EFFECT OF COW AGE AND CONDITION ON NUTRIENT REQUIREMENTS AND MANAGEMENT

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INTRODUCTION

The income and profit of a beef cattle operation is closely related to the rebreeding and reproduction rate of the herd. A 1986 survey of cattle producers in nine counties in central Florida indicated the number of calves sold was only 69% of the breeding age beef cows. Forty-eight percent of the 284 producers that responded indicated that nutrition was their biggest problem with reproduction and another 24% indicated that parasites were their biggest problem.

Nutrition and parasites were factors identified by over 70% of producers surveyed. Both will affect the body condition of the beef cow. The body condition of the beef cow is related to reproductive performance and can be used by cattle producers to make management decisions. Grouping of cattle and the type and level of supplemental feed for maximum profit are decisions that must take body condition into consideration.

BODY CONDITION SCORE AND COW AGE

Body condition of beef cows can be visually evaluated by ranchers and used as an indicator of nutritional status. A simple system of quantitating body condition is called body condition score (BCS) ranging from 1 to 9 (thin to fat). Most cows in Florida have BCS from 2 to 7. A summary of trials relating body condition scored at calving, breeding or pregnancy testing to pregnancy rate is shown in Figure 1 (Kunkle and Sand, 1990). This summary of 12 trials conducted in Florida, Texas and Oklahoma with over 4000 beef cows showed pregnancy rates were improved for beef cows as BCS increased from 3 to 6. This data shows a dramatic increase in pregnancy rate and that a BCS of 5 at pregnancy testing was needed to achieve pregnancy rates above 90%.

During the last 3 years BCS has been used in several herds to evaluate its relationship to pregnancy rate. In addition the age of each cow was recorded to determine its relationship to pregnancy rate. Results from 9 herds with over 4000 cows showed herd pregnancy rates varied from 61% to 92% (Table 1). Pregnancy rates for several herds were below 85 to 90% which is considered to be both achievable and in the economically optimum range for herds using improved pastures. To improve pregnancy rate, a manager must understand what is limiting pregnancy rate. By evaluating the pregnancy rate at each condition score, a manager can determine if the below optimum pregnancy rate is explained by nutritional status (BCS), or other factors such as diseases, bulls, etc., were reducing low pregnancy rate.

A thumb rule is that if cows in BCS 5 have over a 90% pregnancy rate then factors such as reproductive diseases probably did not limit pregnancy rate and improving BCS of thin cows should improve pregnancy rate. In the Manatee C herd the pregnancy rate was 75% but cows with BCS 5 showed a 93% pregnancy rate. The average BCS for the herd was 4.3 and improving the BCS of cows with BCS 2, 3 and

4 would be expected to improve the pregnancy rate. Four of the nine herds evaluated showed pregnancy rates below 90% for cows in BCS 5 or above. In these herds improving BCS of thin cows will improve pregnancy rate but may not achieve 85 to 90%. The Manatee D herd appeared to have lower pregnancy rates at all BCS compared to other herds indicating factors that do not affect BCS were involved.

Evaluating pregnancy rate by the cow age (years) can be useful to determine if it is an important factor. Many ranchers brand the year born on replacement females and this was used to determine cow age in these herds. Heifers (age 1) and 4 year old cows had the lowest pregnancy rate of all age groups when compared across all herds (Table 1). The management and nutrition was different from herd to herd and an evaluation of cow age is more useful within herds.

Manatee locations A, B, C and D were data collected in 1989 and Manatee locations E, F and G were data collected in 1990. The data reported as Manatee locations B and G was the same herd in 1989 and 1990, respectively. Manatee herds were bred at 2 years to calve at 3 years and in 6 of the 7 herds the pregnancy rate was lowest (46 to 86%) for the 4 year old cows. In the Manatee G herd the 3 year old cows had a 10% lower pregnancy rate (79%) compared to all other age groups in the herd. Further evaluation of the data indicated that both lower average BCS (more cows with BCS 3 and 4) and a lower pregnancy rate at each BCS contributed to the low pregnancy rates at age 4 in the Manatee herds. There was some indication that 4 year old cows were calving later in the calving season which would be expected to reduce their pregnancy rate. Even though the pregnancy rate of 3 year old cows rebreeding after their first calf was good (86%), if they were rebreeding late in the breeding season, this would result in later calving as 4 year old cows and would likely lower pregnancy rate. In the Manatee herds in 1990 a management decision was made to remove cows not nursing a calf (most late calvers) when the fall calving cows and calves were worked in January and the pregnant ones were placed in a spring calving herd. This management change, changes in supplementation and/or weather likely contributed to the improvement in pregnancy rates in 1990 compared to 1989. In the Union herd, age 1 and 2 cows had the lowest pregnancy rate (73 and 82%) but these were within the range expected for the nutrition and management. In the Alachua herd no consistent patterns of age and pregnancy rate were apparent.

An evaluation of BCS 5 or higher cows at each age shows a pregnancy rate of 89 or higher for all ages except ages 1 and 4 years (Table 1). All the yearling heifers (age 1) were in the Union herd and their weight during the breeding season was below that needed for high pregnancy rates. The 4 year old cows were mostly from the Manatee herds and late calving as previously discussed may have contributed. In 7 of the 9 herds evaluated, there was a trend for BCS 3 and 4 cows nursing their first or second calf to have a lower pregnancy rate than older cows with similar BCS. In the other 2 herds (Alachua and Manatee) that had very low (61%) or excellent (88%) pregnancy rates, this trend was not consistent. In other words, letting 1st or 2nd calf cows get too thin reduced pregnancy rate more than when older cows were too thin.

In summary, an evaluation of the relationship of pregnancy rate to BCS and age does not pinpoint the exact problem in a herd but it certainly helps a manager eliminate some possibilities and focus attention to management factors that are important and can help improve production and profit.

FEEDING ALTERNATIVES

Improving the BCS of cows below BCS 5 would have improved the pregnancy rate of

these herds and many others in Florida. Molasses or grain feeding can be used to improve BCS, but this approach has economic limitations. A good manager has the challenge of managing the beef herd for good body condition by optimizing the use of forages available and using high energy supplements only for selected groups of cattle when the costs and returns have been evaluated and found to be profitable.

Body condition is affected by such factors as stocking rate, forage species, forage management, date of calving, weaning age, supplements, genetics, parasites, diseases and weather to name a few. Body condition is cumulative over several months and strategies that result in BCS above 5, with little additional costs, will require less supplemental feed during the winter and lower costs of production. Managing the herd to improve BCS using supplementation strategies or other management techniques that provide a high return per dollar invested is a key factor in a profitable operation. Nutritional factors that should be considered include mineral, protein and energy supplements.

MINERAL SUPPLEMENTS

Several minerals have been shown to be deficient or marginally deficient in cattle grazing improved or native forages in Florida. These minerals include sodium, phosphorus, copper, cobalt and selenium. Low quality forage usually has lower levels of minerals than high quality forage and minerals are likely to be less available in low quality forage.

Although acute deficiencies of each mineral have characteristic symptoms, marginal or chronic deficiencies generally result in unthrifty or emaciated cattle (McDowell et al., 1983). These cattle would be characterized as thin or have a lower BCS than if the adequate levels of minerals were fed. Studies with phosphorus deficient diets showed a 31 to 46% reduction in intake when diets containing .07 to .15% phosphorus were compared to a phosphorus adequate diets (Ternouth and Sevilla, 1990; Preston and Pfander, 1964). The reduced intake in low phosphorus diets resulted in lower animal performance but the lower performance was largely explained by the lower intake of digestible energy and there was no apparent effect on digestion or efficiency of energy utilization. During the winter months warm season forages in Florida may have .10% or lower phosphorus (McDowell et al., 1980) and a phosphorus supplement may be critical to maximize the intake of low quality forage and reduce weight and condition loss. A free choice mineral should meet the requirements of beef cattle grazing improved pastures on typical Florida ranches. A complete mineral supplement containing salt, calcium, phosphorus, and trace minerals is recommended. Mineral consumption varies across pastures, seasons, and cattle but an average consumption of 2 ounces/head/day of a mineral containing 25% salt, 14 to 18% calcium, 8% phosphorus, .4% zinc, .2% iron, .2% manganese, .1% copper, .016% iodine, .01% cobalt, and .002% selenium has been sufficient in many situations. Mineral consumption is critical since too high a level is expensive and too little can result in deficiencies. Mineral levels need to be adjusted for different situations such as additional supplements, forage type, soils types, water mineral content, etc.

PROTEIN SUPPLEMENTS

Protein supplements have been shown to increase forage intake and digestibility when forages contain less than 7 to 8% crude protein (McCollum and Horn, 1990). Results of several research studies have shown a 15 to 45% increase in forage consumption when low protein forages were supplemented with protein. A few studies have also shown a 2 to 5% increase in digestibility.

The level of protein supplement needed to

stimulate intake and digestibility appeared to range from .15 to .30 pounds/head/day of crude protein for forages that ranged from 5 to 7% crude protein. When protein in forage is below 7 to 8% it is usually cost effective to supplement with protein. Supplemental protein fed at .2 to .3 pounds/head/day typically costs 5 to 10 cents/head/day and an increased TDN intake of 2 to 2.5 pounds/head/day is expected. Protein supplements are usually more cost effective than energy supplements when forage protein is limiting. Cows fed low protein forage are usually losing weight and need some supplemental feed to minimize weight and condition loss.

Effects of protein supplementation on reproduction was researched over a 10 year period in Hereford cattle grazing native pastures in Oklahoma. In a review of this research, Randel (1989) showed that a natural protein supplement fed prior to calving increased pregnancy rate from 7 to 74 percentage units over 9 trials with an average increase of 25 percentage units (55 to 80% pregnancy rate). In trials where protein supplements were evaluated after calving the higher level of a natural protein supplement increased pregnancy rate from 2 to 50 percentage units over 8 trials with an average increase of 21 percentage units (69 to 90% pregnancy rate). Calves from protein supplemented groups also averaged 15 pounds heavier weaning weights (10 to 22 lb range over 6 trials) compared to groups fed lower levels of protein supplement. Protein supplemented mature beef cows grazing range in Oklahoma had less weight and condition loss and differences in pregnancy rate appeared to be related to the BCS of the cows.

Recent research conducted at the Ona Research Center in south Florida over 4 years evaluated molasses, molasses-urea and molasses-cottonseed meal-urea supplements for wintering beef cows (Pate et al., 1989). Cows supplemented with a molasses-cottonseed meal-urea supplement had a pregnancy rate of 80% compared to 68% for the molasses supplemented cows. An evaluation of the response in cows of different ages showed that pregnancy rate was increased from 38% in 3 year old first calving cows fed the molasses supplement to 70% in 3 year old first calving cows fed the molasses-cottonseed meal-urea supplement (Table 2). The molasses-urea supplemented 3 year old cows had a 60% pregnancy rate. A similar comparison in 4 to 6 year old cows showed the pregnancy rate was improved from 66 to 79% and in 7 to 13 year old cows pregnancy rates were similar(78 vs 81% pregnancy rate). In 3 year old cows the protein supplement dramatically improved pregnancy rate but had very little effect on the weight loss or the body condition loss (Table 2). The 3 year old cows in all treatments had an average BCS of 4.0 to 4.4 at the beginning of the breeding season. Sasser et al. (1988) also found a reduced pregnancy rate when first calf beef cows were fed a protein restricted diet. First calf heifers fed a 7% protein diet before and after calving had a rebreeding rate of 32% compared to 74% in first calf cows fed the protein adequate diet. Cows fed both the 7% protein diet and the protein adequate diet were limit fed similar levels of feed and had slightly lower weight gains prior to calving but the dramatic reduction in pregnancy rate was more than expected based on the reduction in BCS and weight. In both of these studies young beef cows responded to a protein supplement with dramatic increases in pregnancy rates and the BCS were similar or slightly lower indicating that these differences would not have been evident from evaluating the BCS of the cows during the calving and breeding seasons. Application of this research will require managing cattle by age groups for cost effective protein supplementation programs.

Protein supplementation has been shown to improve cattle performance in many situations where forage protein is below 7 to

8% and in some cases when forage protein levels are higher. Protein can be supplemented from nonprotein nitrogen sources or from natural protein sources that have different levels of rumen degradable protein and different amino acid profiles of the rumen undegraded protein. Which source provides the most response or the most economical response is not well defined in many situations. Nonprotein nitrogen (NPN) supplements have been shown to effectively increase forage intake in many situations where forage protein levels are below 7 to 8%. NPN supplements usually result in improved performance but natural protein supplements may give better results in many situations. In growing calves grazing low quality forages natural protein supplements usually give better results than NPN supplements. Determining the most economical protein supplementation program for all situations is not possible with present research. The response to protein supplements is usually good when forage protein levels are below 7 to 8%. Providing .2 to .3 pounds/head/day of crude protein from a NPN containing supplement that is reasonable in cost and not over consumed is usually an economical decision. If higher levels of performance are needed then providing an additional amount of natural protein supplement or replacing the NPN supplement with a natural protein will often result a better performance.

ENERGY SUPPLEMENTS

Supplementing with high energy grain or molasses supplements to improve BCS is very effective but must be carefully evaluated to be cost effective. A medium frame sized cow will gain approximately 75 pounds to improve BCS from 4 to 5 (Herd and Sprott, 1986) and require approximately 400 pounds of TDN from high energy supplements in addition to forage. This will require an estimated 500 pounds of corn or 650 pounds of blackstrap molasses based supplements fortified with protein to be supplemented with maintenance quality forage over an 80 to 100 day period. In some situations the improved performance from the higher BCS will be cost effective but in many situations it will not be cost effective. Considering the marginal economic response it is important that cattle are grouped so that only cattle that will respond are fed the supplement.

MANAGEMENT STRATEGIES

A good ranch manager must evaluate many different options when deciding the ranch management program. Several management strategies that may help maximize profit are as follows:

1. Adjust stocking rate for insure adequate forage during the stocking rate limiting months.
2. Target a calving season that fits the forage, supplements, marketing plan and management.
3. Cull open and poor producing cows.
4. Control parasites and diseases.
5. Provide a good mineral free choice all year.
6. Provide .2 to .3 pounds/head/day of supplemental crude protein for cattle grazing forages containing less than 7% crude protein or have a TDN to crude protein ratio above 8.
7. Provide adequate protein to young cows to improve rebreeding. This may require managing first and second calf cows in separate herds during the winter.
8. Group cattle by age and nutritional needs. Separate groups for weaned heifers, yearling heifers, first calf heifers and young cows and adult cows may be needed for part or all of the year.
9. Keep cows in good condition. Separate cows in thin condition and feed additional supplements to improve rebreeding.
10. Provide higher quality forages or high levels of energy supplements balanced with protein to reduce weight loss or

avoid weight loss when cow BCS is below 5.

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Table 1. Relationship of Herd, Age and Condition Score to Pregnancy Rate, %.

	Condition Score[1]						ALL
	2	**3**	**4**	**5**	**6**	**7**	
Location[2]							
Manatee A	40(5)	21(29)	46(61)	94(271)	--	--	80(366)[3]
Manatee B	--	20(10)	69(54)	86(446)	--	--	82(511)
Manatee C	4(25)	45(65)	63(83)	93(276)	--	--	75(452)
Manatee D	--	8(13)	32(37)	79(165)	--	--	66(216)
Manatee E	--	33(6)	74(39)	91(298)	--	--	88(343)
Manatee F	--	75(8)	82(66)	94(338)	--	--	92(412)
Manatee G	--	100(5)	85(61)	90(446)	--	--	89(512)
Union	--	68(22)	77(222)	88(448)	90(158)	100(9)	85(859)
Alachua	0(7)	6(48)	49(173)	81(139)	98(53)	100(12)	61(432)
Age, Years[4]							
1	--	--	30 (10)	74(139)	80(50)	--	73(197)
2	--	45(11)	70(100)	92(119)	94(34)	--	82(264)
3	--	10(10)	54(41)	89(483)	100(9)	--	85(547)
4	0(14)	19(79)	55(246)	84(599)	95(65)	100(12)	72(1016)
5	--	20(15)	66(74)	91(370)	93(30)	--	85(492)
6	--	38(13)	69(70)	89(335)	100(9)	--	84(431)
7	14(7)	30(23)	65(62)	94(243)	100(4)	--	83(340)
8	--	80(10)	78(37)	94(140)	100(8)	--	91(196)
9	--	60(10)	80(50)	96(162)	--	--	90(225)
10	8(12)	54(35)	78(106)	93(237)	--	--	82(393)
All Cattle	8(39)	33(206)	65(796)	89(2827)	92(211)	100(21)	81(4103)

[1]Condition scored at pregnancy testing from 1 to 9, 2=Very Thin, 3=Thin, 4=Borderline, 5=Moderate, 6=Good, 7=Very Good

[2]Location - County in Florida, Manatee A, B, C and D were evaluated in 1989, Manatee E, F and G were evaluated in 1990.

[3]Pregnancy rate,% (number of cows)

[4]Age at breeding

Table 2. Performance of 3-Year-Old Cows (First-Calf Heifers) and Their Calves Fed Various Molasses Mixtures as a Winter Supplement To Low-Quality Forage (4-Year Data)[a]

Item	Supplementation treatment			Standard error of mean
	Molasses	**Molasses-urea**	**Molasses-cottonseed meal-urea**	
No. of observations	25	26	23	
Cow wt on Nov. 25,lb	1005	1038	1027	29
Cow wt change,lb				
Nov. 25 to March 1	-209	-205	-218	24.4
March 1 to June 1 (breeding)	66	51	53	16.1
June 1 to Aug. 23	57	40	62	9.2
Cow condition score[b]				
Nov. 25	5.6	5.8	5.9	.22
March 1	4.0	4.4	4.4	.16
June 1	4.0	4.0	4.0	.22
Aug. 23	4.7	5.0	5.2	.27
Pregnancy rate,%[c]	37.5[d]	60.0[de]	69.6[e]	8.8
Calf data				
Birth wt,lb	62.9	63.8	64.5	5.1
Survival to weaning,%[f]	92.0	84.6	95.7	6.6
Weaning wt,lb	392	405	422	28.4
Age at weaning,days	223	222	226	9.32
ADG,lb	1.47	1.54	1.58	

[a]Pate et. al., 1990. J. of Animal Science 68: 618-623
[b]Condition score 1 to 9; with 1=very thin, 5=average, and 9=very fat.
[c]Calculated as 100 x number cows palpated pregnant/number cows exposed to bull.
[d,e]Means in the same row with a different superscript differ (P<.05).
[f]Calculated as 100 x number of calves weaned/number of calves born.

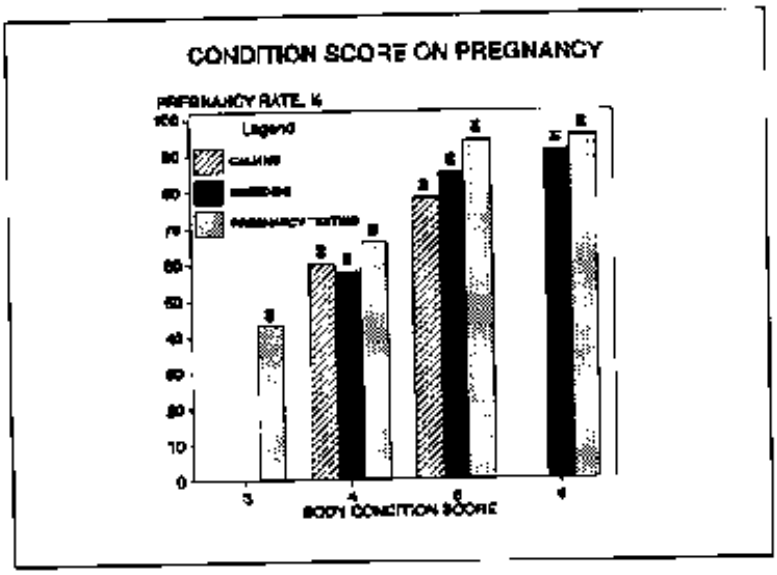

Figure 1. Relationship of Body Condition Scored at Calving, Breeding, or Pregnancy Testing to Pregnancy Rate.