EXPERIENCES OF EIGHT OHIO BEEF AND SHEEP PRODUCERS WITH YEAR-ROUND GRAZING

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ABSTRACT
Livestock producers participated in a demonstration project to extend the grazing season and evaluate dormant forage quality and yield. Differences were not detected in yields among forage species but yield differences existed among sites. Yield estimates did not change over time across all forage species but some sites were only able to participate for two months. Producers utilizing fescue beyond November had reductions in herbage mass.

Crude protein, available crude protein, acid detergent fiber, and neutral detergent fiber content differed among forage species and sites. Energy and lignin content were similar for all forage species and sites. Sodium and copper were perhaps the most universally deficient minerals. While magnesium levels appeared adequate, relatively high potassium levels could interfere with magnesium absorption. Mean fescue endophyte content was 67% which could reduce animal performance. Based on this project and other information, a beef cattle grazing manual was printed and has been distributed.

KEYWORDS
Cattle, sheep, year-round grazing, fescue, forage quality, stockpiled forage

INTRODUCTION
Pasture represents a largely untapped resource for Ohio agriculture. Of the sixteen million acres of Ohio farmland, over two and a half million acres are in some form of pasture. The profitability of livestock operations is largely determined by feed cost. The most expensive feed cost for Ohio cow-calf producers continues to be hay production (Fowler and Stout, 1990).

Developing winter grazing systems could effectively reduce or eliminate the cost of hay production. This would reduce the requirement for purchased inputs such as fuel and equipment. Labor for the winter period can be reduced to 25% of that of conventional wintering of beef cows in Ohio (Van Keuren, 1970). Small and medium size cattle operations have fewer production units (cows) to spread fixed costs. Improving the profitability of beef cattle operations should assist in sustaining Ohio rural communities. The objectives of this project were 1) to involve Ohio beef and sheep producers in a profit oriented extension/research project and 2) to characterize dormant forage resources of Ohio.

MATERIALS AND METHODS
A total of twelve producers participated in the winter grazing project. Sites were allowed to participate if (1) they had enough standing regrowth to furnish forage dry matter requirements for cows or sheep for the winter grazing period, (2) sufficient protection for animals from prevailing winds, (3) adequate soil drainage, and (4) had a constant supply of water. Animals needed to have adequate body condition to maintain themselves during the winter.

Herbage Mass. Determinations of herbage mass were made the first day that animals had access to the new plot area A 3/8 inch steel rod was used to make a square quadrat and with the area of 4 square feet. Forage mass was measured by hand-clipping (Milner and Hughes, 1968). Three samples were taken per pasture. Standing herbage was clipped to about 1 inch of the soil surface (Bosworth, 1988). Forage and hay samples were dried at 55^{o}C for 48 hours and then ground to pass a 1 mm screen. The sample dry sample weights were converted to pounds of herbage per acre (1 Acre = 43,560 ft^{2}). The yield of dry matter was used to calculated how many grazing days were possible. In the project, only the pasture that was to be immediately used was sampled.

Forage Quality. Pastures to be used were sampled every 30 days. This was done to observe how pasture quality changes over time. Hand-cut samples (40 mm stubble) for quality estimates were taken along the quadrat area. Three samples per pasture were taken and mixed together and then subsampled. The subsample was sent to the laboratory for forage quality analysis. Quality factors were dry matter, energy, protein, fiber and mineral content. Soil samples were also collected at each site. Selected fescue samples were collected to measure endophyte content of the pasture.

Animal Performance. Producers observed the animal's body condition. It became impractical to weigh animals due to limitations on farm labor and lack of scales. However, no significant health problems were reported. Hay was allotted to animals during the particularly harsh winter conditions or when snow or ice made grazing impractical.

RESULTS AND DISCUSSION
All pastures at each farm site were classified with regard to plant species. Fescue was a major for species in this study representing 48.5% of the forage samples followed by red clover-orchardgrass at 12.1% of the samples. The rest of the forage samples were represented by orchardgrass (9.1%), orchardgrass-bluegrass (9.1%), fescue-red clover-alfalfa (6.1%), fescue-red clover (6.1%), fescue-red clover-orchardgrass (3.0%), fescue-orchardgrass (3.0%), and bluegrass (3.0%).

All producers were able to extend their grazing season. Fescue is usually recommended if extending the grazing season further into the winter is desired. Site 4 was able to use an orchardgrass-bluegrass mixture (OC,BC) into December but the previous November pasture contained some fescue. The particularly harsh winter precluded further use of the pastures for most producers. Orchardgrass and bluegrass were effectively used by other producers during October and November.

Herbage Mass. Table 1 lists the dry matter yields from pastures at the various sites by month. Differences were not detected in yields between forage species within months during October ($P = .67$), November ($P = .37$), and December ($P = .94$). This should not be interpreted that producers can use state-wide averages to determine local forage yields. Site variation in forage yield within month did exist ($P < .05$).

Multiple regression analyses was not able to detect change in forage yield over time ($P = .25$) when all forage species were evaluated. However many forage species were only used in October and November. Harsh weather is usually more prevalent during December and January. A loss of dry matter occurred when fescue alone was evaluated over the inclusive period of October through January ($P = .10$). Dry matter yields were greatest for urea fertilized fescue pastures. Sites 2 and 3 did not utilize urea on their fescue. Fescue pasture yields were effectively doubled by the use of urea fertilization. However, dry matter yield decreased by 1000 lbs/acre from December to January. This effectively reduced the stocking rate by one cow from December to January. Producers need to take into account this dry matter loss, due to weathering, when planning to extend the grazing season beyond early December.

It should not be concluded that nonprotein nitrogen fertilization is an absolute requirement for extending the grazing season. Additional acreage may be considered for operations that are currently under-stocked. Fescue pastures that contained a legume at least approached the dry matter yields of urea fertilized fescue pastures, although dry matter losses to clovers are much higher when stockpiled than fescue.

Forage Quality (Protein, Energy and Fiber). Table 2 contains the forage specie protein, energy and fiber values for the winter grazing project. Average forage crude protein content was 14.4% but ranged from 8.5 to 23.5%. Crude protein, available crude protein, acid detergent fiber, and neutral detergent fiber differed among forage species and sites ($P < .06$). However energy and lignin contents were similar for all forage species and sites ($P > .20$).

Forage Quality (Minerals). Table 2 contains forage specie selected mineral contents and levels of significance. The average phosphorus content was .24% which is adequate to borderline for dry, pregnant spring calving cows. However several forage species had values lower than the suggested requirements and the lower range for phosphorus content was .12%. The mean calcium content was .53% and ranges from .26% to .92%. The average copper content was 4 ppm which is well below the suggested minimum level of 10 ppm. The highest level of copper reported among the forage samples was 10 ppm. Average zinc levels were 27 ppm (range 12-52 ppm) which was less than the 30 ppm suggested minimum. Magnesium levels appeared to be adequate but the relatively high level of potassium present (1.72%) may interfere with magnesium absorption. Sodium levels were uniformly low in all samples (range 1 to 428 ppm). Iron levels were typically above the suggested NRC minimum of 50 ppm but the lower range of forage samples was 36 ppm. Typical manganese levels were 86 ppm but a few samples had levels below the 40 ppm suggested minimum.

Soil Test. Soil tests were performed on the pastures included in the project. The soil test level at which the soil can supply adequate quantities of a particular nutrient for plant growth is called the "critical" level for that nutrient. For grass pastures, the critical soil test levels are as follows: pH = 6.0; phosphorus = 30 lbs/acre; potassium = 150 (5 x cation exchange capacity) lbs/acre. If tall-growing legumes are present, the critical pH is 6.5 or higher (except for annual lespedeza) and phosphorus is 50 lbs/acre. Of the pastures in this project, 5 tested below the critical pH level, 9 were below the critical phosphorus level, and 5 were below the critical potassium level for grass pastures. Corrective applications of lime and fertilizer on these deficient sites would improve forage production potential, especially where a legume component is to be maintained.

Animal Performance. In general, the participating producers felt that animal performance was adequate. Two producers reported that animal performance prior to the beginning of the trial was less than acceptable. Based on reported animal symptoms and forage analyses, copper levels were determined to be deficient. Mean endophyte content of the fescue was 67% with a range of 23% to 100%. The estimated reduced gain would be 1.4 to 1.6 pounds per day.

Table 1
Herbage mass based on location, forage type and date.

Specie/Location	October	November	December	January
	Dry Matter Pounds Per Acre			
Fescue:				
Site 2	992±540.0	920±417.3	876±163.4	552±186.9
Site 2				760±372.8
Site 3	912±487.1			
Site 5	3607±1327.0	4382±1555.2	4367±1338.0	791±540.0
Site 6	1600±517.7		1112±361.1	
Site 7	1568±293.3			
Site 8	2088±500.6	2511±413.8	3039±341.4	335±154.3
Fescue, Red Clover				
Site 9	1400±176.9	1943±495.4		
Fescue, Red Clover, Alfalfa				
Site 11	1647±499.0	1776±213.3		
Bluegrass				
Site 10	2415±492.7			
Site 10	2207±166.3			
Bluegrass, Orchardgrass				
Site 3		1408±390.2		
Red Clover, Orchardgrass				
Site 1	696±145.9			
Site 4	1040±556.3	1815±561.9		
Orchardgrass				
Site 3		2295±766.3		
Site 10		2183±345.7		
Site 10		1816±186.4		
Site 12	1104±120.0	1816±239.9		
Orchardgrass, Fescue				
Site 7		1652±353.5		
Orchardgrass, Fescue, Red Clover				
Site 1		1560±1560.0		
Orchardgrass, Bluegrass				
Site 1			664±363.5	
Site 10		1344±444.5		
Site 10		912±267.3		

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Table 2
Forage protein, energy, fiber and mineral values for winter grazing demonstration project.

(100% Dry Matter Basis)

Fescue=Fes, Red clover=RC, Alfalfa=A, Orchardgrass=OG, Blugrass=BG

	CP[a]	ACP[b]	NEl[c]	NEm[d]	NEg[e]	ADF[f]	Lig[g]	NDF[h]
Specie	%	%	(—Mcal/lb—)			%	%	%
Fescue	13.2	12.7	.60	.59	.29	36.9	5	60.4
Fes-Rc-A	10.7	10.2	.57	.56	.23	37.7	7	63.0
Fes-Rc-OG	12.1	10.4	.58	.56	.25	38.2	5	63.3
Fes-Og	18.9	18.9	.56	.54	.22	22.1	9	45.1
Rc-Fes	18.5	18.5	.66	.66	.37	25.8	4	46.3
Rc-Og	19.1	18.9	.64	.63	.34	27.9	5	48.2
Og-Bg	13.3	12.0	.63	.61	.31	35.6	3	59.9
BG	13.6	12.4	.66	.66	.37	35.4	3	60.0
OG	14.4	13.3	.58	.57	.25	37.1	6	60.2
Std Dev.[i]	3.22	3.51	.045	.050	.072	5.38	2.2	7.03
P[j]	.04	.05	.24	.28	.38	.03	.33	.04

	Ca[k]	P[l]	K[m]	Mg[n]	S[o]	Mn[p]	Fe[q]	Cu[r]	Zn[s]	Na[t]
Specie	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm
Fescue	.47	.24	1.6	.22	.2	66	117	3	22	38
Fes-Rc-A	.62	.18	1.4	.29	.2	57	106	4	20	58
Fes-Rc-OG	.54	.18	1.6	.24	.2	83	74	3	22	24
Fes-Og	.29	.26	2.4	.19	.2	147	73	5	29	15
Rc-Fes	.44	.28	2.2	.33	.2	86	55	4	23	21
Rc-Og	.77	.30	2.3	.28	.2	102	170	8	42	230
Og-Bg	.54	.19	1.4	.21	.2	122	385	6	32	87
BG	.48	.24	1.7	.22	.2	184	101	6	29	9
OG	.60	.22	1.4	.18	.2	104	198	5	33	4
Std Dev.[i]	.163	.064	.45	.073	—	6.9	119	1.7	9.2	76.6
P[j]	.11	.44	.09	.36	—	.04	.09	.01	.05	.02

[a]Crude protein
[b]Available crude protein
[c]Net energy lactation
[d]Net energy maintenance
[e]Net energy gain
[f]acid detergent fiber
[g]Lignin
[h]Neutral detergent fiber
[k]Calcium
[l]Phosphorus
[m]Potassium
[n]Magnesium
[o]Sulfur
[p]Manganese
[q]Iron
[r]Copper
[s]Zinc
[t]Sodium
[i]Standard deviation of least square mean
[j]Probability level