Liquid Supplements for Cattle on Southern Forest Range

HAROLD E. GRELEN AND HENRY A. PEARSON

Highlight: A molasses-urea mixture fed free-choice yearlong as a supplement to cows on pine-bluestem range produced a higher calf crop and heavier calves than cottonseed cake fed only during winter. Because the liquid supplement required no feeding labor, it was \$14.63 per cow and \$0.81 per acre more profitable than the cottonseed cake.

Native forages on southern forest range are deficient in some nutrients throughout the year but are especially poor during winter (Campbell et al. 1954). Supplemental feeding can substantially increase cattle production (Duvall and Whitaker 1963; Duvall and Hansard 1967), but the usual supplements—cottonseed cake and hay—increase labor requirements considerably. Liquid supplements containing molasses and urea can be fed free-choice and may be more economical and equally beneficial.

A study was initiated in November 1969 to determine if liquid supplements fed free-choice would adequately support a year-long cow-calf operation on southern pine ranges. Preliminary results reported by Pearson (1974) indicated that liquid supplement is not satisfactory when fed in winter only. The data reported here were collected from November 1969 through September 1975, and indicate that liquid supplements have important potential as a yearlong supplement on southern forest range.

Methods

The study was conducted on the Palustris Experimental Forest in central Louisiana on an area where moderate yearlong grazing has been practiced since 1951. Cattle stocking rates are 1.5 acres per animal unit month, and utilization averages about 42% of the current year's herbage growth.

Soils vary from poorly drained flatwoods to well-drained sandy loams with slopes up to 10%. Longleaf pine (*Pinus palustris* Mill.) was clearcut in 1965, and only a scattering of small pines and some scrub oaks (*Quercus* spp.) remain. The herbaceous vegetation is mainly slender bluestem (*Andropogon tener* (Nees) Kunth), pinehill bluestem (*A. scoparius* var. *divergens* Anderss. ex Hack.), other bluestems, and panicums (*Panicum* spp.). The primary shrub is southern waxmyrtle (*Myrica cerifera* L.). Annual herbage production averages about 2,000 pounds per acre.

To improve forage availability and to stimulate new growth, the range is prescribe-burned on a 3-year rotation (Campbell et al. 1954; Duvall and Whitaker 1964). Utilization is heaviest immediately after burning but declines during the second and third years, allowing time for the plants to regain vigor.

Beginning in 1969, two supplementation treatments were compared. The control treatment (CSC) provided 418 pounds of cotton-

seed cake per cow year on a graduated schedule. Feeding began in November with 1 pound per cow per day and was increased to 3 pounds per day from January 1 to March 10. The daily amount was gradually decreased to 1 pound during April and was kept at that level until feeding ended May 31. Approximately 260 pounds of grass-legume hay was supplied during the latter part of winter and on cold, rainy days. Whenever cottonseed cake or hay was fed, it was distributed three times a week (Pearson and Whitaker 1972).

In the yearlong liquid supplement treatment (LS), self-feeding roller tanks (Fig. 1) dispensed a liquid supplement mixture of urea and molasses containing 32% crude protein (Table 1). Some additional hay and range cubes (20% protein) were supplied during severe winter weather. Salt and steamed bonemeal were provided free-choice yearlong in both treatments.

Fig. 1. Liquid supplement was dispensed free-choice yearlong in "lick" tanks.

In November 1969, two herds of 15 Brahman crossbred cows were randomly assigned to the treatments. Each year the cows were bred to good quality Angus bulls for calving in December through March. Calves were weaned and sold in mid-August to allow cows adequate recovery time before winter.

Results and Discussion

Feed Consumption

Supplemental feed consumption varied with treatment (Table 2). CSC cows ate 418 pounds of cottonseed cake and 260 pounds of grass-legume hay. Cows on the LS treatment averaged 1,200 pounds of liquid feed each year; during the severe winters of 1970, 1973, and 1974, they were also given some hay and range cubes.

The LS herd ate no more salt and slightly less steamed bonemeal than the CSC herd. Bonemeal primarily compensates for phosphorus deficiencies, and the phosphorus in the liquid

Authors are principal range scientist, Southern Forest Experiment Station, Forest Service, U.S. Department of Agriculture, Alexandria, Louisiana; and principal range and wildlife scientist, Forest Service, U.S. Dep. Agr., Washington, D.C.

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Table 1. Label data on contents of liquid supplement.

Composition	Amount
Crude protein, not less than (This includes not more than 30% equivalent protein from nonprotein nitrogen.)	32.00%
Crude fat	None
Crude fiber	None
Sugar (Invert), not less than	40.00%
Calcium (Ca), not more than	1.50%
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Phosphorus (P), not less than	1.25%
Iodine (I), not less than	0.0055%
Cobalt (Co), not less than	0.003%
Copper (Cu), not less than	0.008%
Iron (Fe), not less than	0.02%
Zinc (Zn), not less than	0.0125%
Choline chloride, not less than	50.00 mg/lb
Vitamin B ₁₂ , not less than	2.50 mg/lb
Vitamin A, not less than	30,000 USP Units/lb
Vitamin D ₃ , not less than	5,000 USP Units/lb
Vitamin E, not less than	10 IU Units/lb

Ingredients: cane molasses, urea, phosphoric acid, propylene glycol, vitamin A palmitate, D-activated animal sterol (source of vitamin D₃), choline chloride, vitamin B₁₂ supplement, alpha tocopherol acetate (source of vitamin E), ethoxyquin, manganese sulfate, cobalt sulfate, iron sulfate, copper sulfate, magnesium sulfate, zinc sulfate, pantothenate.

supplement perhaps accounts for the decreased bonemeal intake.

Daily intakes of liquid supplement were lowest in winter and highest in summer, and the greatest increase occurred during March and April (Fig. 2). Consumption averaged 1.9 lb/day in winter, 3.5 lb in spring, 4.4 lb in summer, and 3.5 lb in fall. Totusek et al. (1971) reported an average daily consumption of 3.2 lb in winter trials in Oklahoma. Pearson (1974), however, found that cows given liquid supplements only during winter ate less each day than those on a yearlong treatment ate during the winter. Apparently, adjustment periods are necessary whenever the diet is switched to nonprotein nitrogen (Kennedy 1970). Also, some unknown physiological or rumen biological factors may inhibit consumption if liquid supplements are provided only during winter.

Consumption of liquid supplements fluctuated within a given month, especially if a new shipment of feed differed in composition from the previous one. As commercial feeds were used, quality control was impossible, but the variation did not disrupt cattle productivity. Operators who mix their own feed can control intake to some extent by regulating the amount of urea, phosphoric acid, or aluminum sulfate in the feed (Reynolds et al. 1970; Totusek et al. 1971). To prevent overconsumption that may cause urea toxicity, roughage should be

Table 2. Yearly supplement consumption and costs for cows grazing native range.

Items	Supplement ¹			
	CSC		LS	
	lb/cow	\$	lb/cow	\$
Cottonseed cake	418	23.91	0	0
Liquid supplement	0	0	1211	52.50
Range cubes	0	0	21	1.14
Grass-legume hay	260	4.16	19	.23
Salt	16	.30	16	.30
Steamed bonemeal	11	.98	9	.74
Total		29.35		54.91

¹CSC = control treatment with 418 pounds of cottonseed cake per cow on a graduated schedule.

LS = liquid supplement of urea and molasses containing 32% crude protein.

Fig. 2. Liquid supplement intake by cattle.

fed before placing cattle on the molasses-urea mix, and water and roughage should be available continuously (Reynolds et al. 1970).

Cattle Performance

Generally, cattle performance was better with the liquid supplement (Table 3) than with the CSC. LS cows were slightly heavier than the CSC animals. However, the LS herd lost more weight in winter than the CSC herd; lactating cows with consecutive calves lost 13% on the CSC treatment, including the calf weight loss, while weight losses on liquid supplements averaged 24% (Pearson 1974). Totusek et al. (1971) found similar responses with range cows in Oklahoma.

The LS treatment yielded higher calf crops and weaning weights than the CSC treatment; although LS calves were 14 days younger when sold, they averaged 16 pounds heavier than CSC cows. Totusek et al. (1971) found that cows given liquid feed only in winter had lower calf crops than those supplemented with cottonseed meal on an Oklahoma range. A similar reaction to winter-only liquid supplementation also occurred in Louisiana (Pearson 1974).

Table 3. Cattle performance with supplementation programs.

Items	Supplement ¹	
	CSC	LS
Cow weight in spring (lb)	825	830
Calf crop (%)	82	92
Parturition (date)	Jan. 19	Feb. 2
Sale weight at weaning (lb)	415	431

¹See footnote on Table 2.

Cost and Returns

Feed costs were higher, labor and travel costs were lower, and returns were greater with the LS treatment (Table 4). Annual feed costs for the LS treatment were about double the CSC costs. Between 1969 and 1975, liquid supplements averaged \$87 per ton. Cottonseed cake rose from \$88 to \$180 per ton. Range cubes averaged \$106 per ton; hay, \$32 per ton; and salt and steamed bonemeal, \$1.85 and \$9.20 per hundred-weight.

Labor requirements were 7.2 hours per year for the LS herd (\$0.96 per cow) and 90 hours per year for the control herd (\$12.00 per cow). Labor costs were estimated for management of the 15-cow herds, and labor was computed at \$2.00 per hour. Hand-feeding cottonseed cake or range cubes and hay required 3

Table 4. Cost and returns from supplementation programs.

Items	Supplement ¹	
	CSC	LS
Gross returns/calf ²	\$162.06	\$174.52
Gross returns/cow	132.89	160.38
Feed costs/cow	29.35	54.91
Labor and travel costs/cow	13.80	1.10
Net returns/cow	89.74	104.37
Net returns/acre	4.99	5.80

¹See footnote on Table 2.

²Returns based on average price during 1969-75 which varied between \$25 and \$75/cwt regardless of supplementation.

hours labor per week. No labor was charged for the general care and maintenance of the herds; consequently, liquid supplement herds had no labor charge except when other supplements were supplied during severe winter weather. The liquid supplement distributor delivered the feed to the tanks.

Travel averaged 6 miles per week at \$0.15 per mile when cattle were hand-fed. Yearly travel was estimated at 13.5 miles with the LS treatment (\$0.14 per cow) and 180 miles for the control (\$1.80 per cow).

Equipment costs for cottonseed cake feed troughs, liquid feed roller tanks, barns, corrals, etc., were not included in the cost-return analysis. Liquid feed tanks (metal or fiberglass) range from \$85 to \$100 and have an expected longevity of at least 5 years. One tank with two rollers should be sufficient for about 30 cows.

Calves from both treatments sold for about \$40 per hundredweight. Gross returns per calf were about \$12 higher for the LS treatment than for the CSC (Table 4). Gross returns per cow were over \$27 more for the LS than for the CSC; combined costs

for feed, labor, and mileage were about \$13 per cow less for the CSC. Consequently, net returns per cow on the LS treatment were \$15 higher than on the CSC; net returns per acre were about \$0.80 more. At 1976 prices—cottonseed cake, \$180 per ton; liquid supplement, \$114 per ton; cubes, \$138 per ton; hay, \$40 per ton; calves, \$27 per hundredweight—net returns per acre are reduced to \$1.90 for the CSC and \$2.18 for the LS treatment.

Literature Cited

- Campbell, R. S., E. A. Epps, Jr., C. C. Moreland, and others.** 1954. Nutritive values of native plants of forest range in central Louisiana. Louisiana Agr. Exp. Sta. Bull. 488. 18 p.
- Duvall, V. L., and S. L. Hansard.** 1967. Responses of southern range cattle to protein supplementation. J. Range Manage. 20:153-157.
- Duvall, V. L., and L. B. Whitaker.** 1963. Supplemental feeding increases beef production on bluestem-longleaf pine ranges. Louisiana Agr. Exp. Sta. Bull. 564. 18 p.
- Duvall, V. L., and L. B. Whitaker.** 1964. Rotation burning: A forage management system for longleaf pine-bluestem ranges. J. Range Manage. 17: 322-326.
- Kennedy, Bill.** 1970. Liquid supplements for beef? You can Scratch that! It's no longer a question . . . The cattle industry is now pouring it on, mixing it in and lapping it up. Louisiana Farmer 7(12):9.
- Pearson, H. A.** 1974. Liquid supplements for cattle grazing native range. p. 33-40. In: Proc., Louisiana State Univ. 14th Annu. Livestock Prod. Day.
- Pearson, H. A., and L. B. Whitaker.** 1972. Thrice-weekly supplementation adequate for cows on pine-bluestem range. J. Range Manage. 25:315-316.
- Reynolds, W. L., H. C. Gonsoulin, T. M. DeRouen, and others.** 1970. Feed molasses and urea mixtures to beef cattle. Louisiana Cattleman 70(11):8-9.
- Totusek, R., J. W. Holloway, and W. E. Sharp.** 1971. Self-fed liquid and dry supplements for wintering range cows. Oklahoma Agr. Exp. Sta. Misc. Pub. 85:36-41.

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