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Cattlemen's Day Report 1992

Nancy M. Cox

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1992 Cattlemen's Day Report

MAFES
MISSISSIPPI AGRICULTURAL & FORESTRY EXPERIMENT STATION Verner G. Hurt, Director Mississippi State, MS 39762
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AGRICULTURAL AND FORESTRY EXPERIMENT STATION • OFFICE OF THE DIRECTOR
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June 19, 1992

Dear Cattlemen:

I am pleased to welcome you to the MSU/MAFES/MCES Beef Cattle Field Day for 1992 and to thank you for your participation in this important program for Mississippi's Cattlemen.

Our research and extension personnel have done an excellent job of summarizing their beef and forage research and education programs in this publication. We sincerely hope this information and today's presentations will be useful to you in your operation and invite any suggestions you may have for their improvement in future field days. In addition, we urge you to contact any of the research or extension personnel regarding problems you may have or other questions related to your beef operation.

Again, thank you for your participation in our 1992 Beef Cattle Field Day.

Sincerely,

Verner G. Hurt
Director

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Cattlemen's Day Report

1992

Compiled by

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On the Cover

The cover photos by Fred Faulk, Coordinator of Photographic Services, University Relations, Mississippi State University, are of a herd of purebred bulls of several breeds (top) and of a herd of F_1 cows with calves. The herds are pastured at the Leveck Animal Research Center, located at the south edge of the Mississippi State University campus. The Mississippi Agricultural and Forestry Experiment Station also maintains research beef herds at the Prairie Research Unit in Monroe County; Pontotoc Ridge Flatwoods Branch Experiment Station in Pontotoc County; Alcorn Branch Experiment Station at Alcorn State University; South Mississippi Branch Experiment Station in Pearl River County; and Brown Loam Branch Experiment Station in Hinds County.

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Foreword

The Animal and Dairy Science staff at Mississippi State University welcomes you to campus and to 1992 Cattlemen's Day. Our department looks forward to this event with a great deal of anticipation and we want to be able to explain our current Extension programs and research projects to Mississippi beef producers.

Mississippi is in an enviable position with respect to the production of forages for cattle grazing. We have the climate and year-round grazing programs conducive to the economical production of beef. The potential exists for numerous additional acres being available for forage production in the next few years.

We would like every beef producer to carefully examine each program and project described in this report. We want your input concerning these projects and to help guide our future work. Your ideas and suggestions are important to us and we will appreciate your comments.

I hope you have a profitable and enjoyable day at MSU and take home information that will be useful in your operation. Thank you for your participation in this field day and for your interest in, and support of, our beef cattle research and Extension efforts.

Bill V. Able, Head
Department of Animal and Dairy Sciences

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Extension Beef Cattle Program Highlights

Blair McKinley
Cooperative Extension Service
Department of Animal and Dairy Sciences, MSU

The MIMS Program

The MIMS (Maximize Immunity - Minimize Stress) program is a production, herd health, and marketing program. The objectives are to improve production efficiency, reduce morbidity and death loss in stocker calves sold at weaning, and to improve sale price of calves. During 1990 and 1991, more than 8,500 calves were certified through the health program and 7,500 were sold through Special "MIMS" Calf Sales. This is a joint program between the Departments of Animal Science and Agricultural Economics, the College of Veterinary Medicine, and the Mississippi Cattlemen's Association.

Beef Cattle Newsletter

A monthly newsletter, "Beef Cattle Management Tips," is an important part of the Extension education program. These letters are prepared by Extension area livestock specialists and mailed to each county Extension office; they in turn cosign the letters and mail a copy to each person on their beef mailing list.

Beef Cattle Short Courses

Beef cattle are raised on 20,000 farms in Mississippi. The Jan. 1, 1992 inventory of 707,000 beef cows is valued at $500 million. Value of cows and calves sold in 1991 was $280 million. Most beef cattle producers in the state are involved in cow-calf operations. At the present time, the average weaning weight of Mississippi calves is 400-425 pounds with a calf crop of 70-75 percent. In order for Mississippi producers to remain profitable, producers must produce a 90 percent calf crop with an average weaning weight of 500 pounds.

In order for a beef producer to be successful and show a profit in his operation, he must be knowledgeable in many areas: forage production, general management, facilities, breeding, animal selection, marketing, nutrition, and herd health, just to name a few. An interdisciplinary approach in the form of beef cattle short courses was taken by the Extension specialists in the Animal and Dairy Science Department to assist producers in the different areas of beef production.

Beef cattle short courses involving Extension animal scientists, agronomists, agricultural economists, veterinarians, and computer specialists, along with MAFES personnel and representatives from the Mississippi Cattlemen's Association, are offered on a county level. Topics covered in each short course are determined by advisory committees in each county.

In the past, short course participants have been asked to evaluate these courses and place a dollar value on the information received. Respondents to the questionnaires indicated the value of information received from these short courses was worth approximately $50/head. Total value of information received ranged from $250 to $10,000.

Forage Testing and Ration Formulation

The forage testing program is a joint effort between the Mississippi Cooperative Extension Service and the Mississippi State Chemical Laboratory. Each cattleman is allowed five free forage analyses per year. Producers may request a custom-balanced ration based on the quality of the forage being fed. There were 919 forage samples submitted for analysis during the year ending March 31, 1992. This is a 6 percent increase over the previous year and an 18 percent increase over 2 years ago. More than ever, beef producers are understanding how nutrition influences conception rate, weaning weight, and net return.

Survival in the cow-calf business is strongly dependent upon a good feeding program. Such a program is based on a high quality forage. Supplementing a poor quality forage properly can be very expensive, yet failure to supplement properly will result in reduced conception rates, lowered weaning weights, and fewer calves weaned.

Many grasses can make excellent grazing, but these same grasses will often make poor quality hays. Factors affecting hay quality include plant species, soil fertility, time of year grown, and stage of maturity when harvested. Of these, stage of maturity is the most important. As plants mature, fiber content increases and energy and protein contents decrease. The first key to a sound nutrition program is putting up the best quality forage possible.

The second key is determining the **actual** quality of your forage and supplementing properly. The im-

portance of protein supplementation is often overemphasized when supplementing beef cattle. While protein is important, energy (TDN) is required in larger amounts, and many forages will not supply adequate energy.

Table 1 shows the average nutrient content of some of the more frequently tested forage samples in Mississippi. The average values would be very similar to those found in textbooks on feeds and feeding, and many people use such values when formulating rations. However, very few forages will test average. Notice the wide range in nutrient contents for both hays and silages. If cows are fed based on average values but the forage is above average, money can be wasted on unnecessary supplements. If the forage is below average, cows are underfed and money is lost due to lowered reproductive efficiency and calf growth.

Good management is a necessity in the farming business today. Forage testing is one inexpensive management tool that every cattleman should utilize.

Table 1. Nutrient content of frequently tested forages, 1991-92 Mississippi Forage Analyses.

			% on Dry matter basis			
Crop	Number of samples		Moisture %	Crude protein	Crude fiber	TDN
Alfalfa hay	33	avg.	12.8	19.2	29.8	61.3
		range	9.5 - 17.7	8.2 - 27.2	16.4 - 46.7	40.6 - 78.2
Bahiagrass hay	111	avg.	12.5	8.5	35.9	49.7
Bahiagrass silage	2	avg.	78.4	16.5	32.4	56.4
		range	5.7 - 29.7	5.1 - 17.5	27.4 - 49.8	34.6 - 58.6
Alicia bermuda hay	72	avg.	11.3	10.6	36.6	50.5
		range	5.9 - 27.0	5.9 - 17.8	24.4 - 49.1	35.1 - 64.6
Coastal bermuda hay	46	avg.	11.0	9.0	35.1	51.7
		range	7.0 - 16.8	4.6 - 14.9	27.6 - 44.7	39.6 - 60.6
Common bermuda hay	15	avg.	10.2	9.1	32.7	53.5
		range	6.2 - 13.7	6.4 - 13.4	21.2 - 40.1	45.8 - 67.3
Tifton 44 hay	92	avg.	12.8	10.2	35.5	51.7
		range	4.9 - 42.6	6.1 - 20.7	25.8 - 46.0	38.8 - 63.2
Corn silage	76	avg.	65.7	7.5	25.8	63.9
		range	45.1 - 80.6	4.7 - 10.8	17.3 - 43.3	44.8 - 73.3
Ryegrass hay	60	avg.	15.1	10.8	40.3	46.2
		range	8.4 - 34.4	5.3 - 21.6	29.4 - 50.7	32.3 - 59.4
Sorghum silage	24	avg.	69.9	8.6	28.0	56.8
		range	45.7 - 79.4	5.4 - 25.6	20.6 - 40.2	46.1 - 74.4

Horn Fly Control on Beef Cattle with Ear Tags in Southern Mississippi, 1991

Joseph P. Harris
Cooperative Extension Service
Department of Entomology, MSU

Tests were conducted on three beef cattle farms in Clark, Jasper, and Newton Counties in southern Mississippi. This was the third consecutive year ear tags were placed in the same herds.

One ear tag per ear (2 per animal) was used on all adult cattle. Terminator® (diazinon) tags were placed on animals in a herd of 49 cows and two bulls on May 10. Saber® (lambacyhalothrin pyrethroid) tags were placed in ears of a herd of 52 cows and one bull on May 9.

Untreated herds of 15 to 30 cows were located in the vicinity of each farm. All ear tags remained in herds for 114 days. Herds were mixed breeds of beef cattle.

Horn fly counts were made visually once a week using binoculars.

Results and Recommendations

Results indicate economic control was obtained by all three treatments. Excellent control was obtained with the Saber tags through 90 DAT (days after treatment); however, during the last 24 DAT, control was reduced in this treatment by about 50%. Good control was obtained with Tomahawk® tags. Low populations of horn flies occurred on both Saber and Tomahawk control herds. This may have resulted from the close proximity of these herds to the treated herds. No detrimental effects to the cattle were observed.

Attach two tags (1 per ear) per adult beef animal in the spring and remove tags from all cattle in the fall. Rotate tags annually (pyrethroids vs phosphates).

Table 1. Control of horn flies on beef cattle using ear tags, 1991.

Ear tag (2/animal)	Mean number horn flies/side adult animal							
	30 DAT		60 DAT		90 DAT		114 DAT	
	T	UT	T	UT	T	UT	T	UT
Terminator*	4.1	214.75	1.1	203.75	2.0	141.25	4.68	158.13
Saber*	0.3	42.88	0	51.13	1.15	38.38	18.9	38.0
Tomahawk*	16.05	88.00	2.95	43.38	3.15	24.13	6.4	27.88

Ear tag (2/animal)	Percent Control			
	30 DAT	60 DAT	90 DAT	114 DAT
Terminator*	98.1	99.5	98.6	97.0
Saber*	99.3	100.0	97.0	50.3
Tomahawk*	81.8	93.2	86.9	77.0

*Third consecutive year tags were placed in same herds.
DAT = Days after treatment
T = Treated
UT = Untreated

The Market Master Program

Jim Quinn
Mississippi Farm Bureau Federation
Cooperative Extension Service
Department of Agricultural Economics, MSU

Market Master is an adult agricultural marketing education program being offered in the United States by the American Farm Bureau. In Mississippi, the program is being jointly sponsored and offered by the Mississippi Cooperative Extension Service and Mississippi Farm Bureau Federation with the aim of increasing net farm income.

After the initial presentation of the program to Mississippi producers, it was evident that the original course would need modification to produce the desired results in "southern" states. This resulted in a total rearrangement of the material offered and redesign of the example farm used in the curriculum. The example farm now produces crops common to all areas of Mississippi so that the marketing plan is built around crops that Mississippians know and understand.

The course begins with the facts used in the class and moves directly to the records essential in a marketing plan. It then shows the producer how to determine and incorporate his cost of living into a price that will allow the standard of living he and his family desire. From here, the course moves into the use of the various cash marketing tools available today and continues into basis, basis contracts, and risk management through futures markets and options on futures contracts. At this point, the market plan and alternatives are discussed, reviewed, and revised to ensure that the best method of marketing the crop has been chosen. After all of the marketing possibilities have been covered, the remainder of the course is dedicated to analyzing the market situation to help producers choose the best time to price the crop.

In the redesigned course, the marketing plan is built around cotton production. However, during the summer of 1992, the course will be adapted to dairy production as well as soybean and cattle operations for use in areas of the state where there is no cotton production.

The redesigned course can be taught in six 3-hour sessions at a cost to farmers of $125 per farm family. If you are interested in having Market Master taught in your area, contact your local county Extension agent or your local Farm Bureau. We will teach the program in any area of the state that can produce 10 farm families committed to the program.

Mississippi Forage and Grassland Council

C. Pat Bagley
North Mississippi Research and Extension Center
Verona, Mississippi

Description

The Mississippi Forage and Grassland Council (MFGC) entered its second year of activity with tremendous growth. MFGC is an affiliate of the American Forage and Grassland Council, which has affiliate (state) councils in 33 states and 3 Canadian provinces. The organization has as its purpose to better educate and to disseminate educational materials to both producers and the general public as to the role of forages to livestock. This also includes the beneficial effects of forages and livestock on sustaining and improving the environment.

Current membership of MFGC is slightly more than 4,200 members statewide. Each member of MFGC receives a copy of the Hay and Forage Grower magazine and the AFGC Newsletter. State sponsored activities include the following:

- Annual meeting held in conjunction with the Mississippi Cattlemen Association annual meeting in Jackson.
- Speaker's Bureau.
- Exhibitor at forage field days statewide.
- Annual statewide field day.
- Plans for statewide hay contest and hay marketing service.

National News

At the recent American Forage and Grassland Council annual conference, held in Grand Rapids, Michigan, MFGC was a major winner.

(1) MFGC received the President's Award, which is presented to one council each year. The award included a check for $500 to help MFGC with its educational programs, a traveling trophy, and a banner for display.

(2) Bob Thompson of Starkville, an MFGC Board member, was elected to the national Board of Directors for the American Forage and Grassland Council.

(3) Mississippi was selected to host the 1995 annual conference for the American Forage and Grassland Council meetings. Plans are underway and it is expected that there will be approximately 600 people attending the annual 4-day event.

1991 Mississippi Cow-Calf Enterprise Budgets

Charlie S. Forrest and Randall D. Little
Department of Agricultural Economics, MSU

Our objective is to provide economic and technical information about producing weaned beef calves in Mississippi in the form of cow-calf enterprise budgets. The enterprise budgets are the product of a multidisciplinary effort involving MAFES and MCES personnel. Costs were estimated for three representative herd sizes: 30, 100, and 300 cows. Weaning weights for steers were 500 pounds and heifers, 475 pounds. Total revenues generated from the enterprise were also estimated for comparison to the various cost categories.

Results

Total receipts per cow ranged from $433.77 in the 30-cow herd to about $380.00 per cow in the 100- and 300- cow herds. Receipts per cow in the 30-cow herd were greater because all calves were sold and replacement cows were purchased. Replacements were raised in the larger herds.

Variable costs for the 30-, 100-, and 300-cow herds were $297.53, $262.25, and $272.28 per cow, respectively. Variable costs included pasture maintenance costs, hay, supplemental feed, salt and minerals, veterinary supplies and services, marketing charges, labor, and interest on operating capital.

Reference

1991 Mississippi Cow-Calf Enterprise Budget. MCES, MAFES, Department of Agricultural Economics, Mississippi State University, 1991.

1991 Mississippi Forage Enterprise Budgets

Charlie S. Forrest and Randall D. Little
Department of Agricultural Economics, MSU

Our objective is to provide economic and technical information about producing forage in Mississippi in the form of forage enterprise budgets. The enterprise budgets are the product of a multidisciplinary effort involving MAFES and MCES personnel. Establishment and maintenance costs were estimated for perennial and annual forage crops.

Results

Forage establishment and maintenance costs were estimated for a wide array of forage and forage combinations typical in Mississippi. Establishment costs included expenses for field preparation, lime application, fertilization, interest on operating capital, and seed or sprigs. Maintenance costs include lime, fertilizer, and herbicide application, necessary equipment usage expenses, and interest on operating capital.

Examples of perennial forages contained in the publication include alfalfa hay, bahiagrass, hybrid and common bermuda pasture and hay, dallisgrass pasture and hay, and fescue pasture. Annual forages include corn and sorghum silage, pearl millet annual pasture, ryegrass and wheat pasture, and sorghum-sudan pasture and hay.

Reference

Forage-1991 Planning Budgets, Agricultural Economics Report 43, MCES, MAFES, Department of Agricultural Economics, Mississippi State University, March 1991.

Overseeded Ryegrass versus No Pasture and High versus Low-quality Hay for Wintering Beef Cows

David St. Louis, Carl Hovermale, and Ned Edwards
South Mississippi Branch Experiment Station

Pensacola bahiagrass and Alicia bermudagrass pastures were stocked at 1.0 head/acre and managed in a conventional three-pasture rotation. Overseeded systems had two-thirds of the area overseeded in Marshall ryegrass for winter grazing (1.5 hd/acre). Excess summer forage was harvested as hay used for systems requiring low quality hay. Nitrogen fertilizer was applied to overseeded pastures at 68 lb/acre in January and April. Pastures not overseeded in all systems received one annual application of N at 68 lb/acre in April. Corn and soybean meal were fed to approximate NRC requirements of cows in all systems using forage test analysis of hay samples and estimated nutritional value of pasture. Feeding objectives were to have cows in moderate body condition prior to calving, not too thin prior to breeding, and increasing in weight and condition throughout a 60-day breeding season. High quality hay was produced outside the systems by fertilizing at a rate of 100 lb N/acre per cutting (P_20_5 and K_20 added as per soil test) and harvesting at 4-week intervals, as weather permited.

Results

Cows with no winter grazing lost significantly more weight in the calving season than cows grazing overseeded ryegrass ($P<0.05$). Similarly, cows receiving low quality hay tended to lose more weight in the calving season than cows receiving high quality hay. Calf weights were not significantly different. High quality hay ranged from 58% to 62% TDN and 9% to 17% protein while low quality hay ranged from 49% to 55% TDN and 10% to 14% protein. Cows with winter grazing ate 34% less hay and 50% less grain than cows with no grazing. Feeding of high quality hay resulted in 29% less hay consumption and 17% less grain consumption than feeding of low quality hay.

Recommendations

The cost of wintering beef cows under the management of this trial for 1990-91 was least for high quality hay and no winter grazing and most for low quality hay and overseeded ryegrass pasture (Table 1).

Reference

St. Louis, D. G., C. H. Hovermale, J. D. Davis, and F. H. Tyner. 1990. Alicia Bermudagrass vs. Pensacola Bahiagrass: Economic Comparison of Intensive Cow-Calf Forage Systems for South Mississippi. MAFES Bulletin 970.

Table 1. Hay quality, supplements fed, and economics of wintering beef cows at the White Sand Unit, South Mississippi Branch Experiment Station, Poplarville, MS, 1990-91.

Winter pasture hay quality		Overseeded ryegrass[1]		None	
		High	Low	High	Low
Hay Quality					
TDN	%	58-62	49-55	58-62	49-55
Protein	%	9-17	10-14	9-17	10-14
Winter Supplements					
Hay	rolls/hd	1.17	1.71	1.83	2.54
Corn	lb/hd	358.3	385.8	675.0	806.7
Soybean meal, 44%	lb/hd	0.0	16.0	0.0	35.4
Wintering Cost[2]					
Hay	$/hd	23.40	34.20	36.60	50.80
Corn	$/hd	25.08	27.01	47.25	56.47
Soybean meal	$/hd		1.84		4.07
Pasture	$/hd	53.33	53.33		
TOTAL	$/hd	101.81	116.38	83.85	111.34

[1] Marshall ryegrass overseeded on sod to provide 0.67 acre/cow.
[2] Prices: hay, $20/roll; corn, $140/ton; soybean meal, $230/ton.

Multispecies Grazing of Beef Cattle and Sheep

S. L. Banes, H. W. Essig, L. H. Boyd, F. T. Withers, and C. E. Cantrell
Leveck Animal Research Center and
Department of Animal and Dairy Sciences, MSU

The practice of grazing two or more species of domestic animals together or separately on the same unit of land in a single growing season is known as common use, dual use, or multispecies grazing. While multispecies grazing has been practiced for many years on western rangelands, it has not been a common practice on pastures in the southeastern United States. One of the main reasons that multispecies grazing has not been practiced is that for years pastures have been established and maintained as monoculture systems, which greatly reduce the benefits derived from grazing two or more species of livestock within a growing season. Beef production in the southeastern United States is often a marginally efficient and sometimes an unprofitable enterprise. However, the potential of the ruminant animal to utilize forage grown on land generally not suited for grain crops is an opportunity that has not been fully exploited. Improved management of high quality forage species through the use of multispecies grazing could make both beef and sheep more productive and competitive.

Objectives of this study were: (**1**) to evaluate diversified management of existing land areas for nontraditional use of multispecies grazing of beef cattle and sheep; and (**2**) to determine the performance of cattle and sheep grazing together versus cattle grazed alone, and measure forage growth, quality, and weed species under common use grazing.

This study was conducted from July 1987 through October 1990. Fifty-four cows and 27 ewes were randomly assigned on the basis of breed type, weight, body condition, and age, into three replications of two treatment groups. Treatment 1 consisted of nine cows grazed alone (CONTROL), while Treatment 2 consisted of nine cows grazed with nine ewes (C+SH). Parturition of each species occurred in the spring of the year in each pasture area, and management after parturition was consistent with typical management procedures for each species.

Three pastures were used as replications in this study with each 25 acres being fenced into two 12.5-acre pastures and Treatment 1 in one-half and Treatment 2 in the other half. The forage system was a bermudagrass base with Marshall ryegrass sodseeded in October. At monthly intervals, forage samples and weed species were identified and numbers of weeds present in 10 randomly assigned areas of each pasture were obtained. Forage samples were analyzed for dry matter (DM), crude protein, *in vitro* dry matter digestibility (IVDMD), and digestible energy was estimated using the Prichard et al. (1985) prediction equation:

$$\text{digestible energy} = .4820 + .0429\ (\text{IVDMD})$$

Results

There were no differences ($P > 0.05$) among January, April, July, and October cow weights or condition scores. The CONTROL cow body weights and condition scores did however tend to be higher than those for the C+SH cows for the 3 years. When the ewe weights (162.5 lb) were added to the cow weights (1,157.6 lb), the C+SH pastures tended to have more total pounds of animals than did the CONTROL pastures (1,188.1 lb). This suggests that the addition of one ewe per existing cow could be beneficial in utilizing available forage.

There were no differences ($P > 0.05$) in quality measures of forage samples as indicated by crude protein, yield of dry matter per acre, *in vitro* dry matter digestibility values, and digestible energy due to treatment. Calves produced by the CONTROL cows (561 lb) tended to be heavier than calves from the C+SH cows (532 lb), however, the cows on C+SH pastures tended to wean more total pounds (629) of animals when the lamb weights were added to the calf weights.

There were no differences ($P > 0.05$) in quality measures of forage samples as indicated by crude protein, yield of dry matter per acre, *in vitro* dry matter digestibility values, and digestible energy due to treatment. Although there was no difference in DM per acre, the CONTROL pastures tended to have more available forage than the C+SH pastures. This may be attributed to the larger number of animal units grazing the C+SH pastures than the CONTROL pastures.

The C+SH pasture had a lower ($P < 0.05$) total number of weeds than the CONTROL pasture (326 vs 451). This less dense weed population can be attributed to sheep eating a larger amount of weeds than cattle, thus lowering the number of weeds present in the pasture that contained the sheep. There was no difference in the number of species of weeds

between the two treatments, however the C+SH pasture tended to be lower than the CONTROL pasture (7.9 vs 8.5). This trend may be due to sheep consuming weeds that cattle will not consume.

Recommendations

These data suggest that the addition of one ewe per existing cow can be beneficial. The advantages of the system are that it makes it possible to wean more total pounds of livestock per year from a given land area while helping to reduce the number of weeds in a pasture. The greatest disadvantage was that there tended to be a decrease in the amount of available forage for the cows when sheep were added to existing cattle pastures.

Agroforestry for South Mississippi:

Grazing versus No Grazing and Fertilization versus No Fertilization on Pine Plantations

David G. St. Louis and Carl H. Hovermale
South Mississippi Branch Experiment Station

The forest and beef cattle industries are two of Mississippi's 10 major agricultural enterprises. These two industries are also two of the major land users in the state. It was assumed that multiple-use systems required reduction in both forage and/or timber production to meet the goal of providing both on the same site. In Mississippi, little or no work has been done specifically on cattle and timber management. Loblolly pines were planted on 33.2 acres in January 1989, with tree spacings of 4 x 8 x 40 feet (double rows 8 feet apart with trees spread 4 feet within the row). Grazing and fertilization treatments began in 1990 using a 2 x 2 factorial design with two replicates. Stocking rates for continuous grazing were approximately 450 and 900 pounds liveweight per acre on nonfertilized and fertilized areas, respectively. Grazing began when grass attained 4 inches average height and terminated with a 1-inch height. Grazing damage to trees was monitored carefully and overgrazing was avoided by removing animals from pasture when necessary. Yearling cattle were weighed on 28-day intervals and were expected to gain approximately 1 lb/head/day. Tree height, growth, damage, and survival data were collected after tree dormancy in the fall on permanent tree sample plots.

Results

In 1990 and 1991, yearling crossbred heifers weighed 682 pounds and 604 pounds, respectively. Grazing of pine plantations was from 111 to 231 days, depending upon the year and stocking rate. Average daily gain (ADG) ranged from 0.93 pound to 1.44 pounds. Tree damage by grazing was minimal for pines in the control pastures but higher stocking rates in the fertilized pines resulted in significant terminal and lateral bud damage. Heifers in one replicate of the fertilized pasture preferred eating pine buds more than in the other fertilized replicate. Forage availability did not appear to be the cause.

Tree height after the 1990 grazing season was 4.74 feet for the heavier stocked fertilized pastures compared to 4.84 feet for the control pastures. Nongrazed trees were 4.20 and 5.30 feet for fertilized and nonfertilized trees, respectively. Tree damage in 1991 caused by cattle grazing was minimal because trees were larger than in the previous year.

Recommendations

Loblolly pine trees can be grazed after the trees have been planted for one year. However, heavier stocking rates may result in tip damage from browsing on young trees even though growth may not be significantly affected. Fertilization permits heavier stocking rates in the second year after planting. Tree growth in nongrazed areas was no greater than in grazed areas. Fertilization of trees in the grazed and nongrazed areas did not improve growth.

Reference

St. Louis, D. G. 1990. Agroforestry for South Mississippi. *1990 Research Progress Report,* South Mississippi Branch Station, MAFES Information Bulletin 193, p. 124.

Forage Systems for Creep Grazing Fall-born Calves

R. L. Ivy, G. E. Brinks, R. L. Elmore,
R. R. Evans, T. E. Fairbrother, and C. P. Bagley
Prairie Research Unit

The objective of this research was to determine if cool season, high quality forage creep will increase weaning weights of fall-born calves.

Results

Four 10-acre pastures of tall fescue (endophyte-infected) were used to maintain cows of each group. Tillage treatments were: (**1**) maximum tillage; (**2**) spray and disk; (**3**) disk; (**4**) spray; and (**5**) no-till. Forage treatments were: (**1**) ryegrass; (**2**) rye-ryegrass; (**3**) ryegrass-crimson clover; and (**4**) ryegrass-berseem clover. Two groups of calves were allowed to graze on "creep grazing" while the other two groups were not allowed access to "creep grazing."

Results are presented in Table 1. Data showed a slight advantage of calves grazing creep over those receiving no creep. There was a 37-pound advantage to the calves receiving the forage creep, but the differences were not statistically significant.

Table 1. Calf performance on creep grazing, Prairie Research Unit, Prairie, MS. 1991.

	1990-1991	
Item	**Creep**	**No-Creep**
Number of calves	14	14
Initial wt.	202	204
Final wt.	572	542
Grazing days	190	190
Total gain/hd	370	338
ADG (Mean)	1.95	1.78

Minimum Tillage for Planting Winter Pasture

David W. Ingram, E. G. Morrison, and Rick Hardin
Brown Loam Branch Experiment Station

The objective of this study was to compare reduced or minimum tillage methods for planting ryegrass for stocker calves. The two sod types utilized were coastal bermuda and summer annual grass. All treatments consisted of cutting hay prior to applying burndown chemicals or drilling ryegrass. The following treatments were compared: (**1**) bermuda sod, paraquat burndown, plant no-till; (**2**) bermuda sod, disk lightly, plant with grain drill; (**3**) bermuda sod, plant no-till; (**4**) prepared seedbed; (**5**) annual sod, paraquat burndown, plant no-till; and (**6**) annual sod, plant no-till. Marshall ryegrass was seeded at 35 lb/acre with either a Marliss no-till drill or a John Deere 8300 series grain drill. Nitrogen was applied at the following rates: 51-0-0 at planting, 34-0-0 mid-February, and 34-0-0 April 1. Each 6-acre plot was initially stocked with nine English and exotic cross steer calves averaging approximately 450 lb/head (650 lb/A) when forage growth reached 6 inches in height.

Results

The average daily gain ranged from 2.46 to 2.55 pounds (Table 1). The gain per head was generally greater on annual sod than on bermuda sod treatments. The gain per head for bermuda sod ranged from 337 to 349 pounds and ranged from 403 to 418 pounds for annual sod treatments. Total gain per acre was approximately 100 pounds greater for annual sod than bermuda sod. Animal grazing days ranged from 206 days for no-till bermuda sod to 232 days for prepared seedbed ryegrass. The initial stocking dates for prepared seedbed and annual sod treatments occurred in late November whereas bermuda sod plots were not stocked until mid-January. This difference in animal grazing days per acre (Table 1) was the reason for greater gain per head and total gain per acre. The carrying capacity for all treatments increased throughout the grazing season. Where 650 pounds per acre

were initially stocked, plots finished at 1,250-1,450 pounds per acre capacity in May. Bermuda sod treatments possessed the same carrying capacity as annual sod treatments, but the reduction in grazing days resulted in less total beef produced per acre.

Recommendations

This project is nearing completion of the second year. Data from 1990-91 suggest that planting ryegrass on summer annual sod resulted in animal performance similar to prepared seedbed planted ryegrass. Ryegrass planted into bermuda sod also produced satisfactory animal performance but gain per head and total gain per acre were somewhat less because of the reduced animal grazing days. This project is attempting to maximize animal grazing days on bermudagrass and annual sod-planted ryegrass. Earlier planting dates on bermuda sod, increased fertilization, and pasture aeration are possible next steps in accomplishing this task.

Table 1. 1990-91 winter grazing results at Brown Loam Branch, Raymond, MS.

Sod-seeding treatment	Animal grazing days	Initial grazing date	ADG	Gain per head	Gain per acre
			lb		
Bermuda sod, paraquat, no-till	210	1-11-91	2.47	338	507
Bermuda sod, disk, drill disk, drill	218	1-11-91	2.46	337	505
Bermuda sod, no-till	206	1-11-91	2.55	349	524
Prepared seedbed	232	11-23-90	2.56	418	626
Annual sod, Paraquat, no-till	229	11-26-90	2.49	418	627
Annual sod, no-till	229	11-26-90	2.54	403	605

Paraquat applied at 1.0 pt/A
Ryegrass seeded at 35 lb/A
Nitrogen applied: 51-0-0 at planting, 34-0-0 mid-February, and 34-0-0 April 1, 1991

Forage Systems for Cow-Calf Production in South Central Mississippi

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Brown Loam Branch Experiment Station

This project was designed to evaluate fertilizer application rates, grazing management systems, and carrying capacity of forage types for beef cow-calf production in Mississippi. Additional information was collected to develop budgets for various grass and legume pastures. The potential profitability of pasture systems and the factors that influence that profitability have always been of the utmost concern at the Brown Loam Station. Five forage systems compared for cow-calf production from 1986 to 1990 were as follows:

System	Base pasture	Fertilizer N-P-K	Stocking rates
1	Bahiagrass	0-0-0	12 cows/24 acres
2	Coastal bermudagrass	0-0-0	12 cows/24 acres
3	Coastal bermudagrass	187-50-50	24 cows/24 acres
4	Coastal bermudagrass overseeded with red and white clover	0-25-25	18 cows/24 acres
5	Coastal bermudagrass 8A overseeded with crimson clover, 16 A interseeded with fescue	0-25-25 102-25-25	21 cows/24 acres

Each pasture system was established in 24-acre areas, which were subdivided into three 8-acre paddocks. This allowed the cow herds to be rotationally grazed according to forage availability. Excess forage was cut for hay and the hay credited to the cow as returns. Cattle were maintained in each system all year round and supplemented during the winter with grass hay and protein. Soil pH levels were maintained above 5.5. Clipping and strategic chemical applications were used in all pastures for weed control.

The cow herds were F_1 Brahman-Angus females bred to Charolais bulls. The calving season was planned for late winter calving (Feb. 5 to April 15). Cows were weighed and scored for body condition prior to breeding in mid-April and at time of weaning in late October. Calves were weighed at birth and weaning. Herd health management was based on recommendations of the MSU Veterinary College.

Results

The pasture systems were evaluated for the 5-year period from 1986 to 1990. Animal performance and economic return information compared on a per cow and per acre basis are outlined in Table 1. Land cost and management inputs were not included as costs in the economic analysis.

The weaning weights were similar across all systems. The variation in weaning weights per acre are due strictly to variation in stocking rate. Cow rebreeding percentages (90%) were identical and therefore not presented in the following table. Cow weights and body condition scores were also similar across all pasture systems.

The greatest variation in the costs assigned to the cow herds was due to seed, fertilizer, and lime for pasture maintenance. The total costs per cow are well in range of the variable costs that are reported in most states. The net returns per cow and per acre are due to variations in costs with little from cow or calf performance.

Recommendations

The production of the various pasture systems were similar under the variable stocking rates. The added costs of fertilizer and seed should be weighed against pasture land rental or purchase to provide individual cattle producers valuable budgeting information. Crossbred beef cows can be stocked on bahia or coastal bermudagrass with no fertilizer at one cow per two acres and produce similar in terms of weaning weight per cow as coastal bermudagrass fertilized with 187-50-50:N-P-K. The highest returns per acre were from the fertilized coastal bermudagrass (System 3) or the systems (4 or 5) that had clovers and/or moderate levels of fertilization. There are several questions that remain unanswered such as: (**1**) what is the impact on pasture quality and/or productivity from long-term fertility neglect; (**2**) can productivity and/or profitability be increased by moderate fertilizer applications; and (**3**) how would moderate fertilization affect potential stocking rates. These and other questions will be the objectives for future research efforts at the Brown Loam Branch Station.

Table 1. Pasture forage systems for beef cow-calf production, MAFES Brown Loam Branch, 5-year average, 1986-90.

	Forage systems				
	1	2	3	4	5
Animal Data					
Number of acres	24	24	24	24	24
Number of cows	12	12	24	18	21
Production Data					
Actual weaning wt., lb	598	588	605	615	615
Adj. 205-day wt., lb	518	503	521	527	534
Avg. daily gain, lb	2.26	2.19	2.27	2.32	2.34
Cow body condition[1]	5.87	6.26	6.23	6.19	6.09
Cow wt. at weaning, lb	1,019	1,055	1,065	1,150	1,119
Weaned wt./acre, lb	299	294	605	456	538
Economic Data					
Pasture cost/cow, $	26.86	26.86	80.63	52.75	59.95
Total cost/cow, $	220.68	225.68	284.82	263.37	282.53
Total value/calf, $2	420.24	413.58	425.42	432.08	432.08
Total value/cow, $3	378.85	372.22	382.88	388.87	388.87
Return to land and mgt.					
per cow, $	158.17	146.54	98.06	125.50	106.34
per acre, $	79.08	73.27	98.06	94.12	93.05

[1] Scored from 1 = very thin to 9 = very fat.
[2] Deducted 5% shrink and 5% of sale value for selling and transportation.
[3] Adjusted for rebreeding percentage.

Light-weight Steer Grazing Response to Fungus-free Fescue and Marshall Ryegrass

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This study was designed to evaluate fungus-free fescue and Marshall ryegrass as grazing crops in northern Mississippi for light-weight steers stocked in the fall.

The tall fescue and annual ryegrass received 500 lb/acre of 13-13-13 fertilizer in September and 200 lb/acre of ammonium nitrate in March of each year. The ryegrass land was disked in July and again in August to prepare the seedbed for natural reseeding. Natural reseeding was poor and the area was planted with a grain drill.

All pastures were stocked in the fall with 2 steers/acre, with an average weight of 403 lb/steer and 434 lb/steer in the fescue and the ryegrass, respectively. Prior to stocking, the steers were implanted with a growth stimulant and fed preconditioning feed for about 2 weeks. A diet was fed consisting of hay, corn, cottonseed meal, and salt formulated to achieve a 0.5 to 1.0 pound/head/day gain during the winter when grazing was unavailable.

Results

Fall fescue allowed earlier fall grazing than annual ryegrass, but had a lower average daily gain (ADG) compared to steers on ryegrass during the fall grazing period (Table 1). Total grazing days for fescue and annual ryegrass were 134 and 112 days, respectively. In the spring grazing period, the steers on ryegrass had a higher ADG but a shorter grazing period. Total gain per acre for both grazing periods was 606 lb/acre for ryegrass and 546 lb/acre for fescue.

Table 1. Performance of steers during the fall and spring on fungus-free tall fescue and Marshall ryegrass in the fall of 1990 and spring of 1991 at the Pontotoc Research and Extension Center, Pontotoc, MS.

	Grazing Systems	
Items	**Tall Fescue**	**Annual Ryegrass**
Fall stocking period	11-15-90 to 1-4-91	11-27-90 to 1-4-91
Feeding period	1-5-91 to 4-1-91	1-5-91 to 3-6-91
Spring stocking period	4-2-91 to 6-25-91	3-7-91 to 5-20-91
Total grazing days	134	112
Stocking rate steers/acre	2	2
Daily gain, lb		
Fall	1.43	1.99
Spring	2.14	3.32
Final av wt. lb	676	739
Total gain lb/acre	546	606

Monoculture and Polyculture Endophyte-Free Fescue Forage Systems

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The most economical and efficient energy source for beef cattle is permanent pasture harvested by grazing. The southeastern United States, because of its temperate climate, good soil, and abundant moisture, has forage available to be converted to beef. Two of the most common species of grasses used in permanent forage systems in the southeast are common bermudagrass (*Cynodon dactylon*) and tall fescue (*Festuca arundinacea* Schreb). Tall fescue is productive from November to June, and bermudagrass is productive

from June to October so the two grasses complement each other in grazing systems. This study was developed to evaluate two types of forage systems: polyculture (two species of grass—bermudagrass and fescue), and monoculture (a single species of grass—fescue). The systems were evaluated by comparing the carrying capacity, grazing days, estimated digestible energy produced, and animal performance.

Twenty-four 2-acre paddocks were seeded with 12 combinations of six varieties of tall fescue and/or bermudagrass (n=2 per combination) in the fall of 1988 for a 4-year study. Within the polyculture system, five different varieties of endophyte-free tall fescue were planted in combination with common bermudagrass to constitute five treatments. The sixth treatment in the polyculture system was common bermudagrass. The polyculture treatments were: (**1**) common bermudagrass (BG); (**2**) bermudagrass-blend (BGBR)—50% Cajun fescue, 35% Martin fescue, and 15% perennial ryegrass; (**3**) Cajun tall fescue and bermudagrass; (**4**) Johnstone tall fescue and bermudagrass (BGJF); (**5**) MSF-77-1, an unreleased variety of tall fescue in combination with bermudagrass (BGMS); and (**6**) Kentucky-31 tall fescue and bermudagrass (BGKY).

The monoculture treatments were: (**1**) a blend of varieties (BR)—50% Cajun, 35% Martin, and 15% perennial ryegrass; (**2**) Cajun fescue (CF); (**3**) Johnstone fescue (JF); (**4**) Kentucky-31 fescue (KY); (**5**) Martin fescue (MF); and (**6**) MSF-77-1 fescue (MS). Steers (Hereford-Angus crossbred) were placed on forage treatments when it was determined that sufficient forage quantities were available to support animal growth. The 2-acre paddocks contained an artificial shade and a water source and were divided with a power fence into four 0.5-acre plots that were rotationally grazed on a 7-day basis. Animals were weighed on a 20-day basis.

Results

During year 1, the BG and BGMS treatments of the polyculture system and the MS treatment of the monoculture system were not sufficiently established to compare performance of steers over the entire year. Performance of animals on BGBR, BGCF, BGJF, and BGKY indicated that steers on BGBR had more grazing days than those on BGCF. There were four grazing periods with animals grazing BR, CF, JF, KY, and MF. Steers on the BR and KY treatments had the highest stocking rate (grazing days) and EDE production in addition to a general increase in animal performance. The EDE for steers in the polyculture systems on the BGBR, BGCF, BGJR, and BGKY treatments were not different.

In year 2, the BG and BGMS treatments were evaluated during the last five grazing periods and animals on those treatments tended toward increased grazing days, digestible energy, and dry matter consumed during the last two grazing periods. Steers on BG were more efficient in digestible energy production compared to dry matter consumed than those grazing the BGCF, BGJF, and BGMS treatments. The MS forage treatment was evaluated for the last four of seven grazing periods. Animals grazing the KY and CF treatments had the highest grazing days, digestible energy production, and dry matter consumed, with those on MS producing the lowest values. Those EFF varieties seem to be the most productive for the environmental conditions present for the year.

During year 3, grazing days for steers on all treatments of the polyculture system were not different, but those on BGBR produced more digestible energy than those on BGKY and BGMS treatments. All six monoculture forage treatments were evaluated for all 10 grazing periods. Steers on the KY and MS treatments consistently had values in the highest range for all factors evaluated. Steers on the MS treatment performed much better in comparison to the other treatments in earlier years. Since the MS treatment was only in its second year of evaluation, additional comparisons will be made to determine if animals grazing MS will continue to show comparable performance.

Recommendations

Steers grazing the EFF varieties evaluated in this experiment tended to produce similar grazing days, or stocking rates, digestible energy production and performance. However, steers on the MS treatment produced increased performance during the warmer summer months. Bermudagrass as a forage treatment allows increased steer performance and increased stocking rates during the summer months and may increase EDE efficiency of grazing steers.

Grazing Management of Newly Established Endophyte-free Fescue Pastures

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Stand persistence has been identified as a problem associated with establishment and utilization of endophyte-free fescue (EFF) pastures. Suggestions are that EFF may be subject to more intense grazing because of the lack of alkaloids, resulting in overgrazing and reduction in stand density or loss of stand. Carrying capacity of pastures is often based on the flush growth of the spring season, after resulting in overstocking and overgrazing during dry periods or periods of restricted growth. In most grazing practices, continuous grazing is followed, but other systems such as rotational grazing or deferred grazing are being advocated to balance the productive capacity of pastures. Grazing intensity controls the rejuvenation of herbage and allows for increased accumulation of carbohydrate reserves in the roots, producing a stronger plant to aid in survival in times of stress. This study was conducted to evaluate grazing pressure and stand persistence of KY-31 EFF pastures.

In the fall of 1988, KY-31 EFF was seeded in 10 five-acre paddocks on the Leveck Animal Research Center. Forage systems were: (**1**) continuous grazing to an estimated height of 3 to 4 inches (CONT-SHORT); (**2**) continuous grazing to an estimated height of 6 to 8 inches (CONT-TALL); (**3**) rotational grazing to an estimated height of 3 to 4 inches (ROT-SHORT); (**4**) rotational grazing to an estimated height of 6 to 8 inches (ROT-TALL); and (**5**) rye with fescue continuously grazed until rye was utilized (CONT-RYE). In the CONT-RYE treatment, a mixture of 35 pounds of fescue and 90 pounds of rye per acre was planted and animals were allowed to graze until March 6, 1989, when the rye was utilized and regrowth was allowed to accumulate for a hay crop harvested in early July. Steers were used the first 2 years and heifers were used the last 2 years.

Stand persistence, stocking rate, grazing days, weight gain, forage availability (dry matter from cages), and chemical composition of forage were evaluated.

Results

Quality estimations of forage harvested differed little among treatments but were more influenced by growth rate, plant maturity, and monthly climatic changes. Stand densities were determined through visual observation by two or more scientists. There were no differences in stand densities among the CONT-SHORT, CONT-TALL, ROT-SHORT, and ROT-TALL treatments within either of the first 3 years of the study (91.4%, 77.9%, 54.7%), however, the stand densities decreased from about 91% to about 54% over the 3-year period. The CONT-RYE treatment had a stand density of 70.5% in 1988, 54.2% in 1990, and 20.8% in 1991, which was significantly lower than the other four treatments each year.

Stocking rate was not influenced by treatment or year, however, stocking rate varied within year, with the months of April and May having the highest stocking rate and the largest animal gain. Grazing days were lower ($P < 0.05$) for CONT-RYE (1,002) than for ROT-SHORT, CONT-SHORT, ROT-TALL, and CONT-TALL (1,524, 1,365, 1,192 and 1,109, respectively). Steer average daily gains (ADG) by treatment for 1989 and 1990 were: CONT-SHORT, 1.78, 1.17; CONT-TALL, 1.96, 1.37; ROT-SHORT, 1.65, 1.45; ROT-TALL, 1.81, 1.30; AND CONT-RYE, 1.94, 1.32 lb/d, respectively. Heifer average daily gains were: CONT-SHORT, 0.64; CONT-TALL, 0.66; ROT-SHORT, 0.62; ROT-TALL, 0.68; and CONT-RYE, 0.93 lb/d. Gains of steers for CONT-SHORT, CONT-TALL, ROTSHORT, ROT-TALL and CONT-RYE were: 412, 385, 435, 354, and 337 lb/acre. Heifers on CONT-RYE, ROT-TALL ROT-SHORT, CONT-SHORT and CONT-TALL gaines 202, 178, 177, 167, 166 lb/acre. Cage clipping for dry matter also indicated that CONT-RYE produced the least ($P < 0.05$) yield (386 lb/ac) during the first year; however, yields were similar for the last 2 years. Stand persistence declined over years. No differences ($P > 0.05$) were observed between rotational and continuous grazing.

Recommendations

Endophyte-free fescue should be grazed at a height of 6 to 8 inches to maintain the most desirable forage density. There was no advantage for a four-way rotational grazing of endophyte-free fescue. Endophyte-free fescue stand density declined by year regardless of grazing height.

Endophyte-free and Endophyte-infected Fescue for Cow Herds

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Tall fescue (*Festuca arundinacea* Shreb) infested with fungal endophyte (*Acremonium coenophialum* Morgan-Jones and Gams) is well known for its toxic effects on cattle. A conservative estimate indicates that 90% of tall fescue pastures are infected with the fungus. A symbiotic relationship occurs between the grass and the fungus. The fungus establishes a compatible and permanent biotrophic relationship with tall fescue in which it completes its life cycle in the host and its seed. In addition to its toxic effects on cattle, the endophyte serves as a deterrent to insect pests, alters the leaf morphology, enhances the growth of fescue, and serves as a drought-tolerance factor.

Fescue toxicity manifests itself mostly during the summer season and causes fescue foot, fat necrosis, poor animal performance (poor gain, scours, rapid respiration, fever, rough hair coat, and reduced milk production) and increased susceptibility to other diseases. All these are collectively known as "summer syndrome" or "summer slump."

Objectives of this study were to: (**1**) determine the effects of endophyte fescue on reproduction and milk production; (**2**) evaluate the effect of fescue toxicity on weaning weight, grade, type, and body condition score; (**3**) compare methods of determining forage availability and quality; (**4**) compare forage systems that maximize economic and energetic efficiency; (**5**) compare the nutritional, chemical, physical, and physiological qualities that maximize forage utilization; and (**6**) evaluate various methods of assessing forage quality.

Sixty spring calving cows of Hereford and Angus breeds were used as experimental animals in a split plot design. Cows were assigned to graze either endophyte-free Kentucky-31 tall fescue (EFF) or 100% endophyte-infected Kentucky-31 tall fescue (EIF). Cows were allotted to groups on the basis of breed, weight, and body condition. The fescues were established in 10-inch rows in a common bermudagrass sod. They were placed on each 25-acre pasture during October 1986, and maintained on the same pasture until October 1990. Cows were weighed each year in January (Prior to calving), April (prior to breeding), June (calves about 120 days of age), and October (when calves were weaned). Cows were culled from the population primarily because of death, cancer eye, or broken mouth. Culling was not made on the basis of nonpregnancy because it was a trait being investigated. Cows culled were replaced so that each treatment unit would receive equal access to cattle grazing.

In 1989, milk was collected from each cow on a 28-day interval from April to August by withdrawing the calves overnight from their dam and giving the cows an injection of oxytocin. Milk production was determined by milking individual cows using an electric milking machine. Milk samples were analyzed for lactose, fat, protein, and solid-non-fat components using a Multispec Instrument.

When forage from the pastures were limited, endophyte-free hay was fed to cows on the EFF pastures and EIF hay was fed to the cows grazing the EIF pastures. When hay was fed, a salt:protein supplement (36% CSM, 50% ground corn, 8% urea, and 6% dicalcium phosphate) was mixed in a ratio of 1:2 (1 part salt and 2 parts protein supplement) and fed free choice to both treatment groups of cattle. Other routine herd management and health practices were followed.

Economic evaluation was conducted using the Mississippi 1991 forage planning budget handbook.

Results

Average cow weight suggests that cows grazing EIF consistently have lower weights than those grazing EFF irrespective of the season of the year. However, cow weight gain was not significantly different (38.8 vs 26.2 lb). The 4-year average palpated pregnancy rate for the EFF cows was 87.9% and was significantly higher than the 58.3% for the EIF cows. Results of this study are consistent with results of Lechtenberg et al. (1975) and Hemken et al. (1979) who reported their observations prior to assessing endophyte levels in fescue. Cows grazing EIF tended to have a better condition score than cows grazing EFF. A possible explanation for this was that EIF-grazed animals were gaining weight or getting fatter instead of getting pregnant and those EIF cows with calves produced less milk; therefore, the condition scores were better in EIF cows.

There were more calves weaned from cows that grazed EFF than from those grazing EIF (25 vs 17). There was no difference in calf birth weights due

to treatment. Calf weaning weight was higher ($P < 0.05$) for calves from cows grazed on EFF (510 lb) than those grazed on EIF (414 lb). Calf condition score, grade and type were higher ($P < 0.05$) for calves from cows grazed on EFF than for those grazed on EIF. The average yearly total amount of weight at weaning was higher for calves from cows grazed on EFF (12,527 lb) than for calves from cows grazed on EIF (7,046 lb).

Cows grazed on EFF had higher milk production (8.1 lb) than those grazed on EIF (2.7 lb). A plausible explanation for this was that prolactin, an essential hormone in milk release, could be disturbed by alkaloid's effect on dopamine, therefore depressing prolactin release with a subsequent reduction in milk production. There were no differences in milk solids, lactose, protein, or fat due to treatment.

Forage-animal research data are intended to benefit the producer; therefore, their final use value should be determined by economic analysis. Factors used in the budgeting process were pregnancy rate; replacement heifers; weights of cows, bulls, steers, and heifers; variable cost; fixed cost; and estimated profit. The 4-year average economic analysis indicated that cows grazed on EFF returned an estimated profit of $89.63 per head compared to a loss of $54.44 per head when cows and calves were grazed on EIF.

Recommendations

Pregnancy rate, calf weaning weight, total pounds of calf weaned, calf grade, calf type, and calf condition scores were higher for animals grazed on EFF than for those animals grazed on EIF pasture. When the cows were grazed on EFF, a profit was possible. It is not profitable for beef cattle to continuously graze EIF pasture.

Fescue Variety Trial

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Prairie Research Unit

The objective of this research was to evaluate fescue varieties for yield, disease resistance, and stand persistence.

Results

Total dry matter yield ranged from a high of 6,717 lb/a for GA-Jessup Imp FI to a low of 5,289 lb/a for Martin (Table 1). In the table, the values marked "LSD" indicate the amount of difference between two different forage varieties that would be necessary for a true statistical difference.

Table 1. Dry matter yield of fescue varieties at Prairie Research Unit, Prairie, MS. 1991.

	Dry matter yield				
	Harvest dates				
Variety	4/5/91	4/23/91	5/15/91	6/17/91	Total
	lb/acre				
Alta	953	2,149	1,617	1,066	5,785
Au-Triumph	1,419	2,060	1,515	1,051	6,046
Fawn	1,404	2,101	1,598	1,103	6,206
GA-Jessup FI	1,816	1,915	1,324	793	5,849
GA-Jessup Imp FI	1,804	2,272	1,721	927	6,717
Ky-31 FF*	927	1,856	1,451	1,104	5,340
Ky-31 FI*	1,040	2,060	1,530	980	5,612
Martin	1,125	1,842	1,304	1,016	5,289
MSF-77-1	1,025	1,951	1,616	1,032	5,625
OFI-TF-B1	1,694	2,115	1,799	1,061	6,669
OFI-TF-B15	848	1,917	1,678	1,114	5,558
Penngrazer	1,211	1,922	1,625	930	5,689
TF8872	1,572	2,138	1,540	1,082	6,333
TF9077	1,570	1,958	1,604	1,105	6,237
WVB-88-TF-8-141	999	2,074	1,703	1,172	5,948
Mean	1,294	2,022	1,574	1,036	5,927
LSD (.05)	493	470	388	302	1,192
CV%	26	16	17	20	14

Reference

Edwards, N. C., R. L. Elmore, C. H. Hovermale, D. M. Ingram, R. L. Ivy, B. Johnson, D. J. Lang, and V. H. Watson. 1991. Performance of cool season forage crops in Mississippi. MAFES Info. Bull. 201.

Bermudagrass Variety Trial

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Prairie Research Unit

D. J. Lang
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The objective of this research was to evaluate bermudagrass varieties for forage dry matter yield and stand persistence.

Results

Total dry matter yield ranged from a high of 6,714 lb/acre for "Holly Springs" to a low of 3,080 lb/acre for "Pasto Rico" (Table 1) for 1991. Four-year average is presented in Table 2. In the tables, the values marked "LSD" indicate the amount of difference between two different forage varieties that would be necessary for a true statistical difference.

Table 1. Dry matter yield of bermudagrass varieties at Prairie Research Unit, Prairie, MS. 1991.

Variety	Yield			
	June 3	July 17	Sept 3	Total
	lb/acre			
Alicia	2,384	487	1,969	4,840
Stallings	1,258	694	2,037	3,988
Maddox	1,474	805	1,710	3,988
Murphy	1,324	1,331	2,655	5,310
Tifton 78	1,739	900	2,264	4,903
Lancaster	2,132	1,601	2,559	6,291
Grazer	2,493	1,463	2,425	6,381
Coastal	1,796	1,354	2,697	5,746
Tifton 44	2,504	1,095	2,154	5,753
Holly Springs	2,942	1,221	2,551	6,714
Giant [1]	0	386	2,254	2,640
Pasto Rico [1]	0	494	2,585	3,080
Common [1]	0	344	2,226	2,570
Prairie I	2,382	1,058	2,064	5,504
Prairie II	2,157	1,537	2,578	6,272
Prairie III	2,367	695	1,944	5,007
Mean	1,684	960	2,291	4,936
LSD (0.05)	1,349	318	824	1,490
CV%	56	23	25	21

[1] Reseeded April 25, 1991.

References

Edwards, N. C., R. L. Elmore, C. H. Hovermale, D. M. Ingram, R. L. Ivy, B. Johnson, D. J. Lang, and V. H. Watson. 1991. Performance of warm season forage crops in Mississippi. MAFES Info. Bull. 192.

Lang, D. J., R. L. Ivy, R. L. Elmore, and D. M. Ingram. 1991. Winter injury of Bermudagrass (*Cynodon Pactylon* (L.) Pers.). American Forage and Grassland Council Conference, Columbia, MO., pp. 229-332.

Table 2. Dry matter yield of bermudagrass varieties at Prairie Research Unit, Prairie, MS. 1988-1991.

Variety	Total Yield				4-Year Average
	1988	1989	1990	1991	
	lb/acre				
Alicia				4,840	0
Stallings	5,449	10,405	2,531	3,988	5,593
Maddox	5,065	10,722	W[1]	3,988	0
Gillihan	7,064	10,882	W	0	0
Murphy	0	0	0	0	0
Tifton 78	7,874	8,775	W	4,903	0
Lancaster	6,657	11,605	3,011	6,291	5,473
Grazer	5,183	10,356	4,266	6,381	6,546
Coastal	7,702	11,159	3,680	5,746	7,071
Tifton 44	6,952	10,808	2,626	5,753	6,534
Holly Springs	6,388	10,893	3,174	6,714	6,792
Giant	0	0	0	2,640	0
Pasto Rico	6,516	9,066	W	3,080	0
Tierra Verda	6,253	8,116	W	0	0
Common	5,341	9,174	W	2,570	0
Prairie I	5,435	10,452	3,131	5,504	6,130
Prairie II	5,987	10,171	3,030	6,272	6,365
Prairie III	5,022	10,823	2,200	5,007	5,763
Mean	5,552	10,227	3,072	4,936	
LSD (0.05)	1,595	1,292	733	1,490	
CV%	15.5	16.8	29.8	21.0	

[1] W = Winterkill

Loss of Subterranean Clover Hard Seed during the Summer and Fall under Sod and Bare Ground Environments

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Subterranean clover is a useful cool-season annual legume for overseeding on warm-season grass sods in the southeastern United States. Useful subterranean clover characteristics are vigorous spring growth, prostrate growth habit, and ability to set seed while being grazed. However, a frequent deficiency of subterranean clover in the southeastern United States has been a failure to reestablish a stand.

Proper germination regulation is an important aspect in determining persistence of an annual clover. An impermeable seedcoat (hardseededness) is the most important germination regulation mechanism in subterranean clover. Hard seeds of some subterranean clover cultivars have been shown to soften rapidly during the summer until little hard seed remains after the fall reestablishment period. An adequate soil seed bank is important to stand maintenance following years with low seed production. There are few studies of the loss of hardseededness under field conditions in the southeastern United States. The objective of this experiment was to determine the rate of hard seed loss of subterranean clover during the summer and fall under bare ground and bermudagrass sod conditions.

Seed of 'Woogenellup' subterranean clover was harvested from field plots in early July of 1990 and 1991. Hard seed was separated by first soaking in water then floating off the swollen seeds in a sucrose solution. One hundred hard seeds were counted into 1 x 5-inch dacron mesh bags. Four replications of 3 x 6-foot bare ground and sod plots were prepared in a bermudagrass sod. Bare ground plots were thoroughly tilled and maintained free of vegetation by periodic spraying with Roundup. Sod plots were mowed monthly to a height of 3 inches. Nine bags of hard seed were buried 0.5 inch deep in each plot on July 26, 1990 and July 23, 1991. One bag was removed from each plot at 14-day intervals until November 29, 1990 and November 26, 1991. After recovery of the bags, a 14-day germination test was performed on the remaining seed from the bags. Hard seed was that seed which remained hard at the end of the germination test. Soft seed was that seed which had not germinated when recovered from the field but which germinated or imbibed water during the germination test.

Results

There was a dramatic difference in the softening rate of hard seed between bare ground and sod plots (Fig. 1). Hard seed recovered from sod plots reached a minimum level of about 54.5% by mid-September, compared with only 17.4% hard seed recovered in bare ground plots. The most rapid loss of hard seed occurred before mid-September in both years. Little additional seed softened after mid-September. Fluctuating high temperatures during the summer cause hard seed to soften. Soil surface temperatures of bare ground plots reached 120° F on cloudless summer days. The grass sod keeps the soil surface temperature about 20° F cooler. Therefore, less seed softened under sod than bare ground plots. By late September, soil surface temperatures cooled enough that little additional seed softened.

The accumulation of soft seed in the bags varied greatly between years due to the difference in rainfall (Fig. 1). In 1990, rainfall was relatively low during August and September (Fig. 1) and soft seed accumulated to as high as 81% in bare ground treatments. Germination occurred from early October to November. In 1991, rainfall during August and September was sufficient to germinate much of the accumulated soft seed. Soft seed accumulated to a maximum of 32% and germination of the soft seed was completed by mid-October. This indicated that seedlings emerging from mid-August and later must be encouraged to survive by reducing the competition of the grass sod (use them or lose them). Sod competition can be reduced by grazing or mowing the sod to 2 inches or less.

Recommendations

Results suggested that more subterranean clover hard seed remained after the summer in bermudagrass sod than in bare ground. If seed produc-

tion were equal between bermudagrass sod and bare ground plots, an adequate soil seed bank should be more easily maintained under a sod than bare ground. When growing a reseeding annual clover in a bermudagrass sod, the bermudagrass should be grazed short during mid-August and September to favor clover seedling establishment. If subterranean clover soft seed and seedlings die, little additional hard seed will soften after mid-September and poor clover stands will result.

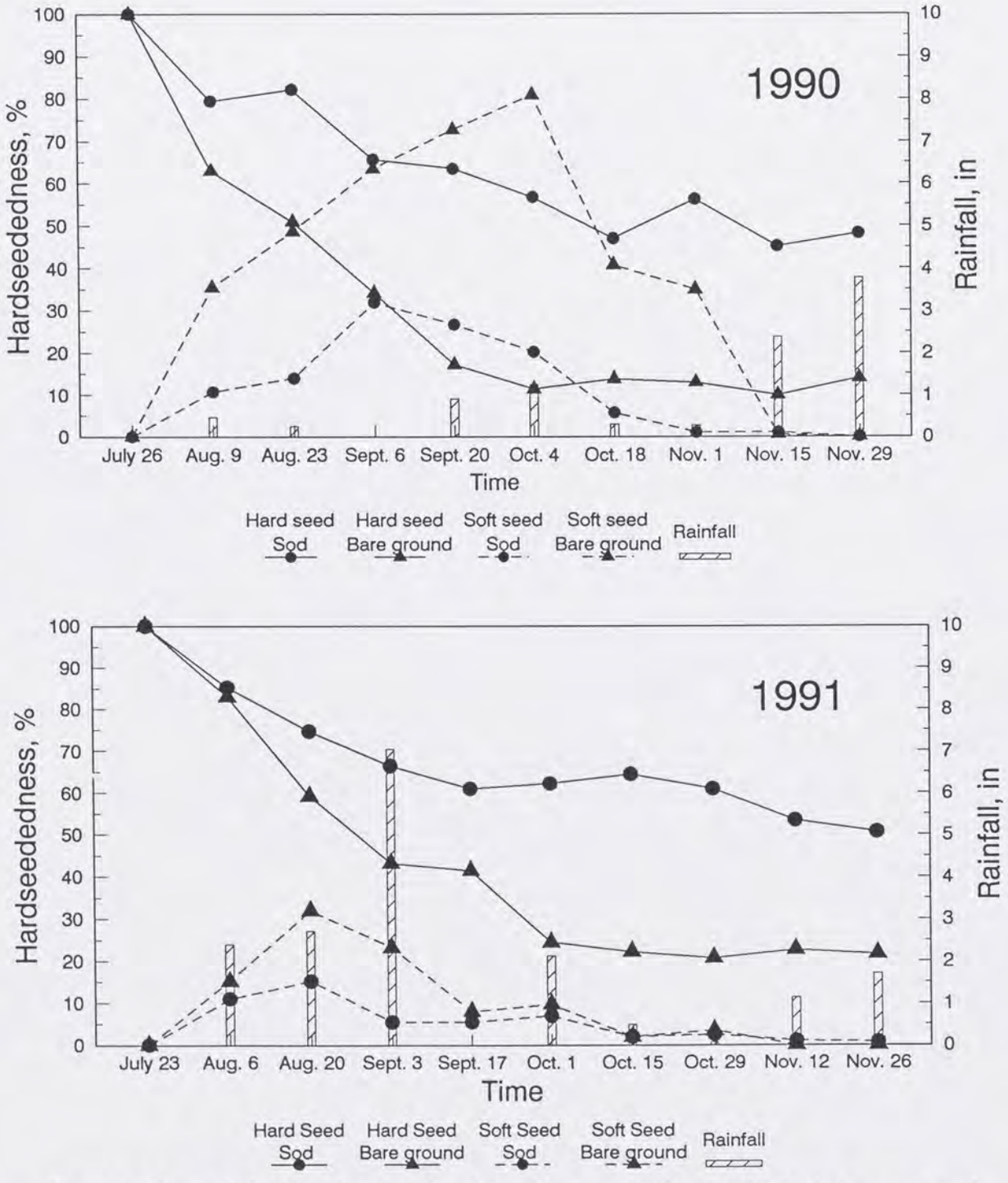

Figure 1. Change in hard and soft seed and 2-week accumulative rainfall during summer and fall of 1990 and 1991.

No-till Winter Annuals following Crabgrass and Subsequent Yield of Crabgrass

David J. Lang
Department of Agronomy, MSU

Early production of winter forages provides dairy and beef animals with high quality pasture. Optimum fall earliness and high yields are obtained by disking through the summer. Disking highly erodible fields, however, may be a violation of the Sodbuster provisions of the 1985 and 1990 Farm Bills. Winter annuals sown into sods or in 80-foot till/20-foot sod strips generally provide an acceptable practice, which brings the field into compliance. Winter annuals seeded into bermudagrass sod, however, yield about one-half less than winter forages seeded into a prepared seedbed, while those seeded into a crabgrass sod yield about one-third less (Lang, 1989). Seeding into a crabgrass sod may extend the utilization of the pasture through the summer (Lang, 1990).

Three species of winter annuals (Walken oats, Marshall ryegrass, and Bigbee berseem clover) were seeded into crabgrass sods in fall 1990. Ryegrass and berseem clover were also interseeded in alternating rows. Tillage plots consisted of summer fallow beginning in July, hay removal in September, and paraquat applied following hay removal in September. Winter annuals were harvested from December to May and the crabgrass was harvested in July and September.

Results

Winter annuals yielded 6-10 times less early in the season (December and March) when sown into a crabgrass sod than those sown in tilled soil (Table 1). Yield differences, however, were not evident in April and May and total seasonal yields were similar across tillage treatments. Paraquat following hay removal did not offer any advantage over hay removal alone. Berseem clover suffered some winter injury and it yielded about half as much as oats or ryegrass. Crabgrass was stimulated following Berseem.

Factors that may help stimulate fall growth of sodeeded winter annual include additional nitrogen fertilizer and aeration.

References:

Lang, D.J. 1989. Comparative effects of tillage on winter annual forage production. *In* Proc. S. Cons. Till. Conf. IFAS Spec. Bull. 89-1:62-64

Lang, D.J. 1990. Utilization of crabgrass and broadleaf signalgrass as summer annual forages following winter annuals. Southern Soc. Agron. Abs., p. 13.

Table 1. No-till winter annuals following crabgrass and subsequent yield of crabgrass.

Tillage and Species	Date of Harvest						
	12-6-90	3-20-91	4-11-91	5-22-91	7-16-91	9-16-91	Total Yield
	lb / acre						
TILL							
Oats	1,220	2,343	1,526	1,153	426	0	6,668
Berseem	760	0	0	1,014	1,478	0	3,252
Ryegrass	1,412	2,131	1,928	1,307	174	0	6,952
Ryegrass + Berseem	1,227	2,355	1,943	1,388	348	0	7,261
SOD							
Oats	234	691	1,688	1,623	835	1,618	6,689
Berseem	45	0	0	727	1,081	1,713	3,566
Ryegrass	126	838	2,193	1,822	793	1,746	7,518
Ryegrass + Berseem	80	928	1,943	2,079	769	1,834	7633
PARAQUAT							
Oats	38	774	1,443	1,726	985	1,645	6,611
Berseem	129	0	0	962	1,027	3,719	3,614
Ryegrass	122	768	1,891	1,770	715	1,740	7,006
Ryegrass + Berseem	209	1,299	1,870	1,917	841	1,652	7,788
CV %	61.6	32.2	14.9	45.5	40.0	12.8	13.1
LSD	239	271	169	551	260	223	865
MEAN	467	1,011	1,369	1,457	789	1,680	6,349

Planting Date: 9-28-90 Fertilizer 165-65-65, with N applied 65 at planting, 50 in February and 50 in June.

Stockpiled Tall Fescue for Winter Forage

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Prairie Research Unit

D. J. Lang
Department of Agronomy, MSU

The objective of this research was to monitor total nonstructural carbohydrates (TNC) of tall fescue for the growing season.

Results and Recommendations

One year of data showed that there was no significant difference between infected and noninfected tall fescue for TNC. The tillers had a greater concentration of TNC than leaves. There was no pasture or treatment by tissue interaction. There was a date by pasture interaction. There was a decline in TNC during the growing season in both infected and noninfected types of fescue.

Problems have been occurring with fungus-free fescue with stand persistence. The thought was that there might be some difference in the amount of TNC accumulated in the fescues. This study indicated there was no difference in the TNC for both fescues. The production of fungus-free fescue will need top management. It will not tolerate mismanagement like fungus-infected tall fescue. Fungus-free tall fescue will need a rest during the summer. A producer interested in trying fungus-free tall fescue should establish a small acreage to see if it will produce at his location.

Reference

Ivy, R. L., R. L. Elmore, R. R. Evans, and D. J. Lang. 1992. Stockpiled tall fescue for winter forage. *In*: Proc. Tall Fescue Toxicosis Workshop. SRIEG-37 (November, 1991) p. 60.

Stand Persistence of Endophyte-free Tall Fescue

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Endophyte-free tall fescue provides cattle growers with the opportunity to increase animal gains and improve pregnancy rates compared with endophyte-infected tall fescue. Stand establishment is adequate provided sufficient fall moisture is available. Stand persistence, however, may decline after 2-3 years on some fields (Essig et al., 1991). Some endophyte-free tall fescue fields have persisted for longer than 7 years at Prairie, Mississippi, where the soil is well-adapted to tall fescue. The presence of the endophyte in tall fescue may impart resistance to insects, disease, nematodes, and drought. Summer rest of endophyte-free tall fescue may also be essential if it is to persist. An experiment was established in 1989 to determine the effect of nitrogen rates from 0 to 150 pounds per acre and summer cutting on endophyte-free tall fescue planted into bermudagrass. Nitrogen was applied in October, February, and May on the summer cut plots. Some plots were left uncut and unfertilized through the summer months.

Results

Tall fescue yield responded to nitrogen fertilizer up to 150 pounds N per acre. Stands of tall fescue declined when the plots were harvested through the summer and fertilized with greater than 90 pounds N per acre (Figure 1). Tall fescue growing in bermudagrass could persist if nitrogen was reduced to less than 90 pounds N per acre per application. In August 1991, all the stands declined rapidly because of the presence of an unknown pathogen. The plots that received less than 90 pounds N per acre and that were left uncut through the summer suffered the least damage.

Recommendations

Endophyte-free tall fescue should probably be planted by itself without bermudagrass and utilized only from October through May. A summer rest is essential. Nitrogen should be applied in September-October and again in February at no more than 90 pounds N per acre per application. Soils that are well-adapted to endophyte-free tall fescue include heavy clay soils in the northern third of Mississippi. Stands may only persist for 2-3 years so care must taken not to tear up all the old endophyte-infected tall fescue in the same year. Endophyte-infected tall fescue can be improved by adding clovers and reducing the fall application of nitrogen.

Reference

Essig, H. W., F. T. Withers, Jr., D. J. Lang, W. J. Woods, and C. E. Cantrell. 1992. Evaluation of Endophyte Free Tall Fescue Cultivars as Monoculture or Polyculture Systems. *In*: Proc. Tall Fescue Toxicosis Workshop. SRIEG 37 (November 1991, p. 54).

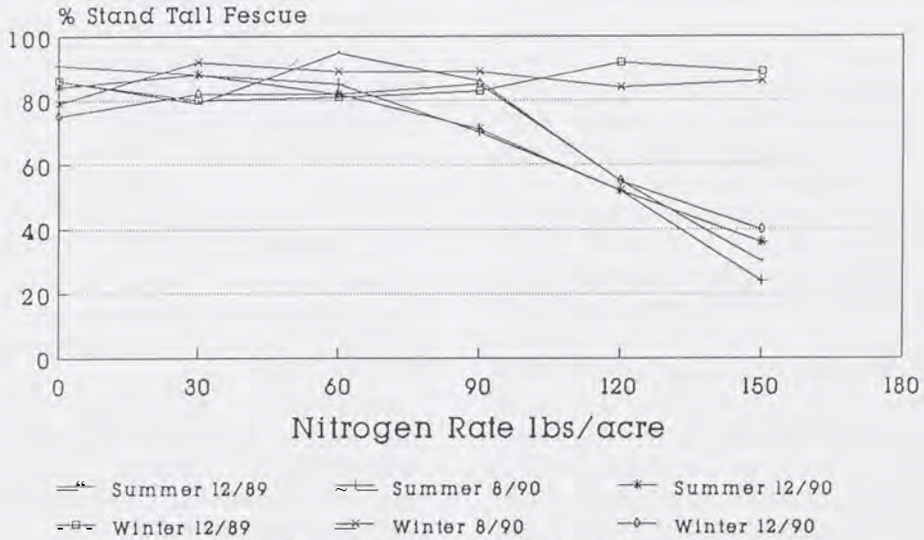

Figure 1. Stand persistence of endophyte-free tall fescue.

Culture and Management of Cool Season Forage and Pasture Crops in Plot Trials

Carl H. Hovermale and Ned C. Edwards
South Mississippi Branch Experiment Station

Cool Season Forage Grasses

Two sets of experimental plots were established; one in cooperation with McDonald Farms at Tylertown, MS, the other on the South Mississippi Branch Station at Poplarville. Ten wheat, 10 rye, 8 triticale, and 20 ryegrass varieties were planted at Tylertown October 10, 1990 and at Poplarville October 17, 1990.

Results

At Poplarville, wheat dry matter (dm) yields ranged from 890 to 1,765 lb/acre. The three highest yielding wheat varieties and their respective forage dry matter yields were: Florida 301H (1,765 lb/A), Florida 302 (1,606 lb/A), and Florida 303 (1,383 lb/A). At Tylertown wheat yields ranged from 2,266 to 3,352 lb/acre. The three highest yielding wheat varieties and their respective forage dry matter yields were: Wakefield (3,352 lb/A), Florida 302 (3,346 lb/A), and Keiser (3,144 lb/A).

At Poplarville, rye yields ranged from 2,672 to 3,164 lb/acre. The three highest yielding rye varieties and their respective forage dry matter yields were: Elbon (3,164 lb/A), NF 125 (3,123 lb/A), and GA WAC5L (3,118 lb/A). At Tylertown, rye yields ranged from 3,884 to 4,589 lb/acre. The three highest yielding rye varieties and their respective forage dry matter yields were: NF 73 (4,589 lb/A), GA WAC5L (4,583 lb/A), and NF 14 (4,536 lb/A).

At Poplarville, ryegrass yields ranged from 2,894 to 4,288 lb/acre. The three highest yielding ryegrass varieties and their respective forage dry matter yields were: Multimo (4,288 lb/A), Multigrazer II (3,776 lb/A), and Multigrazer IIA (3,761 lb/A). At Tylertown, ryegrass yields ranged from 4,284 to 5,086 lb/acre. The three highest yielding ryegrass varieties and their respective forage dry matter yields were: Barmultra (5,086 lb/A), Urbana (5,062 lb/A), and Multigrazer II (5,016 lb/A).

At Poplarville, oat yields ranged from 3,409 to 4,226 lb/acre. The three highest yielding oat varieties and their respective forage dry matter yields were: Simpson (4,226 lb/A), Walken (4,127 lb/A), and NF 20 (4,062 lb/A). At Tylertown, oat yields ranged from 1,296 to 6,047 lb/acre. The three highest yielding oat varieties and their respective forage dry matter yields were: NF 188 (6,047 lb/A), NF 170 (5,847 lb/A), and Ozark (5,759 lb/A).

There is an increasing interest in soil conservation and cost reduction in the establishment of winter pastures. A 3-year experiment was set up at the South Mississippi Branch Experiment Station to determine the effect of planting method on yield and forage distribution of ryegrass.

Ryegrass was planted using five treatments after grazed bahiagrass pasture: conventionally prepared seedbed, one pass with a disk, no-till in standing stubble, paraquat, and no-till planting November 1. Imposed upon these treatments were two seeding methods, drill and broadcast. There was no difference in yield attributable to seeding method and there was no interaction between treatments and seeding method. Conventionally prepared seedbeds yielded more than other treatments.

Cool Season Legumes

Legumes are an important factor in many pasture situations. They are not only highly nutritious, but also have the ability to fix atmospheric nitrogen for use by grass species. Legume variety tests were established at the South Mississippi Branch Experiment Station in order to find legume varieties adapted to the extreme southern portion of the state.

Fourteen red clover, 10 white clover, and 16 annual clover varieties were planted at Poplarville. Plots were harvested to a 3-inch stubble height three times during the production season.

Results

Red clover forage yields ranged from 1,676 to 3,714 lb/acre. The three highest yielding red clover varieties and their respective forage dry matter yields were: FL6-EF (3,714 lb/A), Cherokee – FL 5 (3,618 lb/A), and FL-MTC (3,388 lb/A).

White clover yields ranged from 2,098 to 2,881 lb/acre. The three highest yielding white clover varieties and their respective forage dry matter yields were: VS 600 (2,881 lb/A), Florida XPL-3 (2,881 lb/A), and VS 981 (2,663 lb/A).

Annual clover yields ranged from 1,976 to 3,112

lb/acre. The three highest yielding annual clover varieties and their respective forage dry matter yields were: Segrest Ball (3,112 lb/A), Chief Crimson (3,026 lb/A), and Yuchi Arrowleaf (3,000 lb/A).

Six vetch varieties were planted at Poplarville. Phosphorous and potash were applied to soil test recommendations at planting. Plots were harvested to a 3-inch stubble height once during the production season.

Vetch yields ranged from 1,966 to 3,969 lb/acre. The three highest yielding vetch varieties and their respective forage dry matter yields were: Hairy vetch (3,969 lb/A), Vantage vetch (2,977 lb/A), and both Cahaba White and Woodford vetch (2,499 lb/A).

Culture and Management of Summer Forage and Pasture Crops in Plot Trials

Carl H. Hovermale and Ned C. Edwards
South Mississippi Branch Experiment Station

Alfalfa and Birdsfoot Trefoil Variety Trials

Six nondormant and 16 semidormant alfalfa varieties were planted at Poplarville in November 1989. Plots were harvested to a 3-inch stubble height as required during the production season. Within 3 days after each harvest, the whole experimental area was sprayed with 1.5 pt/acre of Gramoxone®. Twenty alfalfa varieties were planted in 1991.

Results

The six nondormant alfalfa varieties were cut five times and yields ranged from 5,649 to 6,905 lb/acre. The three highest yielding varieties and their respective dry matter yields were, Florida 77 (6,905lb/A), DL 8802 (6,179 lb/A), and DL 8801 (5,889 lb/A).

The sixteen semidormant alfalfa varieties were cut five times and dry matter yields ranged from 6,937 to 5,135 lb/acre. The three highest yielding varieties and their respective dry matter yields were: WL Southern Special (6,937 lb/A), WAMPR (6,800 lb/A), and Pioneer 5331 (6,799 lb/A).

Six birdsfoot trefoil varieties were planted in 1991. Plots will be harvested periodically as appropriate.

Summer Annual Forages

Nineteen tropical corn varieties and two commercial hybrids were planted June 11, 1991 at Poplarville for silage yield. There was no significant difference in yield attributed to variety. Yields ranged from 15.5 to 25.4 tons/acre. The three highest yielding varieties and their yield (tons/acre at 65% moisture) were: Pioneer 3098 (25.4), Cargill 125 (23.1), and Cargill 606 (21.9).

Nineteen tropical corn varieties and two commercial hybrids were planted May 24, 1991 at Tylertown, MS, for silage yield. There was no significant difference in yield attributed to variety. Yields ranged from 16.3 to 26.2 tons/acre. The three highest yielding varieties and their yield (tons/acre at 65% moisture) were: Cargill 511-A (26.2), Cargill 905 (25.1), and Pioneer X304C (24.9).

Six forage sorghum varieties were planted in a randomized complete block design with four replications. Silage yields ranged from 13.7 to 29.3 tons/acre. The three highest yielding varieties and their yield (tons/acre at 70% moisture) were: Deltapine G 1990 (29.3), Dekalb FS 25E (28.1), and Deltapine G 102F (26.3).

Summer Perennial Forages

Thirteen bermudagrass varieties planted in May 1990, were harvested four times in 1991 for forage yield. Dry matter (dm) yields ranged from 2.7 to 6.2 tons per acre. The three highest yielding varieties and their respective dry matter yields were, Tifton 78 (6.2 tons/A), Coastal (6.0 tons/A), and Maddox (5.8 tons/A).

Nine nitrogen treatment combinations were applied to an established bahiagrass sod. These treatments consisted of application timing and nitrogen rate. Plots were harvested four times for dry matter yield. There was no difference in dry matter yield attributable to treatment. Forage samples are awaiting nutrient analysis.

Four nitrogen treatments and two levels of lime were applied to an established bahiagrass sod. Plots were harvested four times for dry matter yield. Lime

had no effect on dry matter yield. There was no interaction between nitrogen rate and lime. The no nitrogen check yielded less than plots with 200 or 400 pounds of nitrogen applied in April and June.

References

Hovermale, Carl H. 1991 Alfalfa Variety Trials in South Mississippi. 1991. MAFES Information Bulletin 208.

Edwards, Ned C., Robert Elmore, Carl Hovermale, David Ingram, Roscoe Ivy, Billy Johnson, David Lang, and Roger White. 1991. Cool Season Forages, 1991 Variety Trials. MAFES Information Bulletin 201.

Edwards, Ned C., Robert Elmore, Carl Hovermale, David Ingram, Roscoe Ivy, Billy Johnson, David Lang, and Vance Watson. 1991. Performance of Warm Season Forage Crop Varieties. MAFES Information Bulletin 192.

Response of Tropical Corn to Cover Crops and Fertilizer Nitrogen

R. L. Ivy and R. L. Elmore
Prairie Research Unit

The objective of this research was to evaluate cover crops and fertilizer nitrogen (N) for corn production.

Results

Cover crop treatments, silage and grain yield are presented in Table 1. Silage yields ranged from a high of 25.7 tons/acre to a low of 13.3 tons/acre. Grain yield ranged from a high of 48.0 bushels/acre to a low of 17.8 bushels/acre. Highest yield for both silage yield and grain yield was from crimson clover. There was no interaction of cover crops x nitrogen.

Table 1. Cover crop treatments, silage and grain yield of tropical corn. Prairie Research Unit, Prairie, MS, 1991.

Cover Crop	N rate	Yield-Ton/A @ 35% D. M.	Grain yield Bu/A*
Crimson Clover	0	25.7	45.0
"Tibbee"	60	18.9	48.0
	120	17.5	23.2
	180	15.1	36.5
Mean		19.3	38.1
Rye	0	15.6	23.4
"Elbon"	60	19.6	35.2
	120	20.2	36.4
Mean		18.5	32.8
Fallow	0	17.9	26.0
	60	17.1	34.0
	120	17.6	20.0
	180	20.9	30.0
Mean		18.4	30.0
Rye/Vetch	0	16.7	27.7
"Elbon"/"Hairy"	60	13.1	24.6
	120	15.8	38.0
	180	18.9	45.0
Mean		16.1	30.0
Vetch	0	14.5	31.2
"Hairy"	60	14.7	25.7
	120	18.3	34.3
Mean		16.0	29.2
Rye/Crimson	0	19.3	17.8
"Elbon"/"Tibbee"	60	14.7	29.5
	120	16.5	34.7
	180	13.8	29.4
Mean		15.9	27.9

Adjusted to 15.5% grain moisture content

Crossbreeding for Cow-Calf Production

David St. Louis
South Mississippi Branch Experiment Station

Brahman influence in beef cows is important to cow-calf production in south Mississippi and the coastal plain. New ways to improve efficiency and management are constantly being sought. The objective of this study was to evaluate combining ability in cow-calf production using F_1 dams and third-breed, terminal cross sires. Cows were bred in a 60-day breeding season to begin calving in January. Calves were weaned at approximately 240 days of age.

Results

Brahman x Hereford F_1 cows had calves with lighter birth weights and greater adjusted 205-day weaning weights than Beefmaster x Hereford or Barzona x Hereford cows but these differences were not significant ($P<0.05$). Calves sired by Brangus bulls were lighter at birth than those from Simmental bulls. Actual and adjusted weaning weights were heavier for Simmental sired calves (see Table 1). Of F_1 cows that were bred in the spring of 1986, 1987, 1988, 1989 and 1990; 95%, 91%, 84%, 91%, and 86%, respectively, were pregnant in a 60-day breeding season. Of those pregnant, 91%, 97%, 91%, 99%, and 95%, respectively, weaned calves.

Of the sire and dam breeds tested at this location, Simmental sires on F_1 Brahman x Hereford dams produced calves with the heaviest weaning weights.

Reference

St. Louis, D. G. 1990. Crossbreeding for Cow-Calf Production. *1990 Research Progress Report*, South Mississippi Branch Station, MAFES Information Bulletin 193, p. 126.

Table 1. Least-squares mean effects of sire breed and dam breed on preweaning cow and calf performance at Poplarville, MS, 1991.[1,2]

Category	No.	Birth wt.	Adj. 205 WW	Wean wt.	Cow wt.	WW:CW ratio
		lb				%
By sire breed						
Brangus	35	79a	495a	540a	1,091	46a
Simmental	45	90b	592b	634b	1,159	52b
By Dam Breed						
Beefmaster x Hereford	7	87	550	594ab	1,084	51ab
Brahman x Hereford	54	82	554	616a	1,115	50a
Barzona x Hereford	9	85	526	550b	1,175	45b

[1] Least squares means computed to adjust for significant forage system effects.

[2] Least-squares means in columns and category followed by different letters are significantly different ($P < 0.05$) with T-tests.

Backgrounding of Crossbred and Purebred Steers, 1990-91

David St. Louis, James Killen, and Gene Morrison
South Mississippi and Brown Loam Branch Experiment Stations

Crossbreeding has been an important management tool in cow-calf production. It is becoming increasingly important to produce desirable carcass characteristics in feeder cattle. The objective of this study was to evaluate backgrounding performance of steers produced in various crossbreeding systems. Steers from crossbreeding experiments at South Mississippi Branch Experiment Station, Brown Loam Branch Experiment Station, Prairie Research Unit, and the Leveck Animal Research Center at Mississippi State University, and weighing less than 700 pounds at weaning, were backgrounded on winter pastures at the Brown Loam and South Mississippi Branches. Sire and dam breeds were balanced for both locations. After backgrounding, all steers were finished in a commercial feedlot at Edwards, Mississippi.

Results

In the 1990-91 trial, Marshall ryegrass pastures were grazed for 174 days at South Mississippi Branch and for 175 days at Brown Loam Branch. Beginning and ending weights were heavier ($P < 0.05$) at Brown Loam than at South Mississippi but total and average daily gains were not different (Table 1). Sire breed differences were not significant for total and average daily gains. There were significant differences in all parameters measured due to dam breed. However, since very few dam breeds were represented by more than one station, it is difficult to evaluate whether dam breed differences were really differences due to the stations themselves.

Recommendations

Of the sire and dam breeds tested in 1990-91, Charolais- sired steers showed the greatest ADG and Brangus+ sired steers the least. However, Brangus-sired steers were heavier and fleshier when the test began. Differences in ADG due to breed of dam mainly reflect beginning weights and compensatory gains.

Reference

St. Louis, D. G. 1990. Backgrounding of Crossbred and Purebred Steers. *1990 Research Progress Report*, South Mississippi Branch Station, MAFES Information Bulletin 193, p. 130.

Table 1. Effect of sire breed and dam breed on performance of steers backgrounded on ryegrass pastures at Raymond and McNeill, MS, 1990-91.

Category	Station origin[2]	No.	Beginning weight	Ending weight	Total gain	ADG
			lb			
By Location (Reps)[1]						
Brown Loam		64	545a	977a	432	2.47
South Mississippi		65	489b	932b	443	2.55
By Sire Breed[1]						
Charolais	B,L	30	498b	959b	461a	2.65a
Gelbvieh	B	22	509b	962b	453ab	2.59ab
Brangus	S	10	584a	987ab	403b	2.31b
Simbrah	S	11	605a	1,029a	423ab	2.43ab
Angus	P,L	24	508b	938b	430ab	2.46ab
Hereford	P,L	32	494b	921b	427ab	2.45ab
By Dam Breed (Means)[1]						
Brahman x Angus	B,L	29	559ab	979ab	420abc	2.41abc
Simmental x Angus	B	12	464cde	947abc	483a	2.77a
Angus x Hereford	B	15	433e	900bc	467abc	2.68abc
Brahman x Hereford	S,P	20	591a	994a	403c	2.31c
Barzona x Hereford	S	5	543ab	996a	453abc	2.60abc
H x BRA[3]	P	8	541ab	987a	447abc	2.56abc
A x BRA[3]	P	4	507bcd	972abc	466abc	2.67abc
Angus	P,L	16	492bcde	904abc	412bc	2.36bc
Hereford	P	12	447de	890c	442abc	2.53abc
Charolais	L	8	525abc	1,006a	480ab	2.75ab

[1] Means in columns and category followed by different letters are significantly different ($P < 0.05$).
[2] B=Brown Loam, S=South Mississippi, P=Prairie and L=Leveck ARC.
[3] H x BRA = 1/2 Hereford 1/4 Brahman 1/4 Angus, A x BRA = 3/4 Angus 1/4 Brahman.

Breeding Programs for the Efficient Production of Quality Beef

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The study at the Prairie Research Unit is to evaluate the value of one-quarter Brahman/three-quarter English cows as replacement females in a commercial cattle operation. One-half Brahman females have been shown to be a very superior commercial cow but to maintain this cow, producers have to maintain two cow herds or purchase replacement F_1 cows. Maintenance of a purebred herd to provide F_1 cows is a management inconvenience as well as being more costly. Also, the risk of disease introduction increases with purchased animals. By using high quality bulls and careful selection of calves from the F_1 herd, quality replacement females can be saved. Hybrid vigor will be reduced, but a high quality feeder steer or heifer will be produced.

Results

In the 1989-1991 time period, pregnancy rates and weaning weight were 95% and 506 pounds for F_1 cows and 93 and 459 pounds for F_2 cows.

Recommendations

The F_2 cow had a lower weaning average than the F_1 cows during the 1989-1991 time period, but many of these F_2 cows were young and they were hampered by the extremely dry weather experienced during this time period. They are quality replacement females and are able to provide high quality calves. They will not provide, as a group, the weaning weights of the F_1 cow, but they are very acceptable.

References

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Evaluation of Three Beef Cattle Production Systems

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This study was designed to evaluate beef cow-calf production response to three pasture management systems. The systems consisted of the following:

1. One cow-calf unit per 2 acres of common bermudagrass, dallisgrass, and fescue. This system received spring weed control but no fertilizer.
2. One cow-calf unit per acre of common bermudagrass, dallisgrass, and fescue which was subdivided into three pastures and fertilized according to soil test recommendations with N, P, and K.
3. One cow-calf unit per 1.5 acres of common bermudagrass, dallisgrass, and fescue subdivided into three pastures. White clover, red clover, and crimson clover was planted in each of the subpastures, respectively, and fertilized with P and K according to soil test recommendations.

Results

The calves on the 2.0 acres/cow pasture with no fertilizer had slightly higher actual and adjusted weaning weights than those on the 1.0 acre/cow pasture with N fertilizer and 1.5 acres/cow pasture with legumes (Table 1). The calves in the 2.0 acres/cow pasture with no fertilizer had a higher calf weaning weight to cow weight ratio than calves in the 1.0 acre/cow pasture with N fertilizer and 1.5 acres/cow pasture with legumes. The 2.0 acres/cow pasture with no fertilizer produced 479 lb/calf adjusted weaning weight in comparison to 457 lb/calf for the 1.5 acres/cow pasture with legumes and 461 lb/calf for 1.0 acre/cow with N fertilizer.

The calf weaned weight per acre was highest for 1.0 acre/cow pasture with N fertilizer (461 lb/acre), intermediate for 1.5 acres/cow pasture with legumes (305 lb/acre), and lowest for 2.0 acres/cow pasture with no fertilizer (240 lb/acre).

Recommendations

These results tend to indicate that improvements in pounds of beef produced per acre may be accomplished by increasing management (P and K fertilizer with either N or legumes) of the forage.

Table 1. Animal performance on three pasture management systems for calf production from March 11, 1991 to October 2, 1991, Pontotoc Research and Extension Center, Pontotoc, MS.

	Pasture management systems		
Items	2.0 acres/cow No fertilizer	1.0 acre/cow fertilizer	1.5 acres/cow Legumes
Total Acres	30	15	22.5
Number of cows	15	15	15
Feeding days (March 11-October 2)	0	0	0
Cow conception rate %	100	87	100
Birth wt lb/calf	73	72	71
Weaning wt lb/calf	485	461	480
Adjusted wt lb/calf	479	461	457
Calf weaning wt/cow wt ratio	47	45	45
Age of calves at weaning	217	215	224
Feeder grade	11	12	11
Frame score	3	3	3
Lb/acre calf weaned	240	461	305
Tons hay/acre harvested	0	0	0

Feedlot and Carcass Performance of Steers from Various Sire Breeds

M. E. Boyd, E. G. Morrison, J. H. Killen, E. W. Hogue, R. R. Evans, and D. St. Louis

Six sire breeds were evaluated for feedlot and carcass performance of their steer progeny. The six breeds – Hereford (H), Angus (A), Brangus (Br), Simbrah (S), Charolais (C), and Gelbvieh (G) – represented the sire breeds currently being evaluated at the experiment stations involved in the statewide breeding project. The dam breeds are dependent on location and represent the breed crosses that perform best at those locations.

Steers were wintered on ryegrass pastures and moved to a feedlot at the Cal Maine farm, Edwards, Mississippi, on June 10, 1990. The steers were kept in confinement, penned by sire group, and fed a whole shell corn and corn silage ration along with a commercially available protein supplement. Steers were weighed at 28-day intervals during their stay in the feedlot. Feed conversion was calculated on a pen (sire) basis. Steers were slaughtered when an estimated 70% of the pen would grade low choice as determined by visual appraisal. Carcass data were gathered by USDA graders.

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No statistical analysis has been performed on the data. The apparent differences between feedlot means (Table 1) and carcass means (Table 2) should be interpreted very carefully. Steers entered the feedlot at an average weight across breed groups of 968 pounds. This is a heavy weight to enter a feedlot, it but does represent the weight of the steers after a normal winter grazing period. Steers placed on grass each year were not the heaviest in each of the various sire groups.

An effort was made each year to select "average" type steers. Steers were kept on feed an average of 144 days, the longest period of any of the 3 years that this study has been conducted. Final weights were also heavier than in any of the 2 previous years. Daily weight gains and feed conversions were acceptable for all of the sire groups.

Total feed costs, including yardage and interest payments on feed, ranged from $207.61 for Br-sired steers to $258.65 for C-sired steers. Cost per pound of gain and value per pound of live weight (based on carcass value) indicate that it was profitable to feed all of the sire groups except A and C. Again, these means should be interpreted carefully as they have varied widely between the sire breeds from year to year.

Carcass weights ranged from 782 pounds for

Table 1. 1991 Feedlot performance (per head) of Hereford (H)-, Brangus (Br)-, Simbrah (S)-, Gelbvieh (G)-, Angus (A)-, and Charolais (C)-sired steers.

	Sire Breed					
Item	H	Br	S	G	A	C
Number	32	10	10	22	24	27
Initial weight	921	988	1,029	959	938	1,029
Final weight	1,302	1,356	1,409	1,318	1,297	1,346
Days fed [1]	137	144	151	137	144	151
ADG	2.78	2.55	2.47	2.53	2.50	2.49
Feed conversion	8.78	7.80	8.30	9.89	10.55	10.34
Cost/head ($) [2]	224.48	207.61	220.94	225.11	247.67	258.65
Cost/lb gain ($)	0.59	0.56	0.59	0.66	0.69	0.68
Value/lb live weight ($)[3]	.63	.64	.65	.67	.67	.65

[1] Includes 14-day acclimation period.

[2] Includes feed, yardage, and transportation costs.

[3] Based on carcass price.

Table 2. Carcass performance of Hereford (H)-, Brangus (Br)-, Simbrah (S)-, Gelbvieh (G)-, Angus (A)-, and Charolais (C)- sired steers.

	Breed of Sire					
Trait	**H**	**Br**	**S**	**G**	**A**	**C**
Carcass weight	782	827	849	800	808	804
Maturity	A	A	A	A	A	A
Dressing %	60.6	61.0	63.1	60.7	62.0	62.6
Adjusted fat, in.	.70	.63	.44	.50	.61	.34
KPH, %	2.10	1.50	1.20	2.20	1.50	1.30
Marbling[1]	8.38	8.90	8.40	8.19	12.20	9.64
Qual grade[2]	18.00	18.20	17.30	18.20	19.40	18.50
REA	12.80	12.30	13.70	14.10	12.60	14.70
Yield grade	3.19	3.50	3.20	2.19	3.40	3.10
Carcass value per lb, $	1.05	1.04	1.07	1.10	1.07	1.08
Total carcass value, $	824.77	862.78	910.76	882.04	864.14	871.43

[1] 7=Average Slight, 8=Slight Plus, 9=Small Minus, 10=Average Small, etc.
[2] 17=Average Select, 18=Select Plus, 19=Choice Minus, etc.

Hereford-sired steers to 849 pounds for Simbrah-sired steers. Dressing percents, fat thickness, and KPH fat were all in the normal range for steers of their weights. Marbling scores, hence, quality grades, were similar for H, Br, S, and G steers, averaging 8.4 or slight plus for marbling and select to select plus for quality grade. A-sired steers averaged 12.2 and C-sired steers averaged 9.6 for marbling, indicating that these steers were fed too long, which would have increased cost/gain and decreased value/lb live weight.

The entire data set has yet to be analyzed. This makes interpretation of differences between means difficult. However, some trends have maintained themselves across the 3 years that we have conducted this study. H and Br steers generally have the shortest days on feed. C and G steers have been the heaviest muscled throughout the project. A- sired steers have had the highest quality grade and generally one of the higher valued carcasses. S-sired steers have had the worst feed conversions and the lowest quality grade. The data are currently being analyzed and should be available in final form next year.

An Economic Analysis of Alternative Calf Management Practices

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Most cow-calf producers sell their calves at weaning. Many of those calves are not prepared to face the stress of weaning, sale, shipping, and comingling with other calves. High morbidity (sickness) and mortality rates result. This study conducts an economic analysis of selected calf management strategies available to Mississippi cow-calf producers. The economic impact of both pre-weaning and post-weaning calf performance was estimated.

Calf performance estimates for each calf management strategy were developed from data gathered with a modified Delphi technique, in which animal scientists, veterinarians, Extension personnel, and producers were interviewed.

Results and Recommendations

Based on the assumptions used in the study, which are reflective of those individuals interviewed, more intensive calf management yielded greater expected profitability to cow-calf producers willing to employ such practices. Although variable costs to the cow-calf producer increased, returns increased more as a result of improved weaning weights and less morbidity and mortality.

According to the study, stocker buyers could afford to offer a premium for calves coming out of an intensive pre-weaning calf management program. Wellmanaged calves will perform better and sooner than poorly-managed calves. They also respond more rapidly to medication, allowing them to resume weight gain sooner following sickness.

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Little, Randall D., and Johnny Wade Gaspard. "An economic analysis of alternative calf management practices." Agricultural Economics Report, Department of Agricultural Economics, Mississippi State University (forthcoming).

Efficacy Evaluation of Erodible Norgestomet® Implants in Growing Heifers

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Controlling the time of estrus is very important in the cattle business because the technology can be used both to suppress estrus and increase weight and to synchronize estrus.

Our study was designed to evaluate efficacy of erodible-type Norgestomet® implants for increasing rate of weight gain and inhibiting cycling in nonpregnant growing heifers during a test period of 154 days.

One hundred crossbred heifers between 13 and 15 months old and weighing 410 to 599 pounds from the Prairie Research Unit were used. All heifers were managed as a single group, and grazed on a mixture of fungus-infected fescue and common bermudagrass with free-choice mineral mix. Also, 5 days a week, from August 27 to the end of the test period, 3 pounds per day of a combination of 50% ground corn and 41% cottonseed meal plus two bales of hay was available.

All animals were randomly allotted prior to implanting within three weight strata (32, 32, and 36 heifers each) to four treatments, including a control (no implant) or 12, 24, and 36 mg Norgestomet.

Individual animal weights were obtained at the time of implanting and at 56, 112, and 154 days postimplanting. Blood samples were taken from jugular

veins of all heifers on days 112, 122, 132, 142, and 153 post-implanting and assayed for progesterone concentration to assess cyclicity. A serum progesterone concentration > 1 ng/ml in any sample was taken to indicate the presence of a functional corpus luteum which meant that the heifer was cycling. Serum progesterone concentration < 1 ng/ml indicates the absence of a functional corpus luteum at that sampling time.

Results and Recommendations

Cyclicity among treatments was not inhibited (Table 1). The Norgestomet implant appeared not to influence the percentage of heifers in estrus throughout the study. However, rate of weight gain at 112 and 154 days was greater ($P < .05$) for the 24-mg treatment and tended to be greater ($P < .08$) for the 36-mg treatment (Figure 1).

Despite the presence of cyclicity in implanted heifers, they still gained more weight than nonimplanted heifers. Although more research is needed to determine efficacious doses for implants, this tool could be useful for increasing gains in heifers.

Table 1. Effect of Norgestomet on incidence of cyclicity.

Day after implanting	0	12 mg	24 mg	36 mg
112	5[1]	12	4	2
122	4	8	2	3
132	0	2	3	3
142	1	1	1	3
Total	10	23	11	14
%	40%	92%	44%	56%

[1] Number of cows with progesterone > 1 ng/ml at that sampling period.

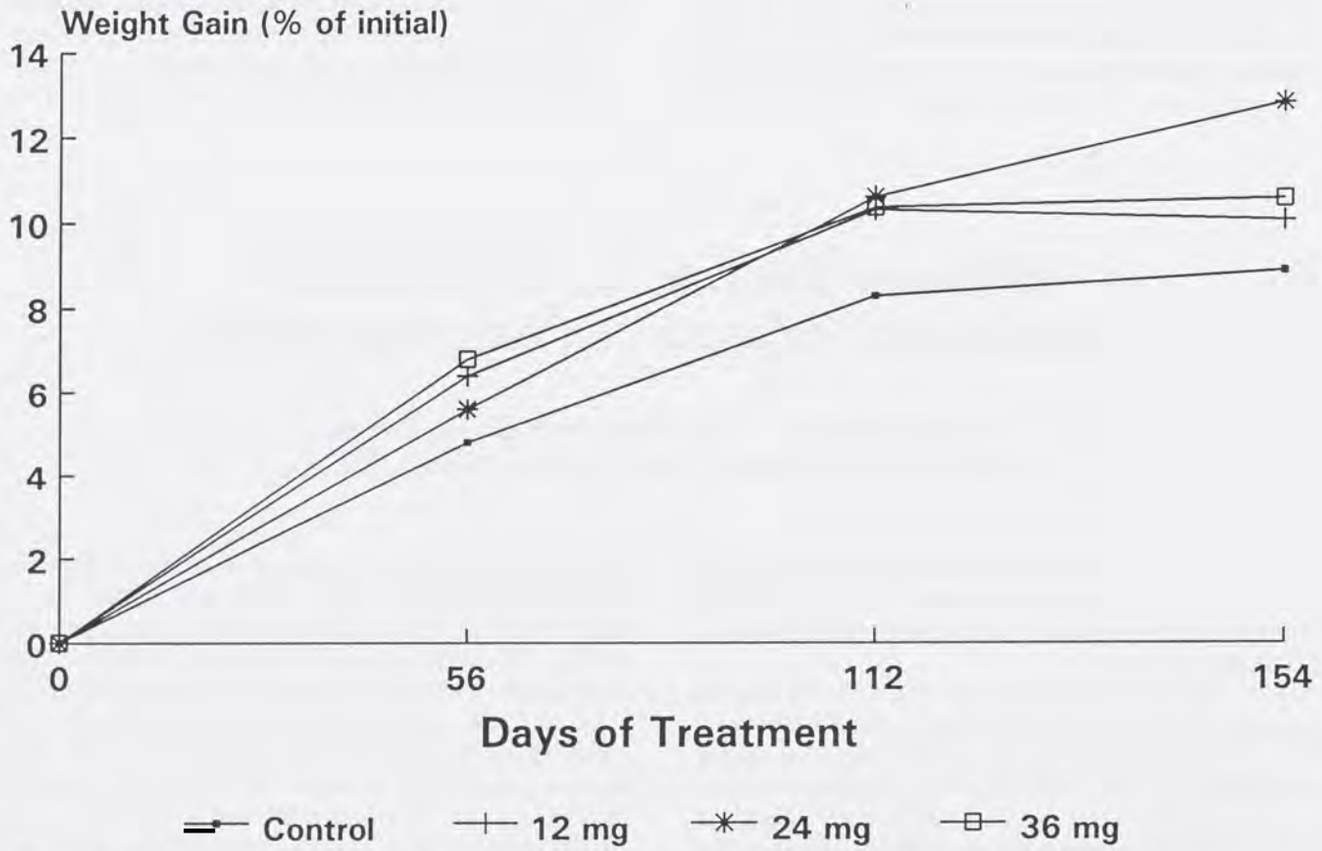

Figure 1. Weight gain, experessed as percentage of initial body weight, was influenced by Norgestomet treatment. At 112 and 154 days, the 24-mg treatment was significantly greater ($P<0.05$) than controls.

Effect of Feeding Frequency on Growth Performance, Carcass Traits, and 24-hour Secretory Patterns of Metabolic Hormones in Beef Steers

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The objective of the study was to alter meal feeding frequency (number of meals fed/day) to possibly improve average daily gain, feed conversion efficiency, or carcass characteristics, such as ribeye area, back fat, percentage of kidney, pelvic and heart fat, quality grade, and yield grade. Blood metabolic hormones were also measured over a 24-hour period to determine if alterations in hormone levels might be responsible for any observed differences in growth or carcass characteristics.

The hormones measured were growth hormone, insulin-like growth factor I, insulin, cortisol, triiodothyronine (T_3), and thyroxine (T_4). These hormones were measured because they include those responsible for growth, amount of carcass lean and fat, and general level of metabolism (homeostasis) of the animal.

The study utilized 12 three-breed cross (1/2 Polled Hereford, 1/4 Brahman, 1/4 Angus) and 12 Polled Hereford steers initially weighing 780 pounds, which were assigned by breed and body weight to receive either one meal or four meals (every 6 hours) per day. Feed intake was equalized between the groups and consisted of 67% ground shelled corn, 19% cottonseed hulls, 12% soybean meal, salt, minerals, and vitamin A. The study lasted for 97 days. Steers averaged 1,065 pounds at the end of the feeding trial.

Results

The steers fed one meal per day gained an average 2.80 pounds per day while requiring an average of 7.97 pounds of feed per pound of gain. On the other hand, the steers fed four meals per day gained an average 3.06 pounds per day while requiring 7.26 pounds of feed per pound of gain. Steers fed more meals per day, even though having the same daily intake, tended to gain faster and more efficiently than those steers fed once daily. There were no differences in carcass characteristics between treatments.

Growth hormone, also known as somatotropin, is secreted by the pituitary gland. Animals administered growth hormone have leaner carcasses, and currently this hormone is being used experimentally in injection or implant form to improve feed efficiency and produce carcasses with more muscle and less fat.

Insulin-like growth factor I (IGF-I) is a hormone that has been implicated to cause increased gain of carcass protein but decreased fat. IGF-I has also been linked to conversion of feed into weight gain in cattle and is secreted by many tissues of the body including muscle and the liver. A positive relationship exists between growth hormone and IGF-I during times of sufficient nutrient intake. During times of nutritional stress, this positive relationship is uncoupled. Growth hormone and IGF-I were not different in those steers fed one or four times per day in the present study.

Cortisol is an adrenal hormone that is secreted during stress and has been reported to cause decreased carcass tenderness. Over a long term, it can also decrease carcass muscle by promoting protein breakdown during stress. Cortisol was not different between the treatment groups in the present study.

Insulin was lower in the animals fed four meals per day than those fed one meal per day. Insulin is a pancreatic hormone secreted in response to increases in blood glucose. It promotes the uptake of glucose and amino acids by cells so these substances can be used for energy. Insulin is positively related to carcass fat and increases with age and body size in cattle. It is also generally higher in heifers and steers than bulls.

The thyroid hormones (T_3 and T_4) accelerate cellu-

Table 1. Average hormone values over 24 hours in steers fed one or four meals/day.

Hormone	Meal frequency	
(ng/ml)	1x	4x
Growth Hormone	10.4	11.3
IGF-I	103.1	101.1
Insulin	1.3	0.9
Cortisol	5.7	5.2
T_3	2.5	2.2
T_4	84.7	76.7

lar activity (metabolic rate) in most organs and tissues of the body, which causes an increase in oxygen consumption and heat production. In the present study, thyroid hormone levels were lower in the animals fed four times per day, which was assumed to be accompanied by a lower basal metabolic rate. Those animals receiving four meals per day reacted metabolically as if they were on a more restricted nutrient intake by having lower insulin production and lower thyroid hormone production even though nutrient intake was equalized between the groups.

Recommendations

The current study suggests that by feeding finishing cattle multiple meals per day, faster gain at a more efficient rate might be achieved without causing any changes in carcass characteristics.

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Product Formulation and Processing Systems for Meat and Meat-based Foods for the Modern Consumer

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With the increase in consumer demand for low-fat food products, this project was initiated to determine if processed meat products that were traditionally considered to be high in fat could be successfully formulated and processed so as to meet the low-fat standards demanded by today's health-conscious American consumers. The ultimate objectives are to have low-fat red meat products available so as to maintain or increase current consumer demand for red meat, thus a higher demand for livestock, which will translate into higher prices paid to livestock producers for their products.

Results

We have determined that lean pork from pST-treated animals reacts similarly to regular pork when processed according to routine commercial conditions. We have also determined procedures whereby low-fat emulsion products can be manufactured and possess acceptable textural and flavor attributes. We have yet to devise a mechanism whereby we can get acceptable flavor and textural qualities and prevent excess purge of the finished products while in shelf-life studies. We have determined that the use of prerigor meats and preblending will assist in solving this problem, but there is a tremendous need to find a product or mechanism by which to hold the free water that exudes from these products when stored in vacuum packages, without having negative effects on labeling, flavor, or textural properties of the products. Purge not only causes an unattractive package, but provides ideal conditions for microbial growth, thus lowering quality of the product as well as causing a shorter shelf-life of the product.

We have also determined that when swine are fed restaurant grease as a part of their diet, the bacon becomes a very objectionable dark brown color upon cooking. Likewise, we have discovered that when swine are fed poultry fat, or HEF (a mixture of animal and plant fats and oils), the bacon will not get crispy. These facts should cause concern to swine producers and meat packers alike as these traits can cause a decrease in the demand for pork bacon and possibly

an increase in the new poultry bacon products that are now available. When swine were fed lard in their diets, these objectionable traits were not present.

There is also a great need to determine if any red meat products can be made that will comply with the newly proposed labeling rules of USDA for light, lean, and extra lean claims. Unless the rules are changed, diet alterations of live animals will be necessary to alter the fatty acid composition of all meat animals if there are to be any of the new "lean or extra lean" products allowed in commerce. Under the proposed rules, poultry products can be labeled as light, lean or extra lean, but red meat products can't meet the standards because they naturally have more than 33 or 36% saturated fatty acids, whereas poultry products have about 28 to 31% saturated fatty acids. Because of the previously mentioned problems that need solving, as well as others, I plan to continue research efforts in the processing area of value-added products for modern consumers.

Recommendations

Due to the technical nature of the processing and formulation procedures used with emulsion sausage, we recommend that interested parties contact the principal investigator for assistance or details. As for using added fat sources in swine diets, care should be used in selecting the fat so as not to produce products that will be objectionable by consumers.

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