



# Variability of Cool-season Grazing Systems

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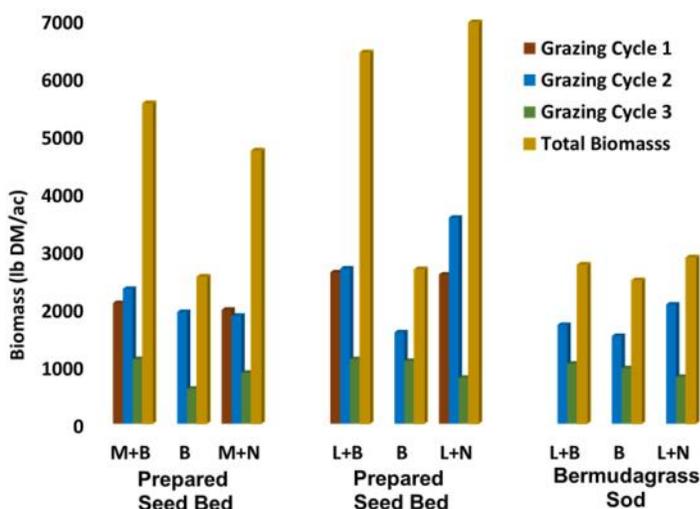
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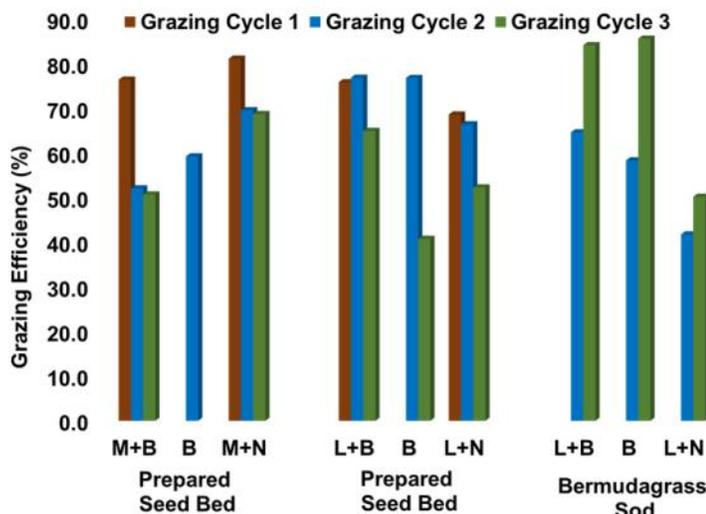
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The cost of chemical fertilizers has increased exponentially in the last decade, impacting forage production and grazing systems during the winter. Winter annual forages are an important part of Mississippi's forage production, especially for the stocker cattle. Although they can decrease the dependence on hay and feed supplementation, their availability could be affected by how they are planted and fertilized. When planning a winter grazing system, producers need to evaluate when most of the forage is needed and be aware of the benefits and disadvantages of the chosen system. For example, planting in a prepared seed bed can provide much earlier grazing, but at the same time it means that a dedicated field that is rotated with a summer annual grass might be required. On the hand, when interseeding into a dormant warm-season grass pasture, producers can have a delay in grazing until the spring and could potentially delay the greenup of the perennial warm-season grasses. It is important that to maintain these systems productive, fertility becomes a major component. A way to mitigate this expense is by incorporating legumes into the system.

Cool-season forage legumes have much to offer, but are overseeded on warm-season perennial grass sods much less frequently. One of the advantages to utilizing clovers is the potential to fix a significant amount of nitrogen; therefore,



**Figure 1.** Biomass production per grazing cycle and seasonal biomass production for the 2014-15 grazing season is Starkville, MS. M+B = Marshall ryegrass and berseem clover; M+N = Marshall ryegrass plus nitrogen; L+B = LoneStar ryegrass plus berseem clover; L+N = LoneStar plus nitrogen; B = Bermseem clover.



**Figure 2.** Percent grazing efficiency (GE) for each of the grazing cycle during the 2014-15 growing season at Starkville, MS.

reducing nitrogen inputs. In addition, depending on the establishment method (prepared seed bed or sod seeding into perennial pastures) and grass companion forages, clovers have the potential of extending the grazing season, improving forage quality, and increasing dry matter production per acre. There is potential to expand cool-season forage opportunities by evaluating new annual clover varieties under grazing conditions in Mississippi. Understanding how berseem clover, compared to traditional clovers (crimson and arrowleaf), fit into grazing systems in Mississippi is imperative for improving grazing potential and reducing the need for hay supplementation.

A grazing demonstration was conducted from October 2014 to May 2015 at Mississippi State University. Two, two-acre paddocks were used for conventional seeding and one 2-acre bermudagrass paddock was used for sod-seeding. Each paddock was divided in approximately 0.67 acre to establish three treatments. The treatments include annual ryegrass (LoneStar and Marshall), annual ryegrass + Frosty berseem clover, and Frosty berseem clover

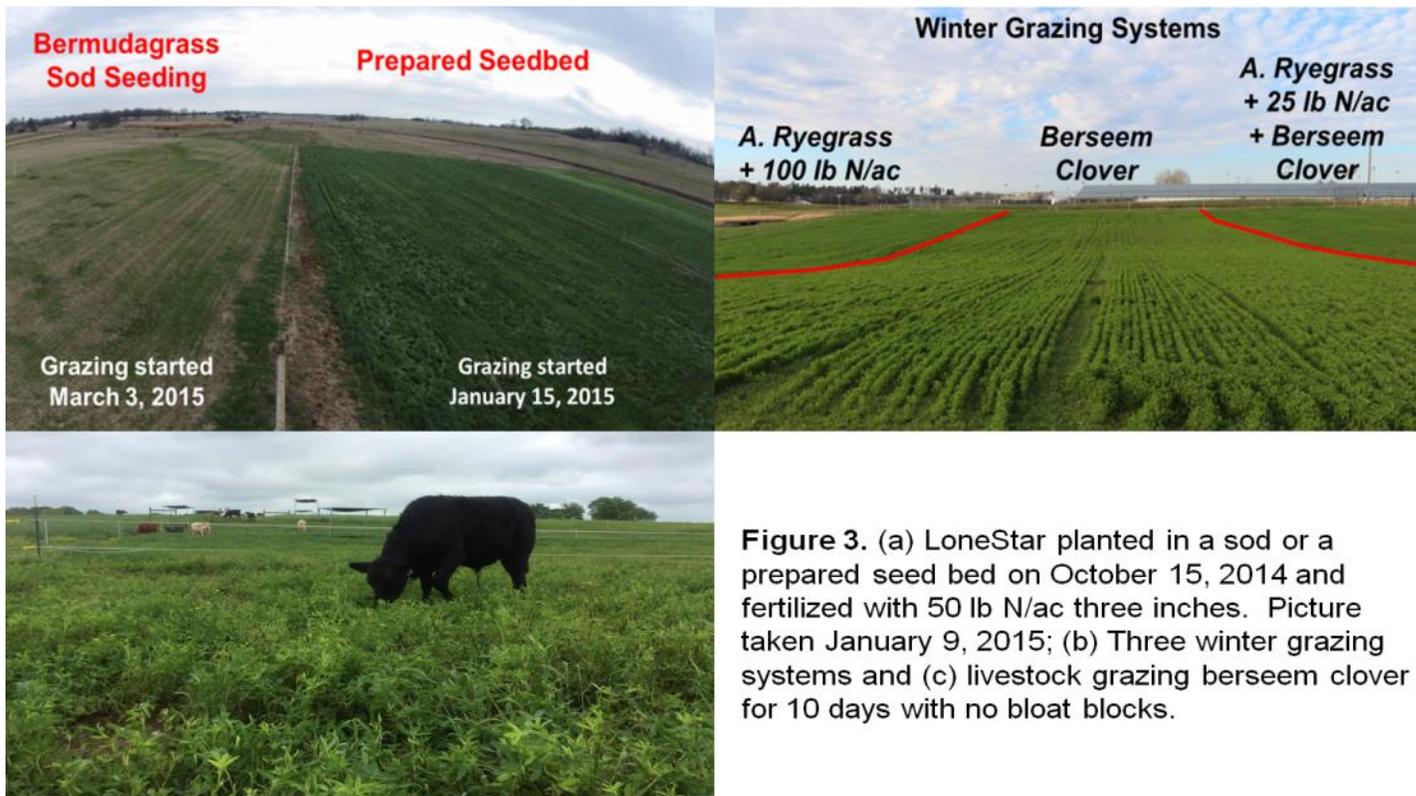
**Table 1.** Estimated cost of establishment and cost of gain for the grazing demonstration during the 2014-15 grazing season at Starkville, MS.

Establishment	Annual Ryegrass	Clover	Nitrogen (lb/ac)	Calendar Days of Grazing	Grazing head days	Total gain per acre (lb of beef/ac)	ADG (lb/ac)	Total Pasture Cost (\$/ac) <sup>1</sup>	Cost of gain (\$/lb)
Prepared Seed Bed	Marshall	Berseem	25	98	98	383.58	3.91	109.85	0.29
	--	Berseem	0	--	--	--	--	--	--
Prepared Seed Bed	Marshall	--	100	105	105	423.88	4.04	125.20	0.30
	Lonestar	Berseem	25	93	117	650.75	5.56	110.45	0.17
	--	Berseem	0	68	64	222.39	3.47	95.20	0.43
Bermudagrass Sod	Lonestar	--	100	93	147	689.55	4.69	125.95	0.18
	Lonestar	Berseem	25	34	34	158.21	4.65	129.20	0.82
	--	Berseem	0	34	34	102.98	3.03	111.20	1.08
Bermudagrass Sod	Lonestar	--	100	34	79	216.42	2.74	128.70	0.59

<sup>1</sup>Pasture include seed cost and fertilizer cost. Labor, equipment and land rent were not included in the analysis.

alone. Treatments containing LoneStar annual ryegrass were only planted in the bermudagrass paddock. Seeding rates for the conventional planting were 25 lb/ac when ryegrass was planted alone. Ryegrass plus berseem clover in the conventional planting were planted at 20 and 15 lb/ac, respectively. In the bermudagrass sod-seeding, annual ryegrass alone was planted at 30 lb/ac. Subsequently, annual ryegrass plus berseem clover 25 and 20 lb/ac in the sod-seeding systems. Berseem clover was planted at 20 and 25 lb/ac in the conventional and sod-seeding system, respectively.

Treatments containing annual ryegrass were fertilized with 50 lb N/ac when grass reached three inches after planting and 50 lb N/ac after the first grazing cycle. Treatments containing ryegrass + bermseem clover were fertilized with 25 lb N/ac when grass reached three inches after planting. No N was applied to pure stand of berseem clover. Grazing in



**Figure 3.** (a) LoneStar planted in a sod or a prepared seed bed on October 15, 2014 and fertilized with 50 lb N/ac three inches. Picture taken January 9, 2015; (b) Three winter grazing systems and (c) livestock grazing berseem clover for 10 days with no bloat blocks.

each treatment was done by using a put and take system. The initial stocking rate was approximately 500-550 lb of beef per ac and varied within each grazing cycle. There were three grazing cycles: (1) GC1 (Dec 17 to Jan 30), (2) GC2 (Mar 17 to Apr 20), and (3) GC3 (Apr 20 to May 5). Prior to and after each grazing cycle, three random forage samples were collected in each paddock using a 2-ft<sup>2</sup> quadrat.

Preliminary data indicated that treatments established in a prepared seed bed had higher biomass production compared to the treatments established in the bermudagrass sod (Fig. 1). Overall average forage production of LoneStar (with berseem or N) was 30% higher than Marshall in the paddocks planted in a prepared seed bed. Overall forage production in the bermudagrass sod was 42% and 97% lower compared to the Marshall or LoneStar treatments in the prepared seed bed.

All treatments displayed consistency in forage quality within each grazing cycle. Crude protein declined with each grazing cycle, although grazing cells containing only berseem clover maintained higher CP throughout the study (data not shown). Grazing efficiency (GE) varied with grazing cycle (Fig. 2). During the grazing cycle 1 (GC1), GE ranged from 68 to 81%. During the grazing cycle 2 (GC2), GE ranged from 42 to 77%. The cost of gain (\$/lb of beef produced) was much lower with the prepared seed bed, except for the berseem grazing cell in the Marshall annual ryegrass due to lack of forage production and grazing availability (Table 1). Higher biomass production with LoneStar in the prepared seed bed along with a longer grazing season resulted in an increased total gain per acre and lowering the cost of gain.

This demonstration provided some information on grazing management practices where the use of grass/clover mix can provide a competitive advantage to producers in a prepared seed bed and reduce hay feeding intervals. LoneStar provided a slight grazing advantage early in the season with earlier biomass production compared to Marshall, although such advantage was not present during the second grazing cycle. The demonstration also served as a tool to indicate that dedicated fields to annual ryegrass with a summer annual crop rotation might provide better forage utilization than planting into an existing summer perennial grass sod.

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# Boost Grazing with Berseem Clover

New annual legume shows promise for pasture and hay production.

by Barb Baylor Anderson, field editor

Producers looking to refresh pastures for grazing season may find adding berseem clover will increase feed nutritional value and cattle productivity, especially in the southern half of the country. Research with the relatively new annual legume shows promise for pasture and hay production, and can be used for some applications in the northern half of the United States, as well.

"Berseem clover is a cool-season, annual legume that is native to the Mediterranean region," says Jerry Hall, president of Grassland Oregon, Salem, Ore. The seed-breeding company developed the berseem clover variety known as Frosty, and released it for commercial use in 2015.

"We began to research cool-season cover crop and forage opportunities a few years ago in response to escalating nitrogen prices. We wanted a crop that might fix a significant amount of nitrogen so producers could reduce nitrogen input use," says Hall.

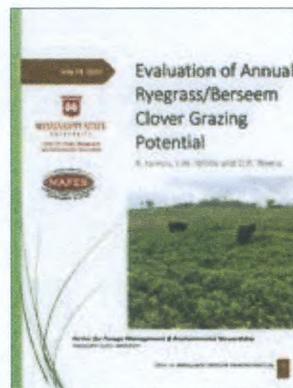
In addition to the nitrogen benefit, Hall says

Frosty has salt tolerance, was bred for improved cold tolerance, has a later maturity than other clovers and a synergistic relationship with alfalfa.

Two types of berseem clover are available — single-cut and multi-cut. Single-cut varieties, like Balady, grow quickly and go to seed with a narrow window for harvest. Multi-cut varieties, like Frosty, can deliver multiple harvests in a single season.

"Frosty does not winterkill until it drops below 5° Fahrenheit (F). That allows for wider adoption in the U.S. We have seen fall planting success all the way into Tennessee," he says. "Frosty can be adapted farther north in the Midwest by planting it in February and March."

Hall adds research indicates that producers can plant berseem clover for annual permanent pasture production to improve



feed quality or as a row-crop cover crop where cows can be turned in and grazed. Berseem clover prefers slightly alkaline loam and silty soils with a pH greater than 6.

"In a declining alfalfa field, you can drill Frosty in during the fall or spring to thicken your stand. If you spring-plant Frosty, you

can get 4 tons per acre over the summer versus the returns you might see from corn or soybeans. It provides high-quality forage in a short time," says Hall.

A low, hard seed count also helps establish berseem clover quickly, filling in bare spots where alfalfa has winterkilled.

"Bale quality resembles alfalfa and feeds similarly," Hall adds. "It dries down the same, maintaining its green color and increasing the forage value."



► **Above:** Producers can plant berseem clover for annual permanent pasture production to improve feed quality or as a row-crop cover crop where cows can be turned in and grazed.

## Better quality, better gains

Rocky Lemus, Mississippi State University Extension forage specialist, has been evaluating berseem clover for the last couple of years. He wanted to see how it might compare to crimson and arrowleaf clovers in improving grazing systems and reducing hay supplementation.

“Legumes make good forage, and many producers can look at using berseem clover to extend grazing in winter. It does improve feed quality and forage yields,” Lemus confirms. “Depending on the establishment method — prepared seedbed or sod seeding into perennial pastures — and grass companion forages, it can increase dry matter per acre and extend the grazing season.”

Lemus’ research confirms the higher forage value translates into greater cattle performance. In evaluating late-fall and early-spring grazing, he says 500- to 550-pound (lb.) stockers saw 3- to 3.5-lb. daily live weight gains when grazing a mixture of Frosty and Lonestar annual ryegrass. He says including Frosty in the mix extended the grazing period and lowered nitrogen costs by 14%. Cattle gained 0.87 lb. per day more than on just ryegrass with commercial fertilizer.

Lemus analyzed berseem clover against annual ryegrass and Bermuda grass in different combinations, in both prepared seedbeds and sod pastures. Grazing began when annual ryegrass or berseem clover reached 12 inches in height. Forage samples were collected in each paddock, and grazing cages were randomly placed in each paddock to determine forage availability.

Animals were weighed at each pre- and postgrazing period in each treatment to estimate daily gain. Initial grazing times and length of time varied among treatments. Between grazing periods, animals were removed from experimental pastures and

**Table 1: Forage quality for each treatment within each grazing cycle**

Establishment	Treatment	Grazing cycle	Forage quality					
			CP*	ADF	NDF	IVTDMD	Fat	Lignin
Prepared seedbed	M+B	1	23.13	18.53	31.14	91.29	2.92	0.69
	M+N		26.14	17.94	29.57	92.40	3.22	1.27
	L+B		23.04	20.15	32.48	91.20	3.06	1.11
	L+N		25.50	19.31	31.38	91.85	3.21	1.08
Prepared seedbed	M+B	2	13.97	28.01	43.66	84.88	3.14	1.39
	B		20.95	25.31	38.28	85.21	2.82	3.00
	M+N		20.89	28.25	44.64	86.89	3.25	2.97
	L+B		21.54	30.23	43.59	88.29	3.22	3.64
	B		23.30	27.60	36.32	83.16	2.71	3.74
	L+N		22.50	27.80	42.28	89.12	3.27	2.74
Bermuda grass sod	L+B	2	17.25	26.95	38.60	82.53	2.79	1.90
	B		22.36	26.41	34.95	82.84	2.73	3.26
	L+N		13.57	29.48	45.57	81.79	2.94	0.74
Prepared seedbed	M+B	3	14.46	35.35	53.89	75.83	2.64	3.95
	B		20.56	33.97	43.95	78.56	2.40	5.83
	M+N		12.17	36.03	55.25	75.97	2.55	4.05
	L+B		14.68	36.00	54.55	78.53	2.55	3.82
	B		20.02	36.09	45.98	76.03	2.14	5.39
	L+N		19.35	32.51	49.56	80.90	2.82	4.40
Bermuda grass sod	L+B	3	10.56	35.20	51.00	74.30	2.54	3.80
	B		20.65	30.48	39.63	81.20	2.51	4.53
	L+N		10.54	37.03	55.24	75.76	2.78	2.98

\*CP = crude protein, ADF = acid detergent fiber, NDF = neutral detergent fiber, IVTDMD = *in vitro* true dry-matter digestibility.

placed on spare pastures where they received mineral and hay supplementation as needed.

Lemus notes crude protein declined with each grazing cycle, although grazing cells containing only berseem clover maintained higher crude-protein levels throughout the study. Variations in gain per acre were recorded within each grazing cycle, and

average daily gains (ADG) varied within each treatment. Treatments containing annual ryegrass and berseem clover mix had higher ADG compared to the berseem clover alone and annual ryegrass alone.

“Research shows an 80/20 alfalfa/berseem clover mix can increase yield, crude protein and water-soluble carbohydrate levels in hay

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**Table 2: Estimated cost of establishment and cost of gain for the grazing demonstration during the 2014-2015 grazing season at Starkville, Miss.**

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## Boost Grazing with Berseem Clover CONTINUED FROM PAGE 51

fields,” says Hall. “We had no recorded cases of bloat and cows selectively grazed for the berseem clover.”

Lemus’ economic analysis found seed and fertilizer costs increased when berseem clover was planted into Bermuda grass due to the increase in seeding rate needed to ensure successful seed germination. He found cost of gain was generally much lower with the prepared seedbed.

“Higher biomass production with annual ryegrass in the prepared seedbed along with a longer grazing season resulted in an increased total gain per acre and lower cost of gain,” says Lemus.

Based on findings, Lemus encourages producers to take advantage of the later maturation of berseem clover. Producers can retain ownership longer.

### Berseem clover’s many applications

Berseem clover may offer producers many applications to manage grazing:

- ▶ **Cover crop.** The high nitrogen fixation and low hard seed count make berseem clover adaptable to organic or non-organic farming.
- ▶ **Short-season forage crop.** In northern states, producers can grow in late spring/summer. In southern states, consider late fall/winter/early spring production.
- ▶ **Food plots.** Grassland Oregon’s Jerry Hall says deer love berseem clover.
- ▶ **Alfalfa hay/silage crops.** Producers can thicken declining alfalfa stands or fill in winter-killed alfalfa fields.

“Producers who want to try Frosty should order seed early. We are cautiously increasing seed production every year, but we also are selling out,” says Hall.

**“Legumes make good forage, and many producers can look at using berseem clover to extend grazing in winter.”**

**— Rocky Lemus**

“You get more gains and less saturation in the market if you can sell two to three weeks later than everyone else. This fits well with stockers who want good-quality forage to fill the gap between ryegrass and Bermuda grass,” says Lemus. “Animals not preconditioned for legumes should not have problems either since there are no incidences of bloat with

berseem clover in our study.”  
Lemus says his work verifies use of

summer annual grasses and clovers provide opportunity for the forage industry. Grass following berseem clover shows better growth and quality from nitrogen left in the soil, grazing management with a grass-clover mix in a prepared seedbed can provide a competitive advantage to producers and hay feeding intervals can be reduced.

**Editor’s Note:** A former National Junior Angus Board member, Barb Baylor Anderson is a freelancer from Edwardsville, Ill.