock system)
System 2 - Fescue, fescue/clover, 1.75 acres/cow (Middleburg 3-paddock system)
System 3 - Fescue, fescue/clover, 1.75 acres/cow (2-paddocks subdivided for rotational stocking)
System 4 - Fescue, fescue/clover, alfalfa/orchardgrass, 1.75 acres/cow (3-paddock rotational grazing)
System 5 - Fescue, fescue/clover, switchgrass, 1.75 acres/cow (Middleburg 3-paddock system)
System 6 - Fescue, fescue/birdsfoot trefoil, fescue/lespedeza, 1.75 acres/cow (Middleburg 3-paddock system)

All systems were seeded in the Fall of 1999 and Spring 2000 in an effort to establish the desired pastures. Although the desired primary forage in many of the systems is Kentucky 31 tall fescue, due to adverse environmental conditions and grazing management, many pastures still contain other grasses including orchardgrass, bluegrass, and quackgrass.

Three years of data have been collected and the fourth year is currently under evaluation. Analysis of the information was conducted to determine the effect of year, forage system, and their interactions on all the variables that were measured. Variables that were considered for this analysis include: cow age, cow body weight at breeding (late April), in mid-summer (late July), and at weaning (early October), cow body condition score (BCS) at breeding, summer, and weaning, cow ADG and BCS change between each of the dates previously mentioned, pregnancy rate, calf weight at birth, , calf weight at the beginning of the breeding season, in mid-summer, and at weaning, calf ADG between each of the weigh dates, and adjusted calf weaning weight (corrected by age, expressed in days).

Results

A. Forage production

The amount of forage and hay offered are presented in Figures 1 and 2.

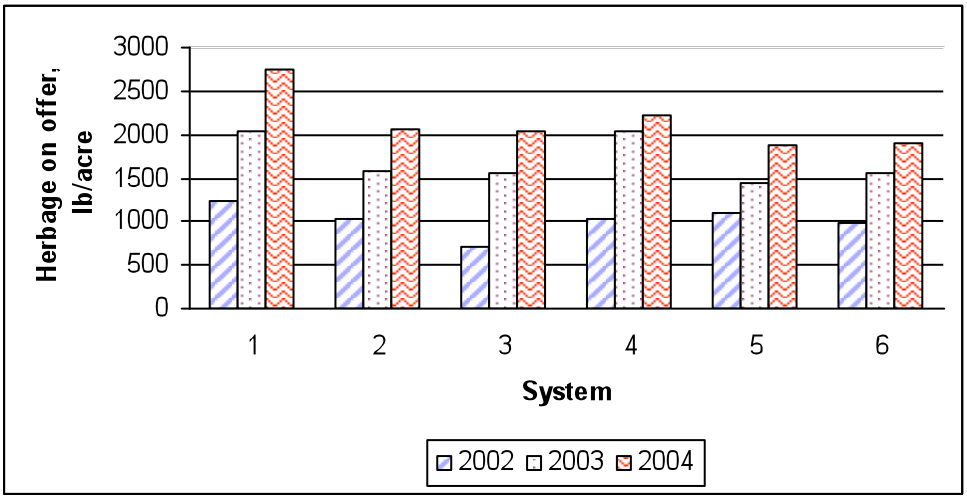


Figure 1. Herbage mass available in each system (average of three replicates)

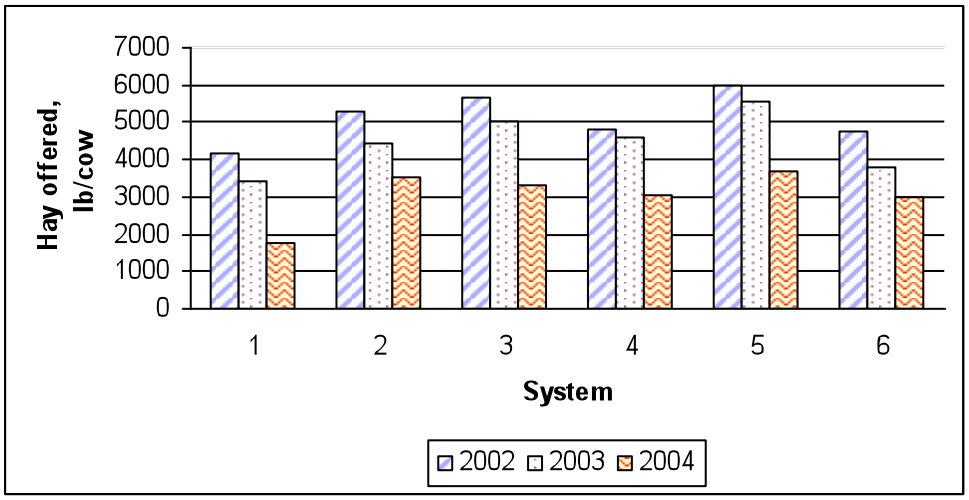


Figure 2. Amount of hay fed in each system (average of three replicates)

There is a clear difference between years on forage on offer and hay fed in the different systems. These differences are larger when 2002 and 2004 are compared.

B. Animal performance

There was no interaction between forage system and year for any of the variables considered. Due to this, the results for selected variables that are considered of interest are presented based on the main factors (system and year).

1. Calves performance

Figure 3 shows the body weight change of calves from birth to weaning across all forage systems

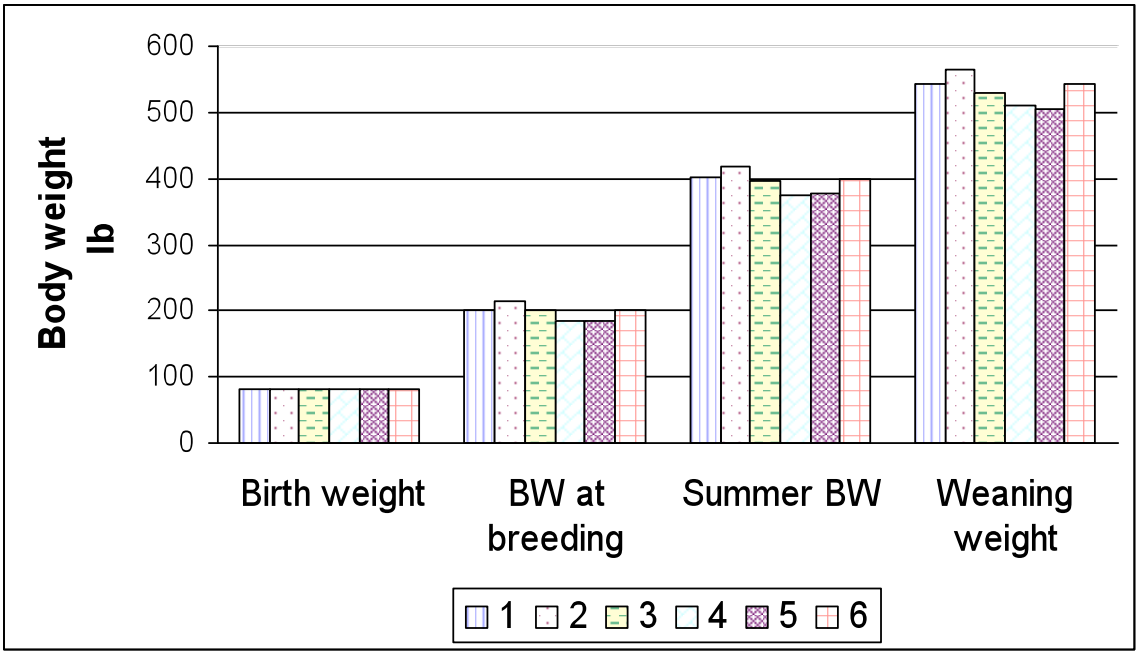


Figure 3. Body weight (lb) of calves from birth to weaning

At birth, calf body weights were not different among the systems. By the beginning of the breeding season, calves from Systems 4 and 5 were significantly lighter than those from the other four systems. This difference was present until weaning. At weaning, calves from system 4 and 5 were between 30 to 50 pounds lighter than the calves from the other systems.

When weaning weight was adjusted for age of the calves (205-d adjusted weaning weight), there was an effect of system and year (Figures 4 and 5). Calves from Systems 4 and 5 were lighter than calves from Systems 1 and 2, while calves from Systems 3 and 6 had intermediate body weights

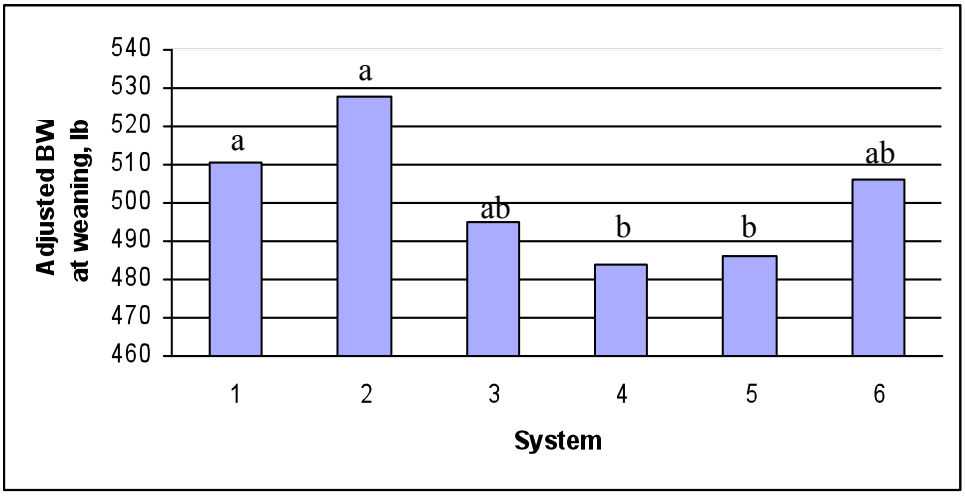


Figure 4. Adjusted weaning weight (lb) of calves born in the different systems

Calves had lower weaning weights in year 1 (Figure 5) primarily due to poor environmental conditions. The 2002 season was marked by extended drought.

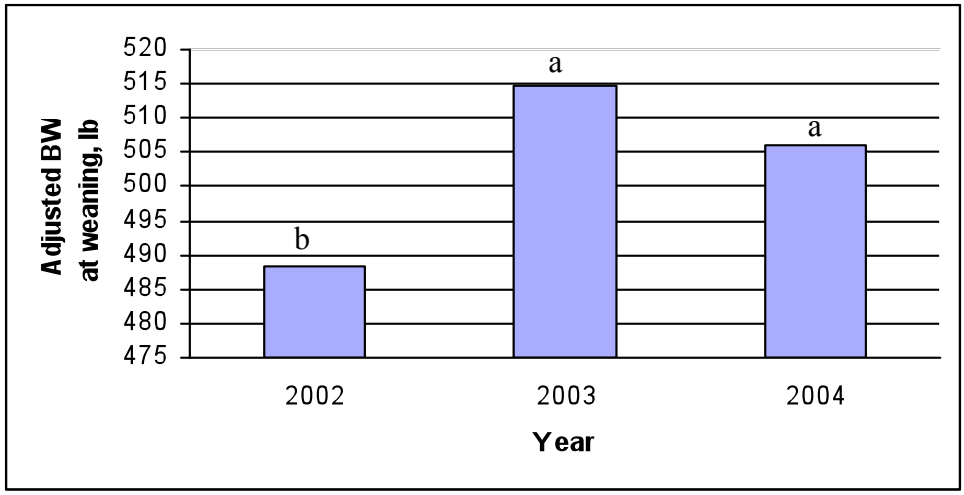


Figure 5. Adjusted weaning weight (lb) of calves (average of the different systems)

2. Cow performance

No effect of system on cow body weight was observed (Figure 6). Body weight loss is clearly observed from mid gestation (early October) to breeding (late April), then cows gain weight after breeding until weaning. In years 1 and 3 (2002 and 2004), the pattern of body weight change (Figure 7) was similar to that seen in Figure 6. In year 2 (2003), cows had sustained gain through the season.

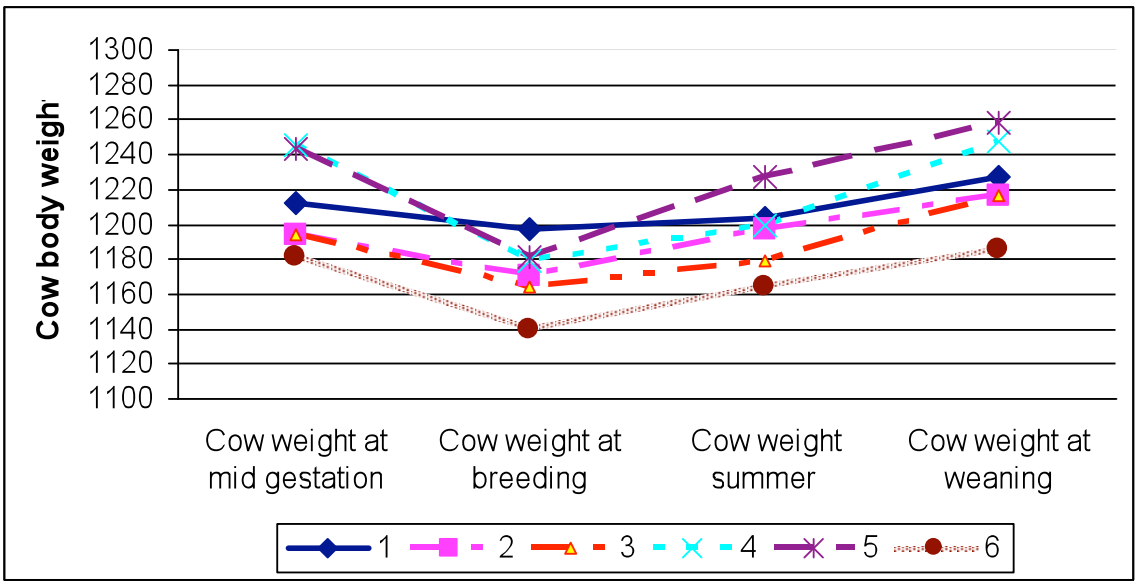


Figure 6. Cow body weight change throughout the year

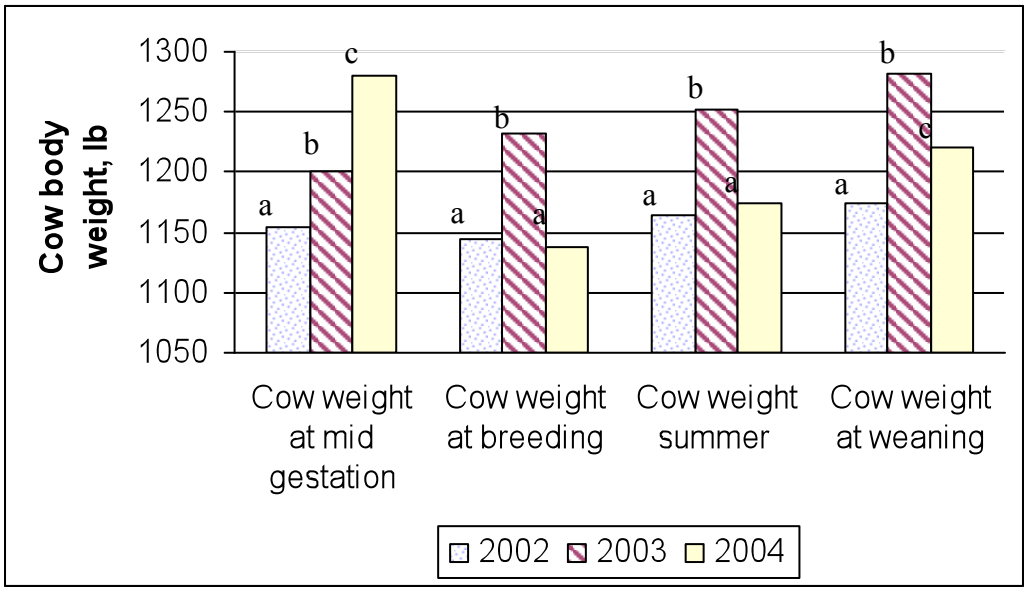


Figure 7. Effect of year on cow's body weight

There were no system effects on pregnancy rates (Figure 8), but pregnancy rates were greater in 2003 (Figure 9). This is probably a result of better environmental conditions. The 2003 season was wetter and cooler than average, resulting in more available forage, which in turn supported greater cow body weights (Figure 7). The cooler conditions were likely less stressful for conception and pregnancy as well.

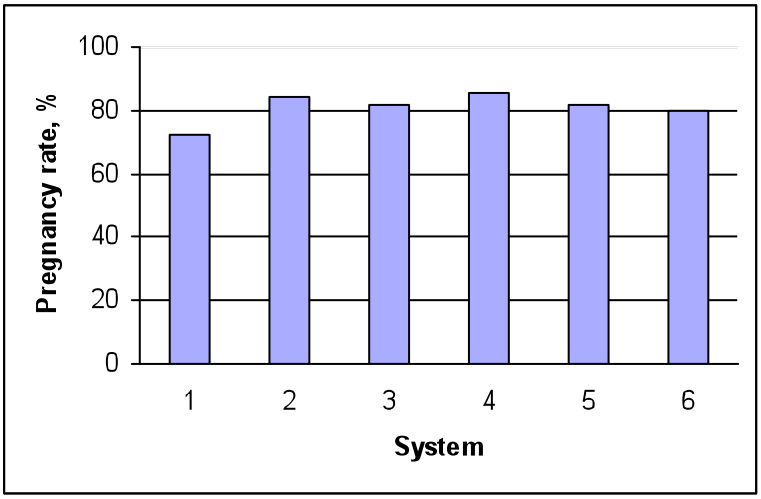


Figure 8. Pregnancy rate for the different systems

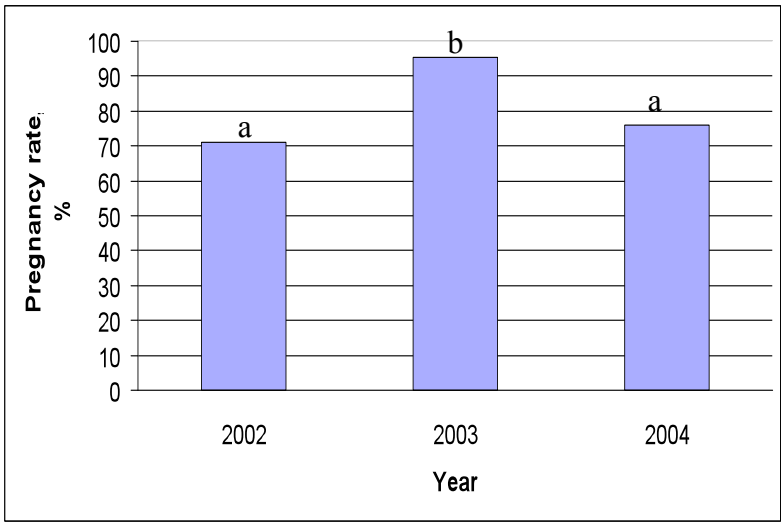


Figure 9. Pregnancy rate by year

Although these results show some differences among treatments, unfavorable weather conditions and less than desirable establishment success of some forages have created difficult challenges for the Project. For these reasons these results should be interpreted with caution.

General observations 2002-2005

- **Overall forage on offer was almost 40% lower in 2002 as compared to 2001 due to extremely dry weather during the growing season. As a result, hay fed increased over 100% in 2002 as compared to 2001 (Figure 8 and 9).**

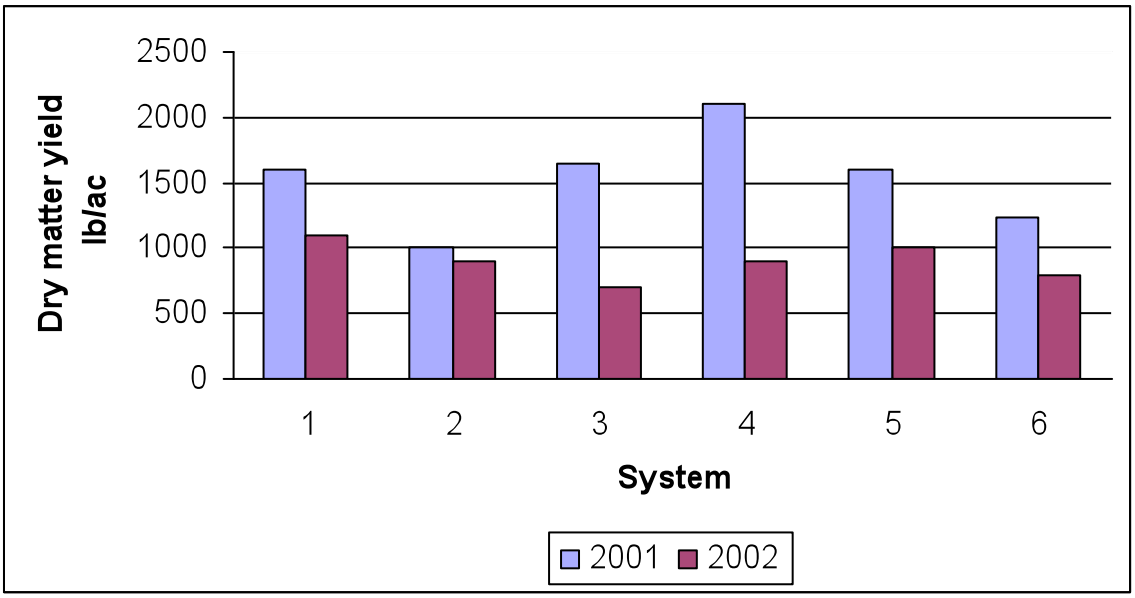


Figure 8. Forage dry matter yield per system (2001-2002)

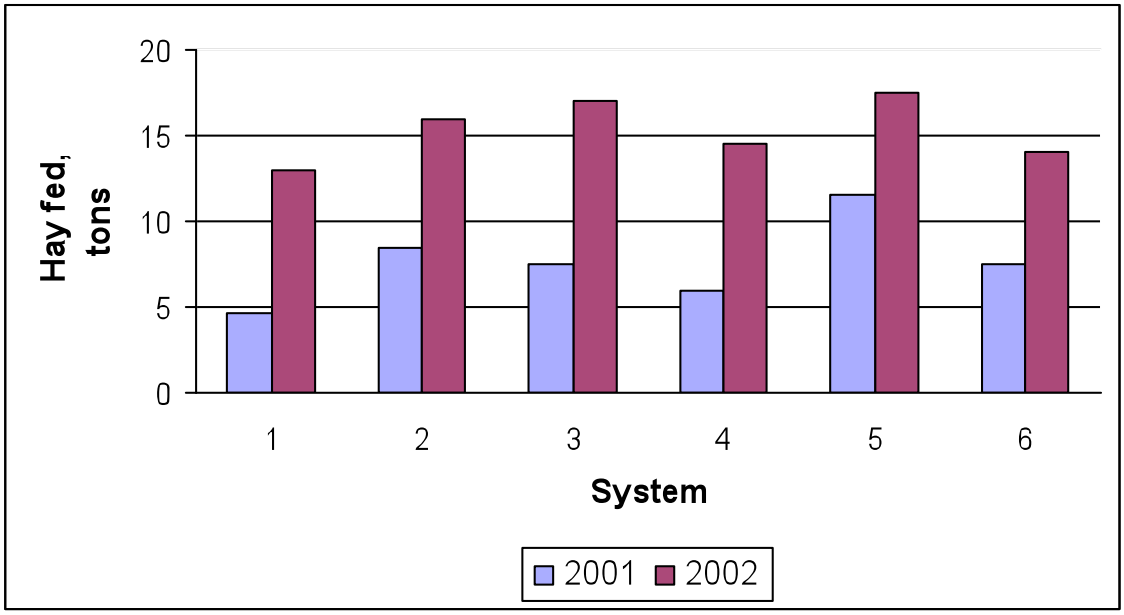


Figure 9. Average hay fed per system (2001-2002)

- **Stockpiled forages for fall and winter grazing in 2001 and 2002 were greatly reduced due to dry conditions, thus requiring additional hay feeding. However, more favorable growing conditions in the fall of 2003 and 2004 produced greater fall forage growth for fall and winter grazing.**
- **Overall, conception rates have been less than desirable for all treatments and replications. The only explanations for the improved conception rates in 2003 are the cooler temperatures and the "flushing" effect of abundant high-quality forages in the spring of 2003. The cows were coming out of an extremely dry winter and gained body condition rapidly in the spring of 2003 due to abundant rainfall and succulent forages.**
- **Bull rotation was implemented in 2003 as one way to help improve conception rates. This reduced the chance of a "low libido" bull being with a group of cows the entire breeding season.**
- **With the exception of 2000, legumes have been difficult to establish. The prolific stands of red clover in the summer of 2000 were detrimental to the fescue establishment in two of the replicates. However, due to the good growing conditions in 2003-2005, ladino and red clover are now more prevalent in the forage mixtures.**
- **Calves have readily adapted to the creep gates which has allowed them to graze higher-quality forages ahead of the cows.**
- **Due to the grass competition and grazing management, both lespedeza and birdsfoot trefoil have been slow to establish and are practically nonexistent. Heavy late summer and early fall grazing have been detrimental to both of these legumes.**
- **Warm season grasses have also been difficult to establish due to adverse environmental conditions. Early attempts to establish Caucasian bluestem failed, resulting in the change switchgrass. However, switchgrass production is only, at best, four months of the year, and switchgrass is not well-suited for overseeding with**

annual cool-season grasses such as cereal rye or ryegrass. This creates a problem in the early spring and late fall and puts an added burden on cool-season forage production in this treatment resulting in additional hay feeding as compared to the other treatments.

- **Weed control, primarily thistle and horse nettle, have been a problem each year. Herbicide was used in the "A" paddocks in the summer of 2004 to help control the horse nettle problem.**
- **Although more labor intensive, we have been able to graze the rotational paddocks longer into the grazing season, especially the treatment containing alfalfa/orchardgrass. Visual observation suggests that forage utilization seems to be better in the rotationally grazed paddocks, however due to the small size of the paddocks and the short duration of the rotation, some paddocks were probably grazed too close, resulting in longer regeneration periods.**
- **In the spring of 2005, a decision was made to graze rather than produce hay on some of the paddocks. This management decision, coupled with adequate rainfall, has provided more cow-harvested forage and less spring hay feeding than in previous years. It has also allowed greater rest periods for more forage re-growth and provided higher quality forage for grazing. This should hopefully translate into higher conception rates and greater forage availability and less hay feeding in the late-August to October period.**

The difficult task of determining what and how much you have in your pastures: Techniques to evaluate/quantify pasture components and available forage

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Crop and Soil Environmental Sciences Virginia Tech

Introduction

Assessment of pasture involves the processes of estimating botanical composition, quality, and availability of the forage. The most practical way of assessing pastures for botanical composition and biomass relies on visual estimation. There is a great need for an effective and efficient sampling method that allows managers to have a good grasp on pasture productivity without significant labor costs. A precise sampling method is very important to evaluate pasture composition, quality, and productivity to obtain optimum animal performance. Botanical assessments of grasslands or pastures are essential to the interpretation of species survival, competitiveness, adaptability, and diversity. Not only is a description of initial conditions needed, but often it is desirable to make frequent assessments of botanical components to describe seasonal effects as well as effects of climate, competition among the components of the sward, and encroachment of weed species. Many sampling methods have been developed to evaluate botanical composition and forage productivity with advantages and disadvantages associated with each one. Producers must examine the assessment methods and decide which one is most appropriate for their operation.

Why is pasture assessment needed?

- To understand and quantify pasture components
- To match animal requirements with available forage (lb/acre) and adjust the amount to be supplemented accordingly
- Assess "weed" encroachment and more effectively manage pasture production and its components

Botanical Composition

1. Visual evaluation

While methods such as hand separation of clipped quadrat samples are highly accurate for the area sampled, they may not adequately describe the pasture as a whole unless large numbers of sampling sites are used. The time required for such sampling and the labor involved quickly become prohibitive. Brodie (1985) described the use of a DAFOR Scale for visually assessing botanical composition. Using a scale where D=dominant, A=abundant, F=frequent, O=occasional, and R=rare is used to evaluate the relative abundance of species. Brodie (1985) describes a species as dominant if most or all of the area is covered. A ranking of abundant would be given to species that cover

about one half to three-quarters of the area. Frequent refers to species that are well scattered throughout the site but cover less than half the area. A species ranked as occasional occurs a few times and a rare species is one that is present only once or twice.

Brodie (1985) suggested that problems with this method include under-assessment of small species, over-assessment of conspicuous species, the need to accurately identify species, and the subjectivity of the method because an individual will assess vegetation more consistently than a group. Attempts to use this procedure specifically in pasture evaluation suggested modifications that may make this a more useful technique. Abaye et al.(1994) modified this procedure as the Double DAFOR Scale for use more specifically in pastures. This modification provides a visual estimate within two scales, one for forages and one for weeds. The Double DAFOR Scale provides a rapid method to describe the species composition of a pasture that would be useful to both producers and researchers. It does require an ability to identify plant species, but with a good manual on forage plant and weed identification and a small amount of training, the Double DAFOR Scale is a useful tool for describing the plant make up of pastures (Table 1).

Table 1. The Double DAFOR Scale

Project_____Treatment_____Date_____Recorder_____

D = Dominant; A = Abundant; F = Frequent; O = Occasional; R = Rare

ID	Ground cover %	Grass %	Legume %	Weed %	Forages					Weeds				
					D	A	F	O	R	D	A	F	O	R

DAFOR scale (Brodie, 1985; Abaye et al. 1994)

D = Dominant - if most or all of the area is covered (1)
A = Abundant - if species cover about ½ to ¾ area (2)
F = Frequent - refers to species that are well scattered (3)
O = Occasional - occurs at few times (4)
R = Rare – species present only once or twice (5)

2. Point transect technique

The point transect method was used as early as the 1920's in New Zealand. This method received little recognition in the U.S. until the 1930's when it was considered a practical method of sampling (Leasure, 1949). In all the point processes, vegetation is recorded as a "hit" when the vegetation is intercepted by any of the points, or pins. The vegetation that is intercepted is then identified and recorded as percent of hits, or average percent composition. A similar method to the point transect method is called the line transect method. In this method, a line or cord is stretched as a transect across the study area

and all vegetation under the line at predetermined intervals is recorded. Both of these methods produce very good results for measuring species diversity, however time can again become a factor.

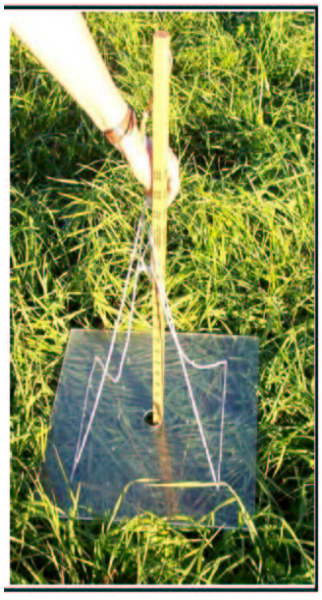
Yield/Biomass Measurements

Density Measurements

Measurement of canopy height is one of the simplest ways to estimate available forage. Canopy height can be measured by using a simple ruler (Figure 2a). Plant height measurements alone can not accurately estimate available forage (forage biomass) due to differences in plant morphology, canopy structure including leaf orientations and stem structures, and plant growth habits (prostrate or upright). Plate meters such as falling plate meters (Figure 2b) and rising plate meters (Figure 2c) give both canopy height and plant density measurements resulting in a better estimate of forage biomass. Rayburn and Rayburn (1998) have conducted extensive research on falling and rising plate meters and have found a strong correlation between canopy height and forage biomass (Table 2).

Figures 2 . Methods used to forage/pasture heights: Ruler (a), falling plate meter (b), and a rising plate meter (c) (Rayburn and Lozier, 2003)

(a) Ruler height



(c) Rising plate meter

Rayburn and Lozier (2003) have developed a chart (Table 2) to easily determine forage mass from pasture height measurements taken with a plate meter (Figure 2a). First, pasture height measurements are taken from different locations throughout the pasture and an average height is calculated. Second, the pasture density is visually estimated by determining whether the pasture is thin, average, or thick. Thin refers to young swards or

converted hay meadows. Average pastures are usually mixed stands of grass and clover, while pure tall fescue or tall fescue mixed with other grasses are considered thick. Finally, the average pasture height and estimated pasture density are used to determine the forage mass of the pasture using the calculation chart created by Rayburn and Lozier (2003).

Table 2. General calibrations for pasture forage density and forage mass at different mean pasture heights as measured with a ruler, a falling plate meter, and a rising plate meter (Rayburn and Lozier, 2003)

Measurement Method			Forage Density			Forage Mass		
			Pasture Tiller Density					
Ruler height	Falling plate meter	Farm Tracker rising plate meter	Thin (aftermath meadow)	Average (mixed grass clover)	Thick (tall fescue)	Thin (aftermath meadow)	Average (mixed grass clover)	Thick (tall fescue)
inches	inches	cm	-(DM lbs/a/inch falling plate ht) -			---------- (DM lbs/a) ----------		
3.0	1.8	7.3	479	583	712	822	1037	1530
4.0	2.4	9.8	464	565	709	1064	1338	1987
5.0	3.0	12.2	448	546	707	1291	1617	2417
6.0	3.6	14.6	433	528	705	1502	1874	2821
7.0	4.2	17.1	417	509	702	1697	2109	3198
8.0	4.8	19.5	401	490	700	1876	2321	3549
9.0	5.4	22.0	386	472	697	2039	2511	3873
10.0	6.0	24.4	370	453	695	2187	2679	4170
11.0	6.6	26.8	355	435	693	2319	2824	4441
12.0	7.2	29.3	339	416	690	2435	2948	4686
13.0	7.8	31.7	324	398	688	2536	3049	4904
14.0	8.4	34.1	308	379	685	2620	3128	5096
15.0	9.0	36.6	292	361	683	2689	3185	5260
16.0	9.6	39.0	277	342	681	2742	3219	5399
17.0	10.2	41.5	261	323	678	2780	3231	5511
18.0	10.8	43.9	246	305	676	2801	3221	5596

Both the falling plate and the rising plate meter have become very popular due to their ease of sampling, training and timeliness in the field. These methods are also relatively simple to use and users can achieve accurate measurements with less training when compared to methods such as visual estimation that takes more training to get the same level of accuracy (Karl and Nicholson, 1987).

As with most sampling methods the falling plate or rising plate meter has some drawbacks. The calibration can be thrown off easily by changes in sward management such as an increase or decrease in grazing pressure. Other factors such as change in weather conditions, time of day, and season can affect plate meter readings. Calibration can also be affected by simply having a change in botanical composition, especially a change in

broadleaf weeds (Kar and Nicholson, 1987). While the falling or rising plate meters are a quick method for obtaining estimates of sward density, it takes a lot of data to obtain good calibrations for one sward.

Summary

Knowledge of the plant species that make up a pasture and the relative amounts of each species present is important for interpreting potential animal performance. It is also important to know the relative amounts and types of weeds present, and to monitor for the presence of poisonous plants or noxious weeds. Plant composition of a pasture can change rapidly. Most currently used techniques to describe the plant species composition of a pasture are laborious, time consuming, and may require specialized equipment. This presents challenges to producers and researchers who need this information and may require it on a regular basis. Plant density can affect the biomass and growth of pasture and thus accurate assessment of plant density can help estimate available forage and help interpret potential animal performance.

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SMALL SCALE FOREST HARVESTING ON THE URBAN INTERFACE

Kris Jensen and Dr. Rien Visser

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Rapidly growing communities and development present numerous challenges to natural resource managers, foresters, and the forest industry. As the urban interface expands, forestland is being lost to development, and the forests that remain are often fragmented into small tracts. In the state of Virginia there are now over 400,000 forest landowners with less than 50 acres. Many of the new landowners in the urban interface come from an urban background and have different opinions about forest harvesting than their rural predecessors.

Urban interface forest landowners, as well as farmers who own small woodlots, may be unaware of the potential benefits of good forest management. A survey in Virginia showed that aesthetics and wildlife management are the landowners primary objectives for potential forest management activities in these small forests. Most also stated that they would consider harvesting if there was a balance between the economic gain and their primary objectives. The main concern about timber harvesting is the disturbance caused by logging equipment and the conditions of the site after the harvest.

The majority of commercial forest harvesting equipment is not well suited for harvesting in small woodlots. However, a wide variety of harvesting systems are available that could be used to harvest interface forests, and many forest landowners are interested in harvesting using small equipment and technologies. Unfortunately, smaller equipment and technologies do not automatically equal low impact harvesting, and unacceptable site impacts can be caused by both small scale and conventional systems. Little is known about the site disturbance, level of impact, system productivity, or harvesting costs of small scale harvesting systems when used in woodlots. Small tract size and low harvest volumes make it difficult to harvest small woodlots profitably.

The ideal harvesting system for interface forests is small, lightweight and nimble, yet safe and cost effective to operate. Lightweight machines with low ground pressure can harvest on sites where soil compaction and rutting is a concern, and small and nimble equipment can fit through the narrow openings without damaging the residual stand. Smaller equipment reduces transportation costs, and can help to make harvesting small sites cost effective.

The Virginia Department of Forestry sponsored a program that included a series of case studies on small scale harvesting systems, as well as a series of workshops throughout the state. Case studies were conducted on an agricultural tractor harvesting system, a cut-to-length harvesting system and a small scale skidder harvesting system to determine the site

impacts, productivity and harvesting costs of each system when operating in urban interface forests.

At the McCormick Farm, a modified agricultural tractor harvesting system was used that consisted of chainsaw felling, limbing and bucking and a John Deere four wheel drive model 950 tractor equipped with a Fransguard V2800 skidding plate and PTO driven winch (Figure 1).

Figure 1. John Deere 950 tractor modified for forestry work

The tractor is rated at 30 horsepower, and the winch has two sliding choker attachment points, and one fixed point. The skidding plate is designed to allow multiple chain chokers to be attached directly to the plate. Directional felling was used to reduce extraction efforts, and whenever possible, pickeroons were used to pre bunch pulpwood stems into small piles of 3 to 5 pieces.

The tract selected for harvesting was a 15.5 acre mixed hardwood stand located on the southwestern side of the property that was high graded and grazed by cattle in the past. The site is similar in species composition, stand structure and harvesting history to many of the small woodlots found throughout Virginia. The primary species that make up the stand are hickory (*Carya spp.*), black oak (*Quercus velutina*), northern red oak (*Quercus rubra*), and white oak (*Quercus alba*). The stand gently slopes from north to south with a relatively consistent slope of 13%, and is a limestone derived, Frederick soil series. A 3.5 acre crop tree release was conducted on this site to improve the quality of the stand and to use as a demonstration site for future landowner workshops. Prior to the harvest, there were 285 trees/acre, average dbh was 14 inches, and the basal area was 115 ft^2/acre.

The results from the study showed that slight site disturbance occurred on 11.4% of the area, and residual stand damage was 5.8% of the trees. Productivity and harvesting costs were 2.9

tons/PMH at $29.20/ton. For small woodlot harvesting to be successful, harvesting systems need to reach a balance between reducing site impacts and residual stand damage and maximizing productivity and profitability.

IS SILVOPASTURE MANAGEMENT AN OPTION?

Dr. John Fike
Crop and Soil Environmental Sciences Virginia Tech

What is silvopasture/silvopastoralism/silviculture and why practice it?

Silvopastoralism is a management practice which intentionally integrates trees, forage crops, and livestock. It is a form of the broader term, agroforestry, which, as the word indicates, integrates forestry and agricultural practices.

The goal of silvopastoral management is to capture beneficial interactions between each of the system's components. For example, having trees in pastures can increase the production, nutritive value, and digestibility of forages as compared to forage grown on open sites without trees. Animals also may benefit from reduced heat stress and altered grazing patterns, and trees may be more productive with the recycling of nutrients by animals.

Nutritional responses observed in forages may reflect changes in micro-environment, botanical composition, or both. For example, poor quality forages such as broomsedge may be reduced in pasture swards grown under trees. Conversely, bluegrass, a very nutritious forage, is often seen in greater amounts under trees. And, because the growing conditions under the trees are moderated, the forages that grow there may be more digestible.

Shade and shelter from trees can benefit livestock by mitigating environmental extremes. Trees provide evaporative cooling, reduce radiant heat loss at night, and reduce wind speed. These buffered environmental conditions allow animals to spare energy for growth, particularly under hot conditions. Increased gain, milk yield, and conception rates have been reported for cattle or sheep grazing pastures with trees in warm environments, but even in our environment, it is not unusual to find cattle looking for shade when air temperatures are in the 50s.

Greater animal performance in silvopastures is likely due both to increased forage production and to direct effects on animal comfort. We have observed 15 to 20% greater forage production under black walnuts and honey locusts in research in Blacksburg. Because pasture productivity can be increased with appropriately spaced trees, it is possible that adding trees to pastures can potentially support increased stocking rates. Conversely, adjustments to stocking rate might not be warranted if comfortable animals respond with greater forage intake and faster growth rates.

Another question about silvopastures is their effect on forage acceptability. Forage nutritional characteristics and digestibility can be improved in silvopastures, but some research has found reduced palatability. Decreased palatability may be related to reduced non-structural carbohydrates observed in shaded plants. Livestock prefer and gain better on forages with greater non-structural carbohydrates. The impact of reduced non-structural carbohydrates on palatability and performance needs further study. We currently don't know if the increase in total plant digestibility is offset by the reduction of non-structural carbohydrates.

While most research suggests moderate shade (about 50% of full sun) is best for forage production, this may be difficult to maintain as an endpoint. Changes in resources (light, temperature, and moisture) available to the forage sward occur as trees mature, thus

forage production will necessarily change over time. Systems managed for continuous livestock production (versus animal removal as the tree canopy closes) need to focus on maintenance of ideal tree density to maximize the benefits of the tree-grass association and minimize the negative effects of competition between these two components. Forage production in pastures planted with conifers decline as trees close canopy, but this is not necessarily the case for pastures planted to open-canopied deciduous trees. More research is needed to define forage response in deciduous silvopastures through time

Selection of tree species for silvopastures

Tree species is an important consideration when establishing silvopastures. Desirable tree characteristics include: 1) marketable timber; 2) high-quality wood; 3) rapid growth; 4) deep-rooted morphology; 5) drought tolerance; 6) production of additional products such as nuts or fodder; 7) and provision of environmental conservation services.

In the Ridge/Valley, hardwood trees such as black walnut typically are well-suited for use in silvopastures. Other trees which may have potential for this region include black locust, honey locust and pecan. In Virginia's Southern Piedmont, loblolly pine may be the tree of choice given its high market value.

Walnuts and hardwoods with similar characteristics can be successfully integrated with pasture production because they produce leaves late in spring, they have sparse, open canopies, and they release leaves early in fall. Such timing and spatial arrangement allows penetration of sufficient light to support forage growth and can reduce competition for resources when grass growth rates are at their highest.

Root architecture is another important tree characteristic to consider. Deep-rooted trees with limited lateral extension in the topsoil are preferred. This type of root shape limits interference with grass roots in the topsoil. And, greater resource sharing can occur if tree and grass roots are active at different times. Tree roots can also capture nutrients from deeper in the soil and can serve as a safety net against loss of nutrients by leaching.

Tree establishment

Silvopastures can be successfully established and managed by planting trees and forages at the same time, by planting trees into existing pastures, or by thinning existing tree stands and planting forages. Planting trees into pastures provides greater flexibility than thinning existing forests. Tree spatial arrangement can be structured to meet management needs, and species with greatest utility or economic merit can be selected.

However, this may require some extra management. Newly-planted trees may need protection from competition until their root systems are below the forage crop's root layer. Early spring herbicide applications that control cool-season pasture can double tree stem volume. Mulches can also be effective, but growth benefits are not as great. Degree of protection required depends upon the vigor of the seedling, which will differ by tree species.

Trees also need protection from livestock and wildlife to prevent damage from trampling or browsing, especially during early years of establishment. Protective measures include removal of livestock from the site, protecting individual trees with tube shelters, cages, or repellents, or use of electrified fencing to protect rows or groups of trees.

Both tree and animal species must be considered when determining protection requirements. Palatable trees will require greater protection, especially from animals that browse, while a single strand of electric fence over the tree row may prevent cattle from

trampling young conifers. Complete exclusion of livestock from new plantings can be useful, provided wildlife pressure is low. Livestock can be returned to pasture once trees are no longer vulnerable to damage, and the forage crop may be mechanically harvested until that time.

Long rotation lengths (the time from planting to harvest) may be a concern for some producers, especially where land tenure is an issue. However, this should not discourage producers and managers looking for rapid returns on investment. Trees may provide products and services long before their harvest at the end of a rotation. Even if managed only for timber, trees may be viewed as a bank account accruing interest with real value that can be sold. Moreover, long rotation lengths need not be perpetual, because multiple rotations can be created. At the appropriate stage, the next generation tree stand can be strategically planted in the understory or established on other nearby pastures, allowing future harvests to be spread out in space, time, or both.

Silvopasture concepts and practices are not new, but their research and use in North America have primarily been limited to the pine plantations of the Southeast and coniferous forestlands of the West. Despite their potential, use of silvicultural practices has been limited in other regions of the USA because of a lack of producer familiarity and a few available management recommendations.

Silvicultural practices can potentially provide rewards from increased production and farm product diversity, as well as providing environmental benefits. This management will, however, require producers to think about their production systems in new ways and to acquire new skills. As one scientist noted, "Silvopasture management…requires shifting our thinking in both spatial and temporal domains and demands skills in managing [complexity] rather than reducing complexity". This may prove both a challenging and an exciting endeavor, regardless, it is the trend for agriculture in the 21st century.

Update on the McCormick Farm Forestry Demonstration Area

Karen Stanley, Forester, VDOF

In 2001, an idea was formed to start permanent forestry demonstration areas after providing the McCormick Farm AREC a Forest Stewardship plan for over 150 acres of forested land on the historic farm. The forest plan identified different forest types on the farm. These areas were relatively accessible and already located on a research farm that was easily located near interstate 81.

Most of the proposed demonstration areas will deal with hardwood management on sites typical to the Shenandoah Valley. The first demonstration area was to demonstrate two different types of improvement harvests. The first was a Crop Tree Release to remove competition from certain higher quality "crop trees". The other side was a commercial thinning harvest to remove low quality timber, though not focusing as intensively on the residual stand.

A clearcut area with a deer management fence will hopefully demonstrate the damage that deer can do to a reproducing forest. It will also demonstrate the benefits of a well-planned clearcut for reproducing high quality hardwood species. A shelterwood harvest is planned to reproduce yellow poplar and other light seeded species in another area. This is a lesser-used harvesting method that can produce results similar to a clearcut without the social aesthetic detractions.

Use of prescribed burning, moderated herbicide usage on invasive species, and pre-commercial operations to change species composition may be used for demonstration of the enhancement of a forested stand. The long-term plan is to have periodic projects so that there is something to see at any given time. And the other stands will have time to grow and show change before another project is undertaken.

The Virginia Department of Forestry has already used McCormick farm's woodland areas for educational demonstrations and also forestry competitions for high school students. McCormick farm can also benefit from this cooperative effort by improving their forest stands and recognize some monetary benefit from the periodic harvesting. Virginia Cooperative Extension as well as the Virginia Tech College of Natural Resources are close cooperators on this ongoing project. The Skyline Chapter of the Society of American foresters and the student chapter from the Dabney S. Lancaster forestry curriculum also lend their abilities to this project. We hope that we are able to show you further forestry projects on this research farm in the future.

Understanding Sheep Ultrasound Measurements for Carcass Traits

Scott P. Greiner
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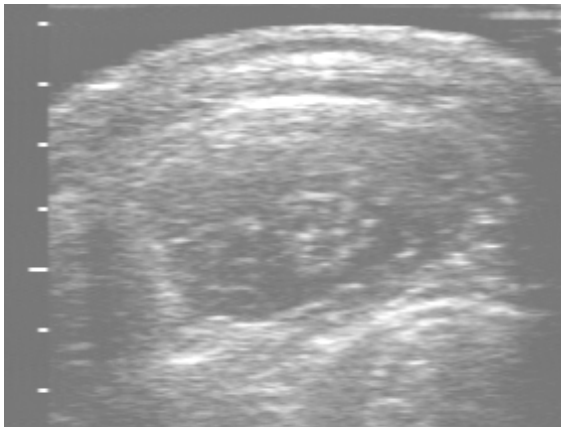
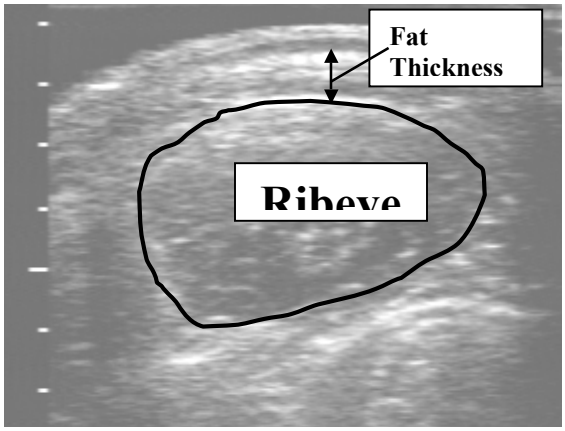
The use of real-time ultrasound technology allows for the objective estimation of carcass traits in live animals. Ultrasound technology is used extensively in beef cattle and swine, and has been an important tool for the genetic improvement of carcass merit in these species. Although ultrasound has been used on a limited basis in sheep, it does offer the same opportunity to quantify conformation in an objective manner. Carcass traits should be considered along with other traits of economic importance (reproduction, growth, maternal ability) when selection decisions are made by flock owners. Since carcass traits are highly heritable, a significant portion of the differences measured in rams or ewes for these traits should be passed on to their progeny and directional change for these traits can be accomplished in a relatively short time.



Ultrasound Images collected for Fat Thickness and Ribeye Area



Fat thickness:

External fat thickness (back fat) is quantified at the 12-13th rib and measured directly over the ribeye muscle. Fat thickness is the most important measurement affecting carcass cutability, and has an inverse relationship with the percentage of the carcass that is saleable. As fat thickness increases, the percentage of carcass boneless retail cuts decreases. Conversely, lambs with lower levels of fat thickness produce carcasses with higher percentages of retail cuts and less fat trim loss. Fat thickness is also the single measurement used to determine lamb Yield Grades. Research indicates that fat thickness can be measured quite accurately with ultrasound: 67% of the time the ultrasound measurement should be within 0.05 inches of the carcass measurement.

Ribeye area:

Ribeye area (measured in square inches) has a positive relationship with carcass cutability and percentage of retail cuts. It is important to recognize that leg muscle score and ribeye area are not perfectly related. Although both are indicators of muscling, ribeye area is the most useful and accurate indicator of total muscle- and the only trait that can be objectively quantified in a practical manner in the live animal or carcass. Ribeye area measurements with ultrasound should be within 0.3 square inches of the carcass measurement 67% of the time.

Adjustments:

Both fat thickness and ribeye area are commonly adjusted to a constant weight endpoint. A standard slaughter weight of 125 pounds is commonly used. To fairly and accurately compare animals, it is essential to adjust the data to a common endpoint. Actual measurements can be misleading due to differences in age, weight, and management. Due to sex differences, rams should be more muscular and leaner than either wethers or ewes at a given weight endpoint when managed in a similar manner.

Accuracy:

Proper use of ultrasound data involves an understanding of its limitations. Although ultrasound is far superior to visual appraisal for estimating these traits, the technology has inherent accuracy limitations. As an example, rams having measurements of 2.6 vs. 2.7 square inches are likely not detectably different for ribeye area (accuracy is plus or minus .3 square inches 67% of the time). However, we could be more confident that a ram having an ultrasound ribeye measurement of 3.0 square inches is more muscular than a ram with a 2.0 square inch ribeye. Ultrasound may be most useful to distinguish which sheep are above average, average, or below average compared to their contemporaries. Additionally, ultrasound is very useful for determining extremes.

Genetics of Scrapie- Codon 171: Questions and Answers

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Virginia Tech

What is scrapie? Scrapie is a slowly progressive infectious disease of sheep and goats, which causes degeneration of the central nervous system. Early symptoms of scrapie include anxiousness and excitability, with head/neck tremors and uncoordinated movement. Advanced stages of the disease are characterized by progressive weight loss, and intense rubbing and scraping against anything to relieve itching of the skin, as well as uncoordinated movement and violent shaking. Due to a long incubation period (2-5 years), the disease normally affects mature sheep. Scrapie is one of several diseases known as transmissible spongiform encephalopathies (TSE) that affect animals and humans. Bovine Spongiform Encephalopathy (BSE) is a TSE that degenerates the nervous system in cattle. In humans, Creutzfeldt-Jakob disease and Kuru are two known TSE diseases. The prevalence of the disease in the U.S. is very low.

What causes scrapie? Current research supports that scrapie is caused by an infectious protein particle called a prion or prion protein. These scrapie prions appear to have the ability to recruit other normal proteins and induce them to alter their structure to become scrapie prions. This is quite different from other infectious diseases, commonly caused by bacteria or viruses. Scrapie is <u>not</u> a genetic disease.

How is scrapie transmitted? The scrapie agent is most commonly transmitted from an infected ewe to her own or other lambs during the first few months of life. This lateral transmission may occur orally or nasally, as the scrapie agent has been found in various sheep tissues and body fluids including central nervous system tissue and the placenta. The role of environmental contamination with the scrapie agent (feed, water, bedding) is not known. Rams generally do not play a major role in transmission of the disease.

What is codon 171? Proteins are manufactured by the joining together of amino acids. Genes code for the sequences of amino acids that form a protein. Genes are made up of stretches of DNA, which is the basic hereditary material of organisms. Variations in proteins (amino acid sequences) are coded for by different forms of genes, known as alleles. In the case of scrapie, the amino acid of interest is located at codon 171 (codons are stretches of DNA that code for a single amino acid).

What are Q and R? There are two basic alleles (forms of the gene) at codon 171 that have been found to be related to scrapie susceptibility or resistance. The "Q" allele is known to produce proteins that are susceptible to conversion to scrapie prions. The "R" allele is thought to produce proteins that are not susceptible to this conversion to the scrapie prion (resistant). A sheep will have two copies of the prion gene in each cell. These copies may be the same or different alleles (i.e. "Q" or "R"). Therefore, a sheep may have a genotype of "QQ", "QR", or "RR" at codon 171. "QQ" would indicate the sheep has two copies of the "Q" allele, "RR" two copies of the "R" allele, and "QR" one copy of each allele. The genotype of any sheep can be determined from a blood sample.

So how do "Q" and "R" relate to scrapie susceptibility? Research has demonstrated that sheep with at least one "R" have increased resistance to scrapie, and sheep with the "QQ" genotype are most susceptible. It is important to recognize that "QQ" sheep are <u>not necessarily carriers</u> of scrapie or infected with the disease. <u>To be a carrier or to acquire the disease, sheep must be exposed to the scrapie agent (regardless of their genotype).</u> Therefore, genotypes "RR" and "QR" are likely to be more resistant to the scrapie disease than "QQ" sheep <u>IF</u> they are exposed.

How can codon 171 genotypes be used in ram selection? Keep in mind that a ram will pass on one copy of each chromosome to its offspring. For rams that are "RR" only "R" sperm will be produced, and for "QQ" rams only "Q" sperm will be produced. Sheep that are "QR" will produce 50% "R" and 50% "Q" sperm. Therefore, "RR" rams will transmit resistance to their offspring 100% of the time ("R" is always passed on), while a "QR" ram will transmit resistance to 50% of its offspring ("R" passed on half the time). A "QQ" ram always transmits a "Q" to its progeny. By knowing the ram's genotype, the percentage of progeny that will carry resistance can be estimated. This is most relevant if replacement ewe lambs will be kept (development of a resistant ewe flock). If all progeny of the ram will be sold for slaughter, their genotype is of less concern (since they are slaughtered young). Codon 171 is a tool that can be used to breed for sheep that have genetic resistance to the disease. The genotype can be used along with the most economically important traits of growth, reproduction, and maternal traits in selecting rams.

Backgrounding Calves on Forage

W. S. Swecker, Jr, G Scaglia, D A Fiske, JP Fontenot

Introduction

The transition from the cow-calf system to the “next phase” for steer and heifer calves can involve multiple stresses and increased risk of disease. Depending on the operation, this may include the beginning of the heifer development program; preparation of steers for wintering, retained ownership, or the purchase of new cattle

Below is a chart that shows the growth of the steers from the Forage Systems Project from birth to 30 days prior to harvest for the years 2001-03. The backgrounding period is highlighted with the small box. You will note a decrease in the rate of growth after weaning (approximately 200 d of age). What can we do to optimize gain in this period relative to potential performance of the calf and forage resources?

We have evaluated the use of forage-based systems for the backgrounding period at Shenandoah Valley AREC and Kentland. This manuscript describes the results of backgrounding studies for the past 2 years.

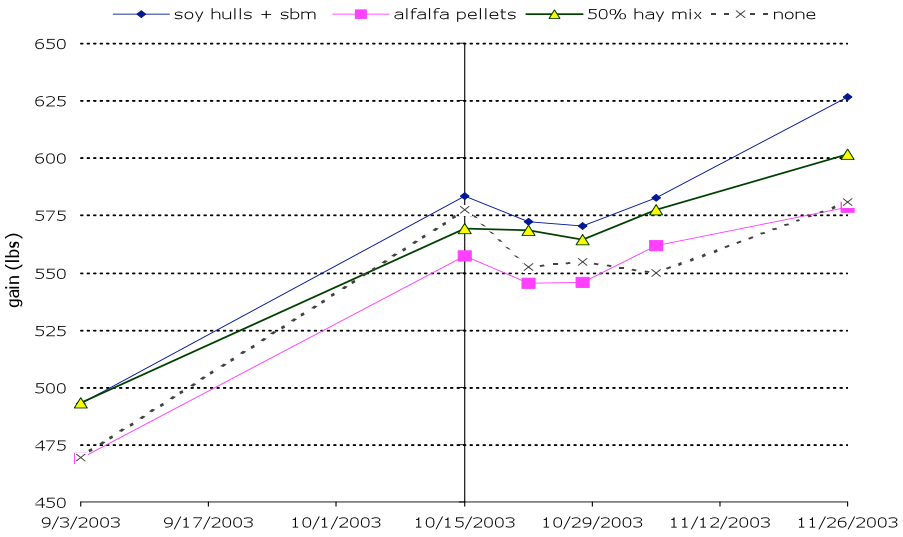
Each study has a brief description of the cattle, dates, and treatments applied. The farm raised steers and heifers come from SVAREC. As forage system cattle are weighed from birth to weaning, the results of the backgrounding studies will also include weights approximately 1 month prior to weaning.

For purchased steers, the initial weight is the weight upon arrival rather than the purchase weight.

SVAREC raised steers:

2003: 36 Steers
Pre-weaned vaccinated and dewormed on 9/3/03. Weaned Oct 15, 2003.
Backgrounded on fungus-infected fescue
4 treatments (9 steers per treatment). All supplements fed at 1% body weight daily

1. Soybean hulls
2. Alfalfa pellets
3. 50% hay, 50% concentrate
4. No supplement



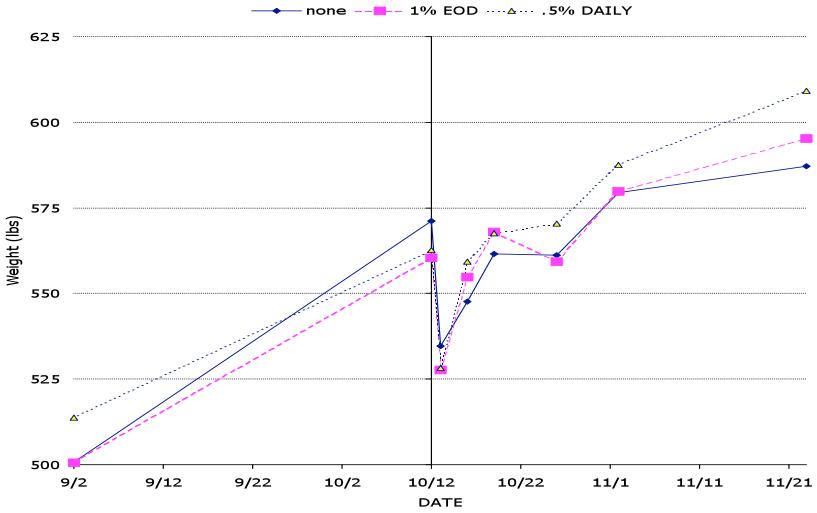
2004: 48 Steers
Pre-wean vaccinated 9/1/04, Weaned and dewormed 10/11/04
Backgrounded on endophyte-free fescue
2 Stress treatments

1. Weaned, shipped to Blacksburg, shipped back to Steeles Tavern that night
2. Weaned, dry-lotted one day

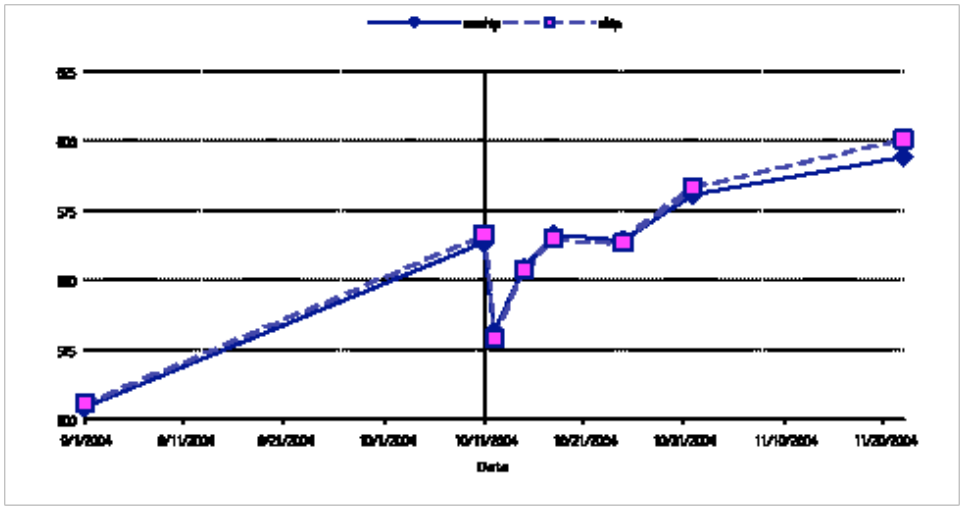
All calves placed on pastures 1 day after weaning
3 Supplement treatments applied to each stress treatment

1. No supplement
2. 0.5% body weight once daily
3. 1% body weight every other day

Feed Treatment



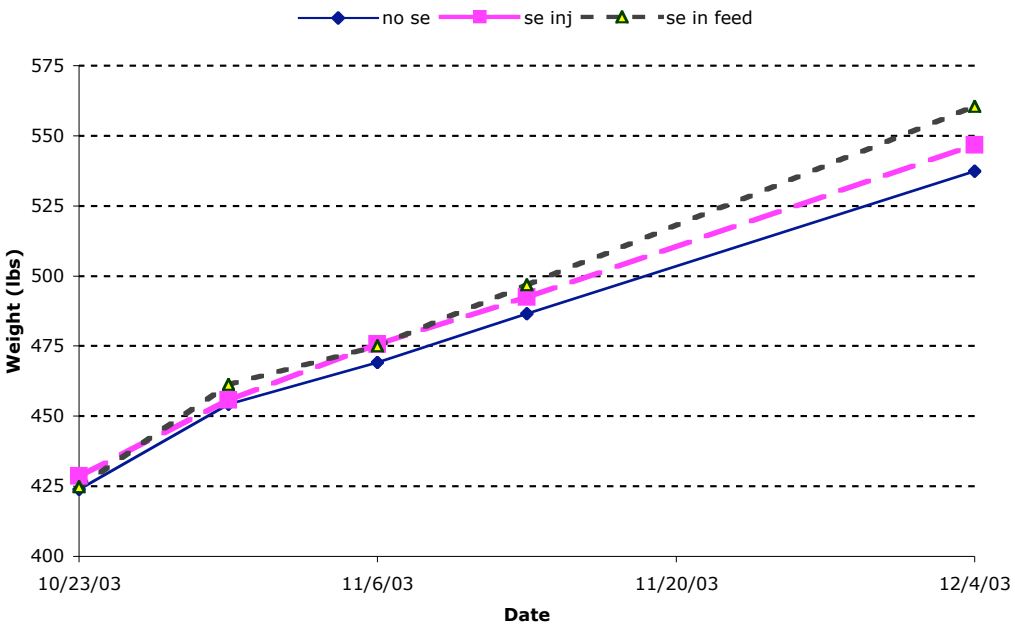
Stress Treatments



Purchased Steers

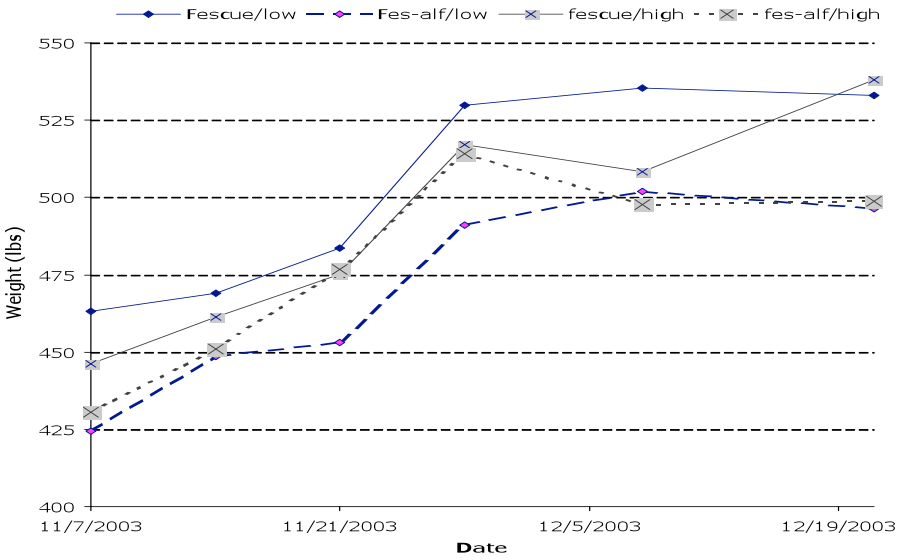
2003: 36 Steers, Steeles Tavern Purchased 10/22/03
Received, vaccinated and dewormed10/23/03
3 Treatments: All calves fed 4 lbs of corn/SBM mixture once daily

1. No Selenium supplementation
2. Selenium injection: 1 cc Mu-Se /220 lbs BW on 10/23
3. Selenium in feed


no se
se inj
se in feed
575
550
525
500
475
450
425
400
Weight (lbs)
10/23/03
11/6/03
11/20/03
12/4/03
Date

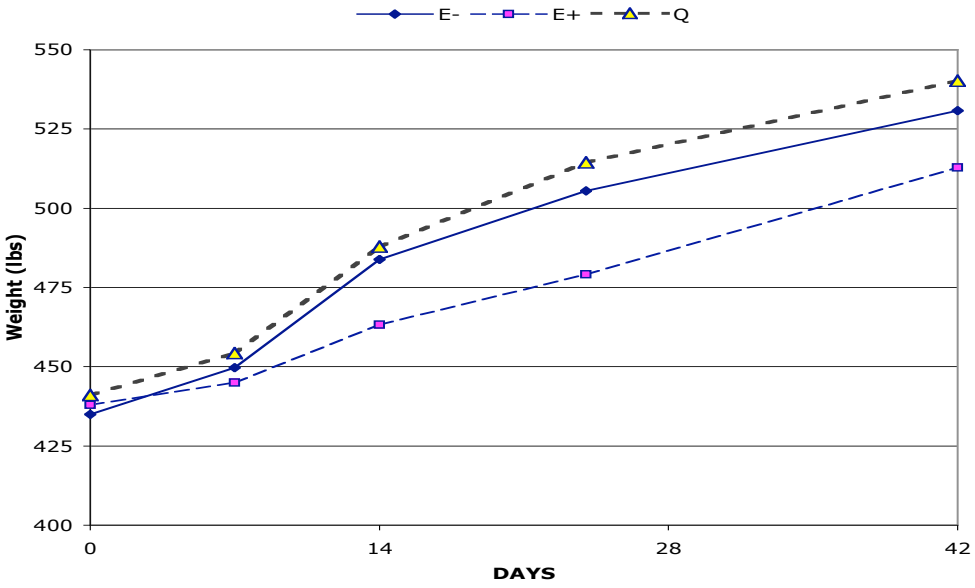
2003: 48 Steers, Kentland, Purchased 11/6/03
Received, vaccinated, dewormed on 11/7/03
4 treatments

1. Endophyte-free fescue - low stocking density (n=8)
2. Endophyte-free fescue – high stocking density (n=16)
3. Endophyte-free fescue + alfalfa - low stocking density (n=8)
4. Endophyte-free fescue + alfalfa - high stocking density (n=16)



2004 36 steers, Kentland
Purchased 10/20 and 10/25
Received, vaccinated and dewormed respective groups on 10/21 and 10/23
3 Pasture Treatments

1. Endophyte infected fescue: E+ (n=12)
2. Endophyte free fescue: E- (n=12)
3. Friendly or nil-ergot, endophyte infected: Q (n=12)



Summary of Steer Studies

SVAREC Steers

Farm Raised steers gained 25lbs (2003) and 33 lbs (2004) in the 42-d backgrounding period. For 2003, supplementation provided an additional 29 lbs compared to no supplement. Assuming 200 lbs feed / steer, this implies a feed efficiency of 6.8 lbs of supplemental feed for each additional lb of gain. At $75/cwt for additional gain, feed must be delivered at less than $200/ ton. For 2004, using the same criteria, but lower feeding rate, the feed must be delivered at less than $357 / ton.

We observed a 6-7% shrink for calves one day after weaning either when shipped for 4 hours or drylotted for one day.

Purchased Steers

Steers backgrounded on forage alone gained 76 lbs (2003) and 90 lbs (2004) during the 42-day period. This gain reflects weight upon arrival, not purchase weight so the gain should be discounted by an estimated shrink of 25-40 lbs.
There were no direct comparisons of supplementation to no supplementation in purchased steers.

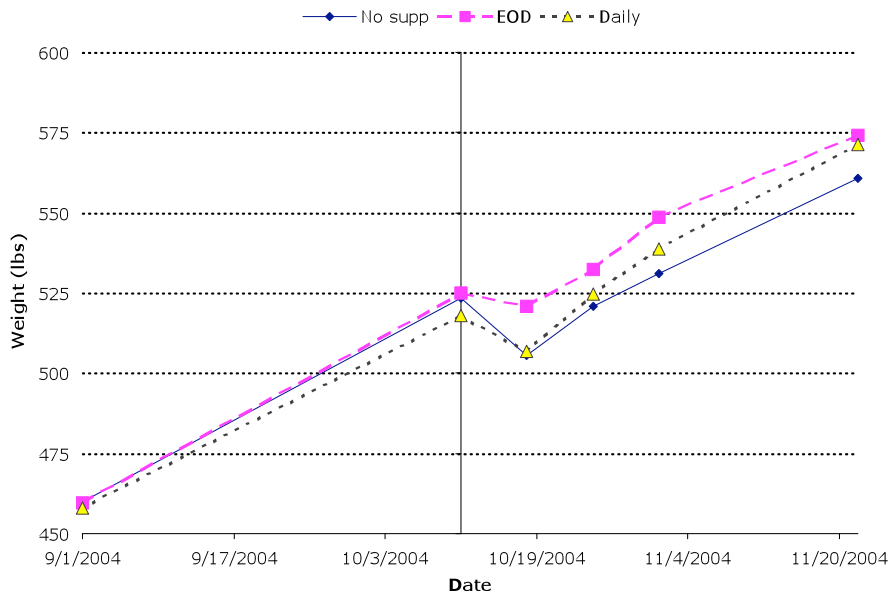
SVAREC Heifers

2003 SVAREC Heifers n=36
Prewean vaccinated and dewormed 9/3/03
Weaned 10/15/2003, moved to stockpiled fescue + red clover
Three treatments

1. Soyhulls + soybean meal fed at 0.5% body weight daily (n=12)
2. Soyhulls + soybean meal fed at 1 % body weight every other day (EOD) (n=12)
3. No supplement (n=12)

2004 SVAREC Heifers n=36
Pre-wean vaccinated 9/1/04
Weaned, dewormed and moved to stockpiled fescue + red clover 10/11/04
Three treatments

1. Corn, soyhulls, wheat midds 0.5% daily
2. Corn, soyhulls, wheat midds 1% EOD
3. No supplement



Summary of Farm Raised heifers

Heifers gained 52 lbs (2003) and 46 lbs (2004) in the 42-day backgrounding period. Supplementation resulted in 20 (2003) and 14 (2004) extra lbs in the backgrounding period. Assuming criteria similar to the steers, feed for the heifers would have to be purchased and delivered for less than $285/ton in 2003 and $200/ton in 2004.

Summary

Heifers and steers can be successfully backgrounded on a forage-based diet. Supplementation of calves on pasture will increase gains but feed efficiency of the gain must be considered, e.g. what is the cost of the gain? Forage quality and quantity must be considered in this late fall period. We, like many producers, can be frustrated in finding quality forage when stockpiling fescue for the cows and lack of rain in August or September limits available forage.

We are challenged with monitoring of disease, especially shipping fever, on forage-only systems. All cattle are observed daily and we designate a morbidity (sickness) score daily. However, “coming to the bunk,” adds a valuable criterion to determine if a calf is sick. Consider your resources, including management skill in formulating the optimal backgrounding program for your calves.

IMPACTS OF LONG-TERM NUTRIENT MANAGEMENT STRATEGIES OF GRAZING SYSTEMS ON SOIL CHEMICAL PROPERTIES AND SOIL QUALITY

G. L. Mullins, J.P. Fontenot, M. Brosius and G. Johnson

INTRODUCTION

Manure, whether mechanically applied or deposited by grazing animals, has been associated with increased risk of non-point source pollution, especially phosphorus. This is especially true in areas where the industry, especially poultry, has been concentrated in geographical areas that are grain deficient, resulting in a reliance on imported grain for poultry feed. Intensification has resulted in the production of large quantities of poultry manure, within relatively small geographical areas. Surplus litter is typically land applied as a nutrient source or used as an animal feed. The objective of this project was to evaluate the effects of long-term nutrient management strategies using poultry litter as a feed and fertilizer for grazed pasture systems in the Shenandoah Valley of Virginia on selected soil chemical characteristics and soil quality.

METHODS

The original experiment was established in 1994 and consist of stocker cattle grazing endophyte-free tall fescue (*Festuca arundinacea* schrub. KY-31). Treatments included: (1) no fertilizer control (i.e., no feeding of broiler litter or soil application of fertilizer or litter) (C); (2) surface application of inorganic fertilizer (AIF); (3) surface application of broiler litter (ABL); and (4) feeding broiler litter (FBL) to the grazing cattle (all they would eat). Applied broiler litter and inorganic fertilizer supplied the same amount of total N, P, and K as was fed as broiler litter to the steers (FBL) in the previous year. The experimental area is divided into 12 x 2.5-acre paddocks (three paddocks per treatment), with four steers grazing from Dec. through Sept./Oct.. Surface applications of broiler litter and inorganic fertilizers were made in late spring (June) each year. Soil samples from the surface 0-4 inch layer were collected in the fall of each year (except for 2003) for routine chemical analysis. The annual treatments were discontinued beginning in 2003.

To further evaluate the long-term effects of the annual treatments on soil chemical and physical properties, intensive soil sampling was initiated in the fall of 2004. In Dec. 2004 paddocks in the first two replications of each treatment were subjected to an intensive grid soil sampling scheme. Each paddock was divided into 25 ft X 25 ft grids, referencing each grid relative to the feeder and source of water. Soil samples were collected to a depth of 4 inches. For each 25 ft X 25 ft grid, 10 soil cores (0.5 inch diameter) to a depth of 4 inches were collected and composited. In addition, a composite soil sample was taken from each paddock (10 soil cores per paddock). The collected samples were subjected to routing soil test analysis including soil pH, Mehlich 1 extractable nutrients and soil organic matter. In late spring of 2005, sampling was initiated to collect selected soil quality indicator using the NRCS-Soil Quality Institute's Soil Quality Test Kit.

SUMMARY

The amount of broiler litter fed to the cattle and land applied averaged ~ 2912 lbs ac^{-1} yr^{-1} (~74 lbs P_2O_5 ac^{-1} yr^{-1}). This corresponded to a significant increase in the levels of Mehlich-1 extractable soil phosphorus (P) in the surface 0-4 inch layer of the AIF, ABL and FBL treatments as compared to the no fertilizer control (C) (Fig. 1). In some years, the FBL treatment was slightly lower than the other two sources of P. As demonstrated in Fig. 2, soil test P levels when averaged across all three sources, increased steadily throughout the study. Between the initiation of the study in 1994 and the fall of 2002, P applied in the annual treatments increased the initial soil test rating of "medium-" (M-) into the "high+" (H+) to "very high" (VH) rating according to the Virginia Tech Soil Testing Laboratory guidelines.

There were also significant differences among treatments for other soil test parameters including soil pH and soil test potassium (Table 1). In conducting the grid sampling, approximately 100-110 individual soil samples were collected and analyzed from each paddock. The overall average (Avg.) soil test data from the grid sampling was similar to the composite sample that was collected independently from the grid sampling scheme. However, for most of the extractable nutrients, the composite samples had slightly lower levels of extractable nutrients, in particular phosphorus and potassium. The grid sampling data show that there were differences among treatments for most of the parameters measured. In addition, the grid sampling data show very clearly that there was considerable "within paddock" variability in soil test values (Table 1). A comparison of the minimum (Min.) and maximum (Max.) values for a given soil test parameter reported in Table 1 illustrates that within a paddock the measured soil test parameters, especially P and K, varied considerably. The control treatment had as great or greater variability as compared to the fertilizer and litter treatments for some parameters. In general, higher soil test levels were observed near the feeder and water source and directly along some fence lines. The lowest values were typically observed at the greatest distances from the feeder and water source.

Results of this long-term study demonstrate that the use of broiler litter as a fertilizer or as a feed for cattle increased the levels of extractable soil nutrients in grazed pastures. The results also demonstrated that 9-annual applications of 74 lbs P_2O_5 ac^{-1} yr^{-1} to this limestone valley soil increased the soil test rating from "M-" into the "H+/VH" range. Initial results from grid soil sampling shows that considerable "within pasture" variation in soil test results can occur. In collecting soil samples from pastures for routine testing, one should avoid areas near permanent water sources, feeding areas and other areas where the animals tend to loaf.

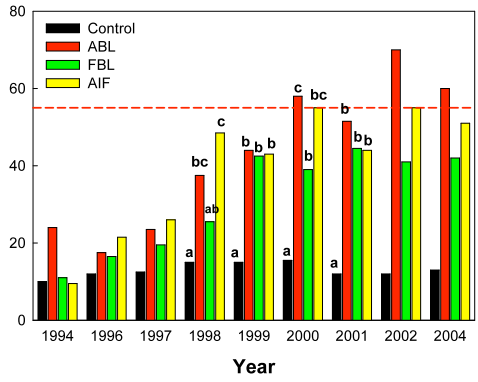


Fig. 1. Mehlich-1 extractrable P in the surface 0-10 cm (4-inch) layer of soil as affected by nutrient management treatments applied to fescue pastures from Dec. 1994 – 2004.

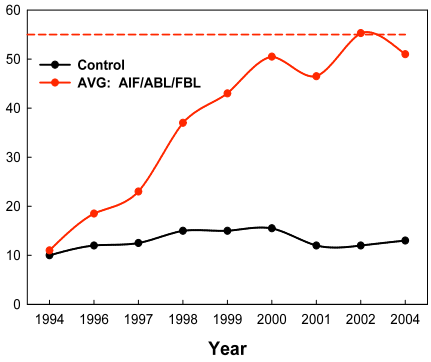


Fig. 2. Mehlich 1 extractable P in the surface 4 inch layer of soil in the no fertilizer control treatment as compared to the average of the inorganic fertilizer (AIF), applied broiler litter (ABL) and fed broiler litter (FBL) treatments.

Table 1. Selected soil test data from the grid and composite soil sampling schemes as affected by the various treatments in the grazed paddocks.

		Soil pH					Soil Test Phosphorus				
			Grid Sampling			Composite		Grid Sampling			Composite
Trt.	Rep	Avg.	Median	Min	Max	Sample	Avg.	Median	Min	Max	Sample
							-------- Mehlich 1 Extractable, ppm -----				
C	1	5.68	5.53	4.89	7.6	5.45	13	12	4	55	14
C	2	6.02	5.98	5.41	7.0	6.48	14	7	3	131	12
AIF	1	6.95	6.98	5.97	7.63	6.62	69	68	28	125	59
AIF	2	6.19	6.17	5.53	6.96	6.57	40	35	20	209	43
ABL	1	6.95	6.97	6.36	7.49	6.85	93	89	41	218	73
ABL	2	5.88	5.89	5.14	6.71	5.87	57	52	22	139	47
FBL	1	7.01	7.08	6.2	7.71	6.58	68	58	25	345	49
FBL	2	6.07	6.02	5.38	7.16	5.96	51	27	9	524	34

	Soil Test Potassium		Soil Organic Matter	
	Grid Sampling	Composite	Grid Sampling	Composite

Trt.	Rep	Grid Sampling Avg.	Grid Sampling Median	Grid Sampling Min	Grid Sampling Max	Sample	Grid Sampling Avg.	Grid Sampling Median	Grid Sampling Min	Grid Sampling Max	Sample
		-------- Mehlich 1 Extractable, ppm -----					---------- Percent ----------				
C	1	80	57	23	339	41	4.6	4.4	3.8	8	4.2
C	2	69	41	22	380	47	4.2	3.9	3.2	9.7	4.1
AIF	1	156	123	67	425	114	4.5	4.3	3.4	7.2	4.9
AIF	2	99	76	22	492	83	4.4	4.1	3.3	12.2	4.9
ABL	1	174	156	56	481	135	5.2	5.2	4.2	9	5.0
ABL	2	145	116	60	379	83	4.9	4.7	3.8	7.3	4.9
FBL	1	140	132	62	315	91	5.3	5.2	4	9.5	4.6
FBL	2	137	104	36	522	94	4.7	4.5	0.4	10.1	4.7

C = no fertilizer control; AIF = inorganic fertilizer; ABL = applied broiler litter; FBL = fed broiler litter
Avg = average; Min = minimum; Max = maximum

Performance and Carcass Quality of Cattle Finished on Pasture and Feedlot

J. P. S. Neel (ARS), J.P. Fontenot (VT), W. M. Clapham (ARS) and E.E.D. Felton (WVU)

Introduction

Demand for lean, high quality meat products has increased in recent years. Health conscious consumers include lean beef products in their diets, and grass-fed beef is imported to the United States to satisfy some of this demand. This meat is perceived as being more healthful (lean) and environmentally friendly from a production standpoint (low input production systems). One of the main problems in the beef industry today is the ability to produce a consistent product. Performance during the stocker period may influence meat quality. A multi-year, multi-location experiment is under way to evaluate the effect of winterfeeding regimes on subsequent pasture and feedlot performance, meat quality characteristics and consumer acceptance. Collaborators on this project are USDA-ARS, West Virginia University, Virginia Tech and the University of Georgia.

Materials and Methods

In early December of 2001, 2002 and 2003 seventy two English-type crossbred steer calves were used to compare growth rate, final weight and carcass parameters from cattle finished on forage (FOR) or high concentrate (CON), after being wintered to gain at low (LOW, ADG = 0.5 lb), medium (MED, ADG = 1.0) or high (HIGH, ADG = 1.5) growth rates. Steers were harvested on the same dates, across treatments, at a commercial meat plant.

Summary

Winter period growth rate influenced finishing period rate of gain, final live and carcass weights, dressing percentage, ribeye area and quality grade. Animals finished on forage had lighter final live and carcass weights, and lower quality grade. Forage finished beef had less rib fat, smaller ribeye area, lower yield grade and a quality grade of Select – versus Choice – for concentrate finished cattle.

Tables

Table 1. Diet compositions during winter feeding period by treatment [a]

	Winter gain treatment (ADG)		
Item[a]	Low	Medium	High
	----------%----------		
Timothy hay	94.30	80.95	61.70
Soybean meal	4.85	3.80	3.10
Soybean hulls	0.00	14.50	34.50

6:1 mineral	0.85	0.75	0.70

[a]All values are given on an as fed basis.

Table 2. Steer performance and ultrasound back fat and rib eye area measurements during winter-feeding period

	Winter gain treatment (ADG)		
Item	Low	Medium	High
Initial wt, lb	597	598	587
Final wt, lb	682 [c]	748 [b]	815 [a]
ADG, lb	0.60 [c]	1.10 [b]	1.70 [a]
End Intra-muscular Fat, %	3.50 [c]	3.80 [b]	4.00 [a]
Initial REA[d], sq in	7.30	7.30	7.00
End REA, sq in	7.40 [c]	8.40 [b]	9.20 [a]

[abc]Row means followed by unlike letters are significantly different P<0.05; [d]Ribeye area

Table 3. Steer performance and carcass data of finished cattle as influenced by winter gain treatment

	WINTER GAIN TREATMENT (ADG)		
Item	Low	Medium	High
Initial wt, lb	682 [c]	748 [b]	815 [a]
Final wt, lb	1094 [b]	1113 [b]	1154 [a]
ADG, lb	2.56 [a]	2.25 [b]	2.08 [c]
Carcass wt, lb	609 [b]	627 [b]	660 [a]
Dressing %	57.1 [c]	57.8 [b]	58.8 [a]
Rib fat, in	0.30	0.32	0.33
REA[d], sq in	11.1 [b]	11.3 [ab]	11.5 [a]
Yield grade	1.9	2.1	2.1
Quality grade[e]	2.8 [b]	3.1 [ab]	3.5 [a]

[abc]Row means followed by unlike letters are significantly different P<0.10; [d]Ribeye area; [e] Quality grade: 2 = Select -, 3 = Select +, 4 = Choice –

Table 4. Steer performance and carcass data of finished cattle as influenced by finishing treatment

Item	FINISHING TREATMENT FOR	CON
Initial wt, lb	754	773
Final wt, lb **(Finish X Year)**	1046	1194
ADG, lb **(Finish X Year)**	1.9	2.7
Carcass wt, lb **(Finish X Year)**	545	718
Dressing % **(Finish X Year)**	54.0	61.8
Rib fat, in	0.18 [b]	0.45 [a]
REA[c], sq in	10.3 [b]	12.3 [a]
KPH[d], %	1.6 [b]	2.4 [a]
Yield grade	1.6 [b]	2.4 [a]
Quality grade[e]	2.1 [b]	4.2 [a]

[ab]Row means followed by unlike letters are significantly different P<0.01; [c]Ribeye area; [d]Kidney-pelvic-heart fat; [e]Quality grade: 2 = Select -, 3 = Select +, 4 = Choice –

Composition and Health Benefits of Pasture Finished Beef

Susan Duckett
University of Georgia

A three-year study was conducted to determine the differences in rib composition, fat concentration, antioxidant content, and palatability of beef from cattle finished on concentrates (CONC) or pasture (PAST). Each year, beef cattle (n = 72) were finished on concentrates or pasture after stockering during the winter months at three growth rates (LOW, MED, or HIGH). After slaughter, ribs were obtained from each animal and shipped to the University of Georgia for meat quality analyses. The 9-10-11th rib section was fabricated into lean, fat and bone, and steaks obtained for fatty acid composition, fat and water soluble vitamin content, and palatability. Finishing cattle on PAST reduced ($P < 0.01$) the percentage fat and increased ($P < 0.01$) the percentage of lean and bone in the 9-10-11th rib section. Total fat content of the rib steaks was 42% lower for PAST than CONC. For CONC finished, higher growth rates during the winter stocker period increased ($P < 0.05$) total fat content of the steaks. Concentrations of conjugated linoleic acid (CLA) and trans-11 vaccenic acid were 114% and 417% greater ($P < 0.01$), respectively, for PAST than CONC. Conjugated linoleic acid is a potent anticarcinogen found in all ruminant products. Trans-11 vaccenic acid can be converted to CLA in the adipose tissues of humans and animals. Omega-3 fatty acid composition was 171% greater ($P < 0.01$) in steaks from PAST than CONC. This resulted in a lower, more desirable, ratio of omega-6 to omega-3 fatty acids in the steaks from PAST than CONC. Steaks from PAST finished cattle contained greater amounts of alpha-tocopherol and beta-carotene, both fat-soluble vitamins with antioxidant activity. B-vitamin content, both thiamin and riboflavin content, was higher in PAST than CONC steaks. Warner-Bratzler shear force, an objective measure of tenderness, was similar between steaks from CONC and PAST. Trained sensory panel analyses of steaks showed similar tenderness and juiciness among finishing treatments. Beef flavor intensity was higher and off-flavor intensity was lower for CONC compared to PAST. Finishing cattle on pasture lowered the total fat content and increased the concentrations of desirable fatty acids and antioxidants in beef steaks.

Frequently Asked Questions and Answers for the Virginia Premises Registration System

Scott P. Greiner, Extension Animal Scientist, Virginia Tech
Steve Hopkins, Extension Agent- Animal Science, Orange County

The National Animal Identification System (NAIS) was recently initiated by the United States Department of Agriculture. The fundamental focus of the NAIS is to maintain the health of U.S. livestock, by strengthening animal disease preparedness through enhanced disease control and eradication capabilities. The goal of the NAIS is to have the capability to identify premises and individual animals that have had direct contact with a foreign animal disease within 48 hours after discovery. By reducing the impact of animal health incidents, ultimately NAIS will increase demand and promote continued consumer confidence in animal products both domestically and internationally.

The NAIS involves three basic steps for implementation: 1) registration of premises, or locations which have animals, 2) identification of individual animals, and 3) documentation of the movement of these animals as they change premises and move through marketing channels during their lifetime. The first step to NAIS is premise registration. In Virginia, the state veterinarian's office of the Virginia Department of Agriculture and Consumer Sciences (VDACS) is responsible for premise allocation. The premise registration system is a computer database system which allows for the necessary information to be collected and stored, and a unique number to be assigned. Premise registrations may be completed on-line in a few minutes. To register your premise, go to the VDACS web site at site at: http://www.vdacs.virginia.gov/animals/animalid.html . Following are answers to common questions pertaining to premise registration in Virginia.

- **Who should register a premise?**
  Any farm, including those that may only have one animal; veterinary clinics, fairgrounds where animals are exhibited; animal laboratories, markets/ collection points; ports of entry; quarantine facilities; rendering plants; slaughter facilities; tagging sites; and any other locations where livestock are kept.

- **Why should I register my premises if it is not mandatory?**
  Every aspect of the National Animal Identification System is voluntary at this point. Some states have enacted legislation to mandate registration, although Virginia has not. Premise registration is the first step for compliance with NAIS, and may provide the ability to take advantage of opportunities that present themselves in the marketplace. USDA has proposed requiring premise registration and individual animal identification effective January 2008 with the entire program mandatory (including animal movement reporting) in January 2009.

- **What is the definition of livestock?**
  If you have one or more animals of any of the following species you will need to have a premise ID in order to register the following animals: Cattle, Bison, Swine, Sheep, Goats, Horses, Poultry, Deer, Pheasants, Duck, Turkey, Llama, Ostriches, or Emu.

- **Is there any cost?**
  Currently there is no charge for premises registration.

- **What if I already have a scrapie or brucellosis ID?**
  These premises IDs were issued for a specific disease program. In many cases, a farm may already have more than one premise ID. The new premises ID issued for the NAIS will be independent of species and disease, and each is unique without duplication anywhere in the U.S. Over time, existing premise numbers issued for programs such as brucellosis will likely be phased out. However, until that time, producers should get a new NAIS premise ID but continue to use the old ID within its respective disease program.

- **How does this affect liability?**
  Producers are and always have been responsible for livestock they produce. Having a premises ID will neither increase nor decrease that liability. Following Beef Quality Assurance guidelines and administrating animal health products in accordance with label instructions are examples of best management practices that should be documented and retained.

- **How can I use my premises ID?**
  In the near future, official NAIS electronic ear tags will be available. To purchase these tags, a premises ID number will be required. Additionally, premise IDs will begin to be used to source verify cattle for marketing programs. You may also need the premise ID in the future when participating in accreditation and certification programs such as those for TB, brucellosis, and scrapie.

- **With premises registration am I obligated to participate in animal ID and tracking?**
  As previously stated, every aspect of NAIS is currently voluntary. USDA has proposed requiring premise registration and individual animal identification effective January 2008 with the entire program mandatory (including animal movement reporting) in January 2009. Cattle will be the first species to incorporate individual animal ID. There are many examples of premiums being paid for cattle that sell with documentation for place of origin/source, vaccination/management program, age, and other items. Electronic identification of these types of cattle is being used as a mechanism to add further value through enhancing the documentation and accountability process, facilitating information exchange, and providing a common template for the information. Therefore, there are reasons to utilize electronic ID beyond compliance such as record- keeping and marketing. It is important to recognize that simply tagging an animal will likely not add value unless the electronic tag provides access to and documentation for information demanded by the marketplace, and most importantly that the electronic tag and the accompanying data are enrolled in a credible network system.

- **What is the definition of a premise for a farm?**

A producer unit/farm shall be defined as an operation where all animals are under common ownership or supervision. In some situations animals pertaining to this premise may reside on two or more lots, farms or ranches that are geographically separated, but in which the animals have been interchanged or had contact with animals from different lots, farms, or ranches. If a business/farm manages two separate locations differently, then each should be considered a premise. If, however, multiple locations have animals moved between them regularly, they may be considered one premise.

- **Who is responsible for getting a premise ID, owner of the land or person with the livestock?**
  The person who owns the livestock is responsible. In order to prevent confusion, the livestock owner should consider notifying the land owner if they use someone else's site for their primary premise location.

- **What if I sell my land, who gets the premises number?**
  The premise code stays with the property, so it is important the land owner be involved.

- **Why do you need my e-mail address?**
  The e-mail address will be used to send you a confirmation of the registration and will include the user name that you create. If you have difficulty logging into the system in the future, the e-mail address will be used to confirm your identity as well. Your e-mail will not be used for other purposes and will be kept confidential.

- **What do you do if I do not have e-mail?**
  Leave the space blank even after the system asks for an e-mail address the second time. The premise ID confirmation information will be mailed to you.

- **What happens if a premise does not have a mailing address or my address is not recognized by the system?**
  If the web-based system does not recognize your mailing address, you will be prompted to apply for an exception (follow directions on-line). As a second option, get a mailing address from your local post office for the premise address (this must be done at the post office since the system utilizes only addresses recognized by the USPS).

- **Who is responsible of making a premise in-active?**
  The person who registered the premise is responsible. If you attempt to obtain a premise number for a location which already has an active premise registration, then first try to locate the person who registered the premise to have them log onto the system and in-activate the premise address. If you cannot locate the person then you will need to make a request to the state administrator through the prompted e-mail text box. Use the text box to explain your situation, and request to place the premise in-active so you can apply the premise number under your account.

- **Where can I obtain more information on the National Animal Identification System and Premise Registration in Virginia?**
  The United States Department of Agriculture Animal and Plant Health Inspection Service maintains a web page dedicated solely to NAIS. The site contains the most current information concerning policy and implementation of NAIS. The address is http://animalid.aphis.usda.gov/nais/index.shtml. For more information or assistance with premise registration in Virginia contact your local Virginia Cooperative Extension Office or VDACS (phone 804-692-0601, email prem.id@vdacs.virginia.gov).