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Confined Feeding of Beef Brood Cows

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CONTENTS

Cattle performance on a conventional pasture system (above) was compared with performance under a confined feeding system (cover).

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Confined Feeding of Beef Brood Cows

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THE HIGHEST YIELDING forage crops are not efficiently utilized by grazing. Thus, some system other than grazing must be used for maximum benefits of improved crops by beef brood cows. Confined feeding systems permit the rationing of nutrients to cows based on their requirements and offer opportunity to use labor-saving equipment. High crop yields and efficient cattle management can possibly be combined more effectively in confined feeding programs than in conventional production systems.

Perhaps the earliest systematic study of confined cow feeding was initiated in 1959 by Marion *et al. (2,3)* at the Rolling Plains Agricultural Research Station, Spur, Texas. One group of cows was confined in drylot and fed a ration of 1 pound of cottonseed meal, 2 pounds sorghum grain, and 45 to 55 pounds of silage or green chopped sorghum per head daily and their calves were creep fed. The second group of cows was maintained solely on native pasture, with no harvested forage fed regardless of pasture condition. Their calves were not creep fed. Most calves in both groups were born in February or March. Results reported showed that cows confined in drylot performed as well as cows on pasture through seven calf crops. Both groups of cows weaned 88 per cent calf crops averaging 475 pounds in drylot and 466 pounds on pasture. Large differences occurred in the eighth calf crop. Drylot cows produced a 100 per cent calf crop but weaned

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only 71 per cent averaging 451 pounds, compared with 88 per cent and 530 pounds on pasture. This lower percentage of calves weaned and lighter drylot calves was interpreted by the authors to be the result of a cumulative nutritional deficiency since the cows were not fed minerals or vitamin A regularly. However, the drylot ration had not affected longevity of the cows at 11 years of age. These workers suggest that a practical and economically feasible system would use grazing 60 to 120 days during the summer and drylot during the remainder of the year.

Meiske and Goodrich *(4)* compared a drylot and conventional system of cow-calf production in Minnesota during a 5-year study. One group of cows was maintained in the drylot and fed silage, hay, or haylage throughout the year. The other group was fed similarly during the winter but maintained on pasture during the grazing season. All calves were born in spring and were creep fed. Fewer accidental losses occurred in drylot than on pasture, but there were no marked differences in health status of cows between herds. In both groups, 88 per cent of cows exposed to breeding weaned calves. Drylot calves consumed about 65 pounds more creep feed per calf but their average adjusted weaning weights were lower than those of calves reared on pasture (472 vs. 431 pounds). The Minnesota results show that approximately twice as many cows could be carried on a given land area if the drylot system were used instead of the conventional plan. The authors concluded that economic feasibility of the drylot system compared to the conventional system would depend on differences in labor costs, feed storage and handling costs, and land area required.

EXPERIMENTAL METHODS

Three feeding treatments for beef cows—two confined systems and a conventional one—were compared in each of 5 years at the Lower Coastal Plain Substation, Camden, Alabama. Hereford (H) cows were used during the first 3 study years and Angus-Hereford (A x H) crossbred cows were used during the last 2 years. The Hereford cows were 2 and 3 years of age at beginning of the experiment, whereas the crossbreds went on test at either 5 or 6 years old. Performance-tested Hereford bulls were used throughout the test and were replaced annually. The Hereford cows calved between January 15 and April 15, whereas the A x H cows calved during fall (average dates of November 5-11).

The crossbred cows were on a fall-calving schedule when selected for this study and no attempt was made to change them. Throughout the test, 15 cows were assigned to each of the following treatments.

Group I, conventional—grass hay plus cottonseed meal (CSM) November 1 to early spring; Coastal bermudagrass grazing during summer at 1 cow-calf unit per acre; calves not creep-fed.

Group II, confined silage—cows and calves confined to 3-acre wasteland area; both fed intermediate type (NK-300) sorghum silage plus protein supplement; calves also given blended creep mixture.

Group III, confined hay—cows and calves confined to 3-acre wasteland area and fed Coastal hay and protein supplement; calves also creeped on blended mixture.

Cows in Group II were fed 1.5 pounds of Auburn-65 protein supplement per head daily from calving to 180 days post-calving, and 1 pound of the same supplement for the remainder of the year. The changes in quantity of protein supplement were made on a group basis when most cows had calved and when calves were about 180 days of age.

Group III cows received the protein supplement at the rate of 1 pound per head daily only during the 180-day period immediately following calving. The Auburn-65 protein supplement fed to all confined cows consisted of:

Cottonseed meal	59 per cent
Urea (281)	15 per cent
Ground snapped corn	13 per cent
Dicalcium phosphate	13 per cent
Vitamin A	10,000 IU/lb.

The creep mixture self-fed to calves in Groups II and III was as follows:

Ground shelled corn	65 per cent
Ground Coastal hay	15 per cent
Cottonseed meal (41%)	8 per cent
Urea (281)	1 per cent
Cane molasses	10 per cent
Salt	0.5 per cent
Dicalcium phosphate	0.5 per cent

Cows under the conventional plan (Group I) were full fed Coastal bermudagrass hay and 2 pounds of CSM per head daily

from November 1 until grazing was adequate in the spring. The 15 acres assigned to this treatment was divided into three pastures of about equal size and were grazed rotationally. Usually two of the pastures furnished ample grazing so that the third area could be used for hay production. However, surplus grazed herbage was harvested as hay.

All calves were weighed at birth, again at approximately April 1 and November 1, and at weaning (250 ± 3 days of age). Cows were weighed about April 1 and November 1. Calf weaning weights were corrected for age of dam and sex by multiplying actual weight by the following factors:

Age of dam, years	*Female*	*Male*
2	1.24	1.17
3	1.17	1.10
4	1.11	1.05
5-9	1.06	1.00

The Hereford cows were milked in April and September 1965 by the oxytocin procedure *(1)*. The resulting 12-hour FCM values were multiplied by 2 to obtain the 24-hour production cited later in this report.

All crops received lime and mineral fertilizer according to soil test recommendations for maximum production. The 15 acres of Coastal bermudagrass utilized both for grazing and hay received 200 pounds of N annually. Nitrogen rate for Coastal grown exclusively for hay (for Group III) was 400 pounds per acre. All N was applied in split applications. Hay and silage yields were determined by weighing crops as harvested. Samples for dry-matter determination were obtained at harvest. Feedstuffs were characterized chemically from samples taken at time of feeding. Because of the change in experimental animals, certain results are presented as 3-year and 2-year data as well as for the 5-year period.

RESULTS

Yield and Composition of Feed

The Coastal bermudagrass area managed for both grazing and hay produced an average of 1.68 tons of hay per acre annually during the 5-year study, in addition to providing grazing for 1 cow-calf unit, Table 1. Crude protein content of this hay averaged 8.6 per cent on a dry-matter (DM) basis.

Sorghum silage production averaged 17.15 tons per acre of 35

per cent DM material that had about 39 per cent head, DM basis, Table 1. Yields ranged from 12 to 24 tons per acre, primarily depending on amount and distribution of rainfall. The largest yield included a second cutting of regrowth forage that was harvested only 1 year during the 5-year study. The silage as fed was about 27 per cent DM and 7.6 per cent crude protein on a dry basis. The moisture content increased during storage because the storage facility was an open, unlined, trench silo.

Coastal bermudagrass managed solely for hay yielded an average of 7.49 tons per acre during the 5-year experiment. Hay yields were rather consistent from year to year, ranging from 6.9 to 8.2 tons per acre. The hay removed from this meadow area had a crude protein content of 9.16 per cent. This small increase in protein of the meadow hay over that from the pasture (9.16 vs. 8.56 per cent) could be attributed to the extra N applied. However, the difference in hay quality between the areas was relatively small. The hay meadow produced slightly coarser forage (33 vs. 36 per cent cellulose).

Analyses of hand-plucked samples from the pastures indicated that the cows were probably consuming forage of about 9 per cent crude protein content.

Feed Consumption

Cows fed hay and protein supplement during the winter in the conventional system required 1.58 tons of hay per cow or an

TABLE 1. FEED PRODUCTION AND CONSUMPTION DATA, BY COW FEEDING GROUPS, 1963-68

Item	Conventional 5-year average	Confined-silage 5-year average	Confined-hay 5-year average
Feed consumption			
Hay or silage, ton/cow	1.58	12.81	4.31
Hay or silage, lb./cow/day	20.1	68.9	23.6
Protein supplement, lb./cow	294	437	170
Calf creep mixture, lb.	----	1,423	1,421
Feed production			
Hay or silage, tons/acre[1]	1.68	17.15	7.49
Land requirements			
Acres per cow (feed production)	0.94	0.75	0.58
Cow-calf units/acre (feed)	1.06	1.34	1.74

[1] Pasture area (conventional) received mineral fertilizer according to soil test and 200 pounds of N per acre annually. Hay meadow (confined) received mineral fertilizer as required and 400 pounds of N per acre. Silage area received mineral fertilizer as required and 100 pounds of N per acre.

average of 20 pounds daily, Table 1. These cows also consumed slightly less than 300 pounds of protein supplement for the winter feeding period.

The sorghum silage consumption of cows in confinement was about 69 pounds daily, or 12.8 tons on an annual basis. These cows ate 437 pounds of protein supplement yearly and their calves an average of 1,423 pounds of blended creep mixture.

Cows that were confined and fed hay received 4.31 tons of hay annually, or an average of 23.6 pounds daily. Also they were fed 170 pounds of protein supplement. Calf creep consumption was almost identical to that of calves from silage-fed cows (1,421 vs. 1,423 pounds).

Dry-matter intake averaged 20.1, 20.0 and 22.9 pounds daily for Groups I, II, and III, respectively. Their daily intake of crude protein, in the same order, averaged 2.2, 2.4, and 2.6 pounds. The latter values were applicable during the first 180 days of lactation when all groups received protein supplement.

Land Requirements

Under conventional management, Coastal bermudagrass supported 1.06 cow-calf units per acre. During this 5-year study, there was a total surplus hay production of 989 pounds per acre from a conventional grazing and hay system. The surplus hay was produced during the first and last years of the study; for the remaining 3 years, less hay was produced than was required for winter feed. However, an accumulative surplus of hay was available each year during the test because a large surplus was produced the first year and only small deficiencies occurred during the succeeding 3 years.

An acre of land averaged producing sorghum silage for 1.34 cow-calf units during this study. Only in 1967 was the goal of 2 animal units per acre achieved and that resulted from the harvest of regrowth forage.

An acre of Coastal maintained solely for hay, and thus receiving 400 pounds of N, produced feed for 1.74 cow-calf units. In other words, only 0.58 acre was required to produce hay sufficient for 1 cow-calf unit.

Calf Weaning Data

Weaning weights and estimated grades at weaning are shown in Table 2. These data are subdivided because the test cows

TABLE 2. CALF WEANING DATA, BY COW FEEDING GROUPS

Item	3-year average			2-year average			5-year average		
	Conventional	Confined		Conventional	Confined		Conventional	Confined	
		Silage	Hay		Silage	Hay		Silage	Hay
Calves weaned, No.	42	40	32	27	26	28	69	66	60
Adjusted wean. wt.[1], lb.	437	531	496	478	583	528	453	551	511
Slaughter grade[2]	9.4	12.1	12.1	10.5	13.3	12.2	9.8	12.6	12.1
Stocker grade[2]	12.0	12.7	12.5	12.5	12.1	12.7	12.1	12.9	12.6

[1] 250-day weight adjusted for age of dam and sex using Iowa PRI factors quoted in text. Differences of 18 and 24 pounds required for significance at P = .05 and P = .01, respectively.

[2] Low Good = 9, average Good = 10, high Good = 11, low Choice = 12, average Choice = 13.

were changed at the end of the third year; thus, the 3-year means represent produce of the original Hereford females and the 2-year means are for progeny of the Angus-Hereford (A x H) crossbred cows.

The A x H cows produced heavier calves at weaning than the Herefords (529 vs. 486 pounds). The crossbred cows required slightly more hay or silage (+ 8.7 per cent) to produce the extra 43 pounds of calf at weaning; however, being larger (52-pound average) than the Herefords they required slightly more feed for maintenance. These results should not be construed to be a comparison of Hereford vs. crossbred (A x H) dams. The Hereford cows were 2 to 5 years old during the study, whereas the A x H cows were 5 and 6 years of age. Also, the crossbreds were progeny from highly-selected, Station-bred cattle contrasted to the Herefords that were purchased with only meager background information. Undoubtedly, the crossbreds had a higher genetic potential because of selection. The fact that the confinement rations were adequate for the more productive cows indicates that the feeding plans are practical.

Combining data for all years, cows fed sorghum silage in confinement weaned calves that were heavier at weaning than those from cows fed Coastal hay in confinement (551 vs. 511 pounds). Also, calves from silage-fed dams were heavier than those from dams grazed in the summer and fed conventionally during the winter (551 vs. 453 pounds). Calves from both groups of cows that were confined were heavier by 58 and 98 pounds than those

from the conventional-fed cows. However, the calves from confined cows were creep-fed and consumed an average of 1,422 pounds of blended creep mixture per calf. They required 2,450 (Group III) and 1,452 (Group II) pounds of feed per hundredweight of gain over the control (Group I).

The estimated slaughter grades of calves from conventional-fed dams were average Good, whereas those of calves from confined cows were low Choice. The stocker grades were low or average Choice for all groups, Table 2.

Milk Production

All lactating cows were milked twice during 1965, within the first 90 days of lactation and again just prior to weaning of first calves. These milk production data are given in Table 3.

TABLE 3. MILK PRODUCTION, BY COW FEEDING GROUPS[1]

Treatment	First 90 days lactation		Near weaning	
	No. of cows	24-hour FCM	No. of cows	24-hour FCM
		Lb.		*Lb.*
Conventional	11	8.04	14	4.26
Confined-silage	8	9.54	12	4.52
Confined-hay	11	6.86	12	4.36

[1] Conversion to fat-corrected milk (FCM) puts milk on an energy equivalent basis.

Reproduction

The calving rate of confined cows fed Coastal hay as their major energy source was lowest in the experiment, Table 4. It was 82 per cent, as compared with 92 per cent for confined cows fed sorghum silage and 95 per cent for those grazed during summer and fed hay plus protein supplement during winter. Calf losses after birth were not great, averaging 0 to 6 per cent for all treatments.

Cows fed conventionally weaned a larger per cent calf crop (92 per cent) than did either of the confined-fed groups (88 and 84 per cent). The major contributory factor was a greater number of calves born to conventional-fed cows, Table 4, because death losses were comparable for all feeding treatments.

There was no difference in average calving date for cows on the three feeding treatments. The range in average calving date among treatment groups was 7 days. Likewise, average birth

TABLE 4. REPRODUCTION EFFICIENCY, BY COW FEEDING GROUPS

Item	Conventional			Confined-silage			Confined-hay		
	3-yr. H	2-yr. AxH	5-yr. comb.	3-yr. H	2-yr. AxH	5 yr. comb.	3-yr. H	2-yr. AxH	5-yr. comb.[3]
Calving rate[1]									
No. calved/no. possible	43/45	28/30	71/75	40/45	29/30	69/75	38/44	23/30	61/74
Per cent calving	96	93	95	89	97	92	86	77	82
Calf losses[2]									
No. weaned/no. born	42/43	27/29	69/72	40/40	26/26	66/66	34/38	28/28	62/66
Per cent weaned	98	93	96	100	100	100	89	100	94
Calf crop weaned[2]									
No. weaned/no. possible			69/75			66/75			62/74
Per cent calf crop			92			88			84

[1] Calculated from data of 1964-68.
[2] Based on data of 1963-67.
[3] Reason for difference between number calved and number weaned for the 5-year period is the different year bases indicated in footnotes 1 and 2.

weights of calves from cows on the feeding treatments were comparable. Calves from crossbred dams were about 10 pounds heavier at birth than those from Hereford cows.

Body Weight of Cows

The average live weight data for cows on all feeding treatments is reported in Table 5. Crossbred cows were slightly heavier than the Herefords, but lost more weight between November and April than did the Herefords. Some of this is possibly a result of age differences of the cows, but the probable explanation for the larger weight loss is related to date of calving. Since the A x H cows usually calved during November, they had likely reached their lowest body weight by April 1, whereas the February-calving Hereford cows had not.

TABLE 5. BODY WEIGHTS OF COWS, BY COW FEEDING GROUPS[1]

Date	Conventional		Confined-silage		Confined-hay	
	H	AxH	H	AxH	H	AxH
	Lb.	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*
November 1	960	1,038	920	987	913	924
April 1	882	936	906	878	889	806
Difference[2]	−78	−102	−14	−109	−24	−118
No. cows	*42*	*27*	*40*	*27*	*33*	*28*

[1] Data from dry cows excluded.
[2] Hereford cows had average calving dates in early February (5-9), AxH cows calved in early November (5-11).

All feeding treatments were adequate to support growth of young producing cows. The young Hereford cows continued to grow during the 3 years in which they were used.

DISCUSSION

This study indicated that feeding of brood cows in confinement is feasible. Confined-fed cows performed satisfactorily in every respect, except that average calving rate of confined-hay cows (82 per cent) was lower than that of conventional cows (95 per cent) or those confined and fed silage (92 per cent). Even so, the confined-hay cows weaned more than an 80 per cent calf crop, which is above the Alabama average. Reproductive performance under confined conditions should be studied for a longer period to more exactly define nutritional requirements. In a previous study at this Station (5), 67 per cent of replacement females on a grass hay plus protein supplement regimen calved initially at 2 years of age, as compared with 50 per cent of those from restricted feeding. The overall calving rate for cows 3 years and older was about 87 per cent during the 9-year study, and percentage calf crop weaned was 80 per cent.

One acre of established, well-fertilized (200 pounds of N plus adequate P and K) Coastal bermudagrass provided adequate forage for grazing of 1 cow-calf unit plus sufficient hay to winter the cow. Of course, protein supplement was purchased for feeding during the winter.

Confined feeding treatments used in this study produced calves with 250-day weaning weights above 500 pounds (511 and 551 pounds). The group of cows from which the A x H cows were selected weaned calves weighing 504 pounds the year prior to being assigned to this test. At that time they were on an optimum plane of nutrition that consisted of grass-legume grazing in the growing season and hay plus protein supplement feeding during the winter on a bottomland pasture containing some perennial cool season grasses.

The milk production of the original cows was low, averaging about 8 pounds on a 24-hour basis during the first 90 days of lactation. Seldom have cows on nutritional research studies in Alabama produced less than 8 pounds of FCM in 24 hours, even in late lactation.

Creep feed produced heavier calves at weaning but the feed

efficiency of creep-fed calves was poor (24.5 pounds feed per pound of gain for Group III and 14.5 pounds for Group II).

Crop yields greatly affect management decisions regarding use of confinement systems for brood cows. An economic analysis of these data, with particular reference to the relationship between crop yields and land prices, will be completed and published in the near future.

Waste disposal was not a problem in this study in which 15 cows and their calves were confined to 3 acres of well-drained wasteland area. Manure was removed occasionally from the area adjacent to the feed bunks. Concrete feeding aprons used at each bunk were self-cleaning. A small stream ran through the confinement lots and served as the water supply.

SUMMARY

1. One acre of established Coastal bermudagrass fertilized with 200 pounds of N provided grazing and hay for 1 cow-calf unit annually using conventional management.

2. One acre of land devoted to production of an intermediate type sorghum silage or Coastal bermudagrass for hay supported 1.34 and 1.74 cow-calf units, respectively.

3. A cow-calf unit confined to a dirt lot the year around required 12.8 tons of sorghum silage or 4.3 tons of Coastal bermudagrass hay annually when these feedstuffs were the major source of energy.

4. Confined cows fed sorghum silage and protein supplement weaned calves weighing 551 pounds, compared with 511 pounds for calves from dams fed Coastal hay in confinement. Calves from conventionally-managed cows weighed 453 pounds at weaning.

5. Calves from confined-fed cows consumed 1,422 pounds of blended creep mixture per calf, whereas those from the conventional system were not creep-fed.

6. Calves from cows in confinement were ⅔ of a grade fatter at weaning than calves from cows in the conventional system (low Choice vs. average Good).

7. Brood cows weaned calf crops (number weaned of number possible) of 92, 88, and 84 per cent for the conventional, confined-silage, and confined-hay systems, respectively.

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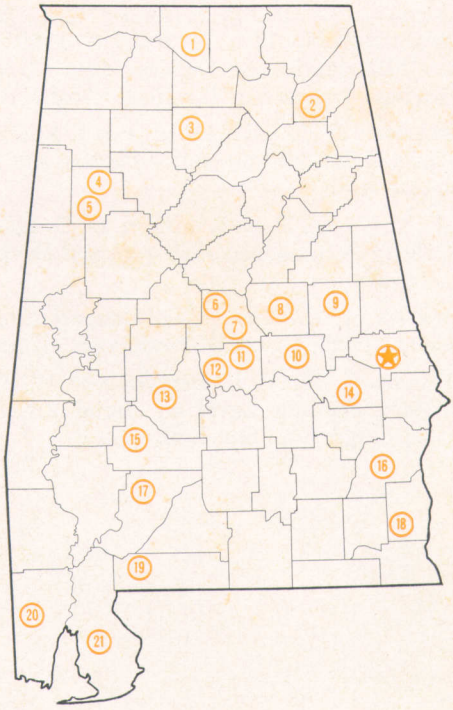

Research Unit Identification

Main Agricultural Experiment Station, Auburn.

1. Tennessee Valley Substation, Belle Mina.
2. Sand Mountain Substation, Crossville.
3. North Alabama Horticulture Substation, Cullman.
4. Upper Coastal Plain Substation, Winfield.
5. Forestry Unit, Fayette County.
6. Thorsby Foundation Seed Stocks Farm, Thorsby.
7. Chilton Area Horticulture Substation, Clanton.
8. Forestry Unit, Coosa County.
9. Piedmont Substation, Camp Hill.
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11. Forestry Unit, Autauga County.
12. Prattville Experiment Field, Prattville.
13. Black Belt Substation, Marion Junction.
14. Tuskegee Experiment Field, Tuskegee.
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17. Monroeville Experiment Field, Monroeville.
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