Nutritional management of beef females

BCS management and supplementation strategies

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BCS and its economic importance

What is BCS?

- Estimated amount of fat of each animal.
  Usually scale of 1 to 9
  1 = extremely thin **9 =** extremely obese
- BCS is an estimation of the amount of body fat and not necessarily body weight.

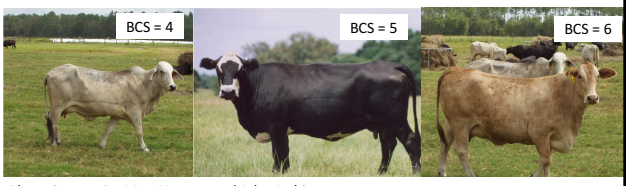

Photo Source: Dr. Matt Hersom and John Arthington

Source = http://edis.ifas.ufl.edu/an319

What is the correlation between BCS and reproductive performance?

Source = http://edis.ifas.ufl.edu/an319

BCS at calving vs. Pregnancy Rate, %

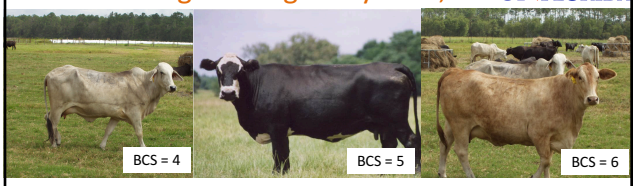

Photo Source: Dr. Matt Hersom and John Arthington

	Body condition score at calving		
	4	5	6
Spitzer et al. (1995)	56[a]	80[b]	96[c]
Lake et al. (2005)	64[a]	-	89[b]
Lents et al (2008)	56[a]	88[b]	-
Bohnert et al (2013)	79[a]	92[b]	-
Average	63.8	86.7	92.5

[abc]$P < 0.05$

Example 1: Effects of Pregnancy rate

Based on a herd size of 100 cows

Ranch A: cows calving at BCS 5 = 87% Pregnancy rate

Ranch B: cows calving at BCS 4 = 64% Pregnancy rate

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550-Lb calf x 87 calves x $1.30/Lb of calf weaning weight = $62,205

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Ranch B: cows calving at BCS 4 = 64% Pregnancy rate

550-Lb calf x 64 calves x $1.30/Lb of calf weaning weight = $45,760

$62,205 – $45,760 = $16,445

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4 lbs of molasses daily for 90 days to move from BCS 4 to 5:
Supp. Cost = 4 lbs x $0.13/lb x 90 days x 100 cows = $4,680

$62,205 - **$4,680 molasses = $57,525**

BCS at calving vs. days to show estrus

BCS at calving	Days to resume estrus
3	89[a]
4	70[b]
5	59[b]
6	52[b]
7	31[c]

$^{abc}P < 0.05$

Houghton et al. (1990) JAS 68:1438

BCS at calving vs. Cows cycling during the breeding season

	In Estrus (%) by indicated days of breeding season		
BCS	20 days	40 days	60 days
4	42%	56% [x]	74% [y]
5			
6			

$^{xyz}P < 0.05$

Spitzer et al. (1995) http://www.journalofanimalscience.org/content/73/5/1251.long

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BCS	20 days	40 days	60 days
4	42%	56% [x]	74% [y]
5	54%	80% [y]	90% [z]
6			

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Spitzer et al. (1995) http://www.journalofanimalscience.org/content/73/5/1251.long

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BCS	**20 days**	**40 days**	**60 days**
4	42%	56% ^{x}	74% ^{y}
5	54%	80% ^{y}	90% ^{z}
6	63%	98% ^{z}	98% ^{z}

$^{xyz}P < 0.05$

Spitzer et al. (1995) http://www.journalofanimalscience.org/content/73/5/1251.long

Example 2: Effects of calving distribution

Based on a herd size of 100 head

Ranch A = 80% Pregnancy rate

Ranch B = 80% Pregnancy rate

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Based on a herd size of 100 head

Ranch A = 80% Pregnancy rate

Calving distribution 25% Sep + 25% Oct + 25% Nov + 25% Dec

Ranch B = 80% Pregnancy rate

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Calves born 20 Sep + 20 Oct + 20 Nov + 20 Dec

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Calving distribution 50% Sep + 25% Oct + 15% Nov + 10% Dec
Calves born 40 Sep + 20 Oct + 12 Nov + 8 May

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8 calves born 60 days sooner = 8 calves x 60 days x 1.5 Lb/day = 720 Lb

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8 calves born 60 days sooner = 8 calves x 60 days x 1.5 Lb/day = 720 Lb
12 calves born 90 days sooner = 12 calves x 90 days x 1.5 Lb/day = 1,620 Lb

2,340 Lb of extra weaning weight x $1.30/Lb = $3,042 of additional income

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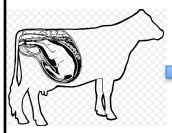
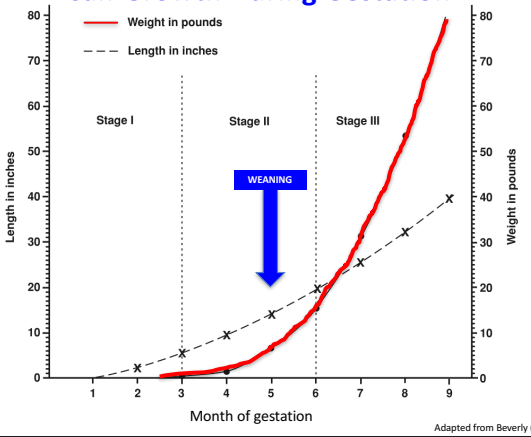
Fetal Programming?

"Maternal stimuli or insult at a critical period in fetal development has long term impacts on the offspring"

(David Barker – Southampton University)

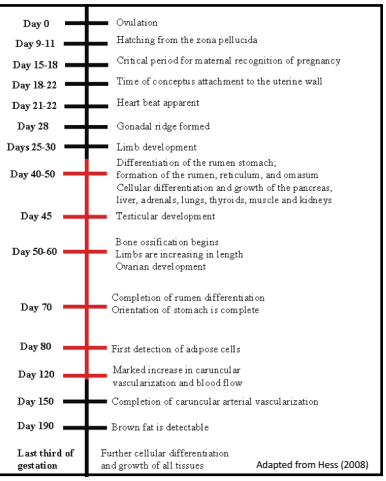


Calf Growth During Gestation



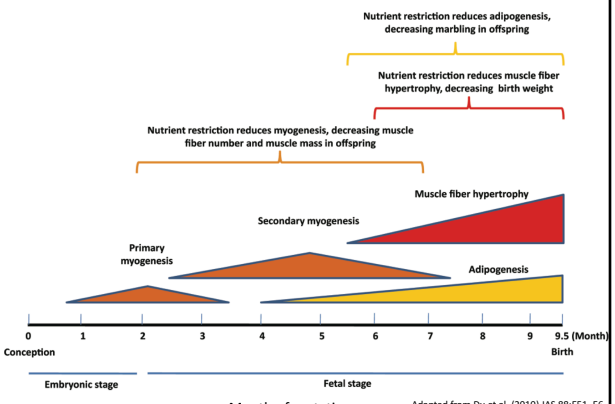
Adapted from Beverly (2008)

Organ Development Beef Cattle



Adapted from Hess (2008)

Calf Growth Timeline



Adapted from Du et al. (2010) JAS 88:E51–E6

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What happens to future calf performance?

Early-gestation

Conception to 3 months of gestation

Angus x Hereford heifers fed 55 or 100% of their nutrient requirements for the first 83 days of gestation

	55% of requirements	100% of requirements
Body weight, lb		
Day 32 of gestation	859	839
Day 115 of gestation	722*	934*
Weight change	-137*	95*
Body condition score		
Day 32 of gestation	5.0	5.1
Day 115 of gestation	4.3*	5.5*
Weight change	-0.7*	0.4*

*$P < 0.05$

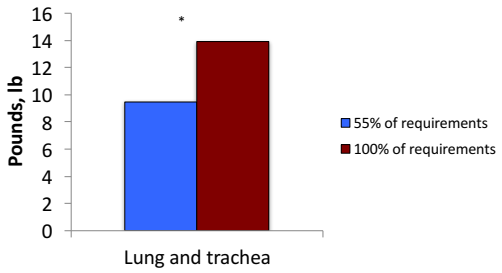
Long et al. (2010) JAS 88:3251-3261

Growth performance of steers born to heifers fed 55 or 100% of their nutrient requirements for the first 83 days of gestation

	55% of requirements	100% of requirements
Body weight of steers, Lb		
Birth	69	71
Weaning (228 days of age)	491	480
Average daily gain, Lb/d		
Birth to weaning	1.8	1.9
During finishing	4.9	4.6

Long et al. (2010) JAS 88:3251-3261

Lung and trachea weight of steers born to heifers fed 55 or 100% of their nutrient requirements for the first 83 days of gestation



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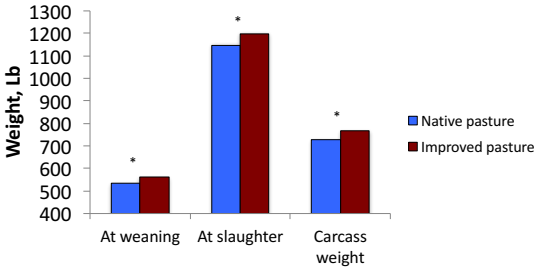
What happens to future calf performance?

Early- to Mid-gestation

0 to 6 months of gestation

Growth performance of steers born to cows grazed on native (< 7% crude protein) or improved (9% crude protein) pastures for 60 d (during mid-gestation)



*$P < 0.05$

Underwood et al. (2010) Meat Sci. 86:588-593

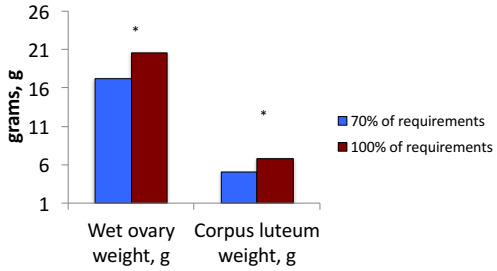
Angus x Gelbvieh mature cows fed 70 or 100% of their nutrient requirements from day 45 to 185 of gestation

	70% of requirements	100% of requirements
Body weight, lb		
Day 45 of gestation	1114	1039
Day 185 of gestation	1140*	1247*
Body condition score		
Day 45 of gestation	5.4	5.6
Day 185 of gestation	4.8*	6.3*

*$P < 0.05$

Long et al. (2012) JAS 90:197-206

Ovary and *Corpus Luteum* weight of heifers born to cows fed 70 or 100% of their nutrient requirements from day 45 to 185 of gestation



*$P < 0.05$

Long et al. (2012) JAS 90:197-206

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What happens to future calf performance?

Late-gestation

6 to 9 months of gestation

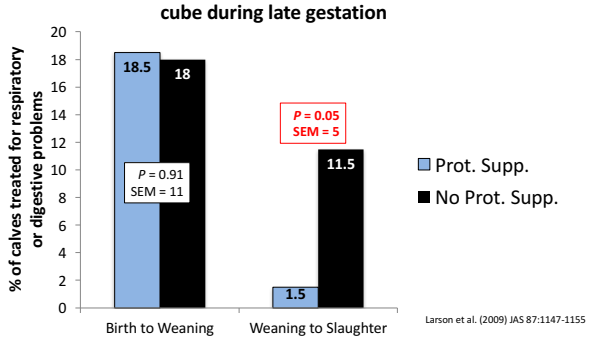
Growth performance of STEERS born to cows receiving no supplementation (No Supp.) or 1 Lb/day of 42% crude protein cube during late gestation

	Stalker et al. (2007)		Stalker et al. (2006)		Larson et al. (2009)	
	No Supp.	Supp.	No Supp.	Supp.	No Supp.	Supp.
Weaning weight, Lb	441*	463*	465*	480*	518*	531*
Carcass weight, Lb	764*	804*	800	813	802*	819*
Choice, %	-	-	85	96	71*	86*
Marbling	449	461	467	479	444*	493*

*$P < 0.05$

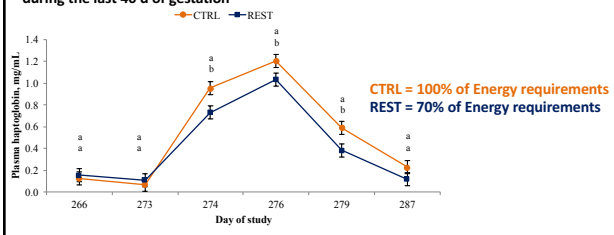
Stalker et al. (2006) JAS 84:2582-2589
Stalker et al. (2007) Rangel. Ecol. Manage. 60:578-587
Larson et al. (2009) JAS 87:1147-1155

Immune response of STEERS born to cows receiving no supplementation (No Supp.) or 1 Lb/day of 42% crude protein cube during late gestation



Larson et al. (2009) JAS 87:1147-1155

Post-weaning immunity of calves born to dams fed 100 or 70% of energy requirements during the last 40 d of gestation



	Treatment[1]		SEM	P-value
Item	CONTROL	RESTRICTED		
Plasma Cortisol, ng/mL	17.5	13.7	1.53	0.05
Serum BVDV-1a titers, log_2	6.36	5.15	0.463	0.05

Growth and reproductive performance of HEIFERS born to cows receiving no supplementation (No Supp.) or 1 Lb/day of 42% crude protein cube during late gestation

	Martin et al. (2007)		Funston et al. (2010)	
	No Supp.	Supp.	No Supp.	Supp.
Weaning weight, Lb	456	467	496*	511*
Adj. 205-day weight	480*	498*	469	478
Age at puberty, days	334	339	366*	352*
Pregnancy, %	80*	93*	80	90

Martin et al. (2007) JAS 85:841-847
Funston et al. (2010) JAS 88:4094-4101

*$P < 0.05$

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Effects on cost of developing heifers?

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*$P < 0.05$

Growth and reproductive performance of HEIFERS born to cows receiving no supplementation (No Supp.) or 1 Lb/day of 42% crude protein cube during late gestation

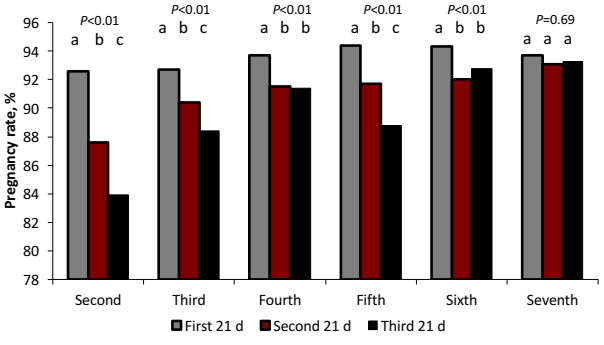
Table 3. Effects of dam protein supplementation during the last trimester of gestation and meadow grazing vs. grass hay feeding during early lactation on reproductive and calving performance of heifers[1]

	Treatment[2]					*P*-value[3]	
Trait	PS	NS	M	H	SEM	LG	EL
Age at puberty, d	339	334	341	332	10	0.70	0.48
Cycling at beginning of breeding season, %	61	67	56	73	—	0.45	0.15
Calved in first 21 d, %	77	49	63	63	—	0.005	0.89
Overall pregnancy rate, %	93	80	83	91	—	0.05	0.18
Calving date, Julian	71	75	73	73	3	0.15	0.94
Calf birth wt, kg	33	33	32	33	1	0.94	0.25
Unassisted births, %	78	64	76	66	—	0.24	0.21

[1]Includes puberty data from 50 heifers born in yr 3, cyclicity and pregnancy data from 91 (PS = 45, NS = 46, M = 46, H = 45) heifers born in yr 2 and 3, and calving data from 77 heifers born in yr 2 and 3.
[2]No late gestation × early lactation treatment interactions were detected ($P > 0.10$); therefore, only main effects are reported. PS = dams supplemented 3 times per week with the equivalent of 0.45 kg/d of a 42% CP cake during the last trimester of gestation; NS = no protein supplement fed to dams during gestation; M = dams grazed subirrigated meadows between the end of calving and the breeding season; and H = dams fed cool-season grass hay from the end of the calving season until initiation of the breeding season.
[3]LG = late gestation treatment main effect; and EL = early lactation treatment main effect.

Martin et al. (2007) JAS 85:841-847

Why anticipate puberty?



HEIFERS: Cushman et al. (2013; JAS 91:4486)

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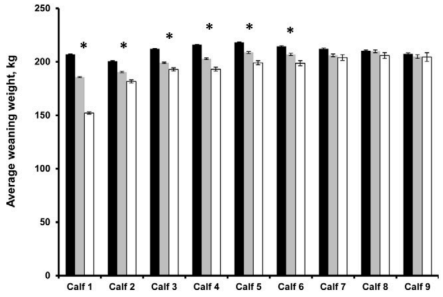
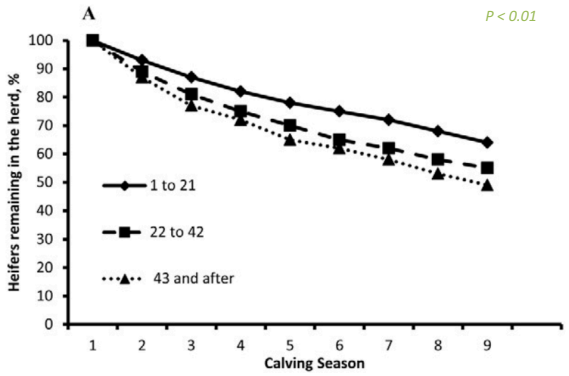


Figure 3. Calf weaning weights based on heifer calving period for the U.S. Meat Animal Research Center (USMARC) cows. Heifers that calved in the first 21 d of their first calving season weaned a heavier calf in each of their first 6 calving seasons (*$P < 0.05$).

Why anticipate puberty?



HEIFERS: Cushman et al. (2013; JAS 91:4486)

2016 - 2017
Beef Enhancement Funds
FL Cattlemen's Association

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Response of Brood Cows Grazing St. Augustinegrass to Seasonal Supplementation with Blackstrap Molasses (5 Years; Pate and Kunkle, 1989).

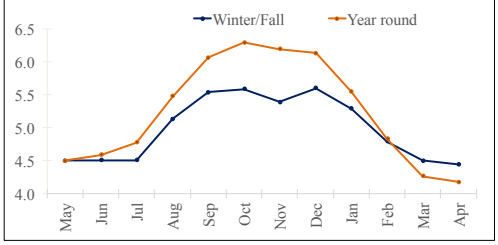
	Molasses Supplementation		
Item	None	Seasonal[1]	Year-round[2]
Weaning, %	83.2	87.7	91.2
Weaning weight, lb	340	370	372
Calf production/cow, lb	283	325	339
Response to molasses, lb of calf/cow	--	42	56
Pounds of molasses for every 1 lb of additional calf production	--	15.0	22.8
Supplementation cost ($200/ton), $/cow	--	$62.2	$127.4
Return (Supp. Cost minus calf production @$1.30/calf lb), $/cow	--	-$7.6	-$54.6

[1] Cows fed 5 lbs/head/day of molasses on a twice weekly schedule from Dec. to Apr. (633 lb total).
[2] Cows fed 5 lbs/head/day of molasses on a twice weekly schedule from Oct. to Mar. (1,274 lb total).

2016 FCA Proposal #1

Does year-round supplementation of cows pay off?

Figure 1. Body condition score simulation (NRC, 2016)



Treatments	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
	lb of dry matter/cow daily											
Year-round Molasses supp.	0.5	0.5	0.5	1.5	1.5	1.5	2.5	2.5	2.5	2.5	2.5	1.5
Fall/Winter supp.							3.3	3.3	3.3	3.3	3.3	3.3

2016 FCA Proposal #1

Does year-round supplementation of cows pay off?

Item	Treatments CON	YCUB	YMOL	SEM	P-value Treatment
Cow Body Condition Score					
Start of study (day 0; June)	4.70	4.40	4.60	0.097	-
Weaning (day 56; August)	5.04	5.14	5.10	0.053	0.42
Cow BCS change					
June to August	0.52	0.60	0.57	0.054	0.65
Cow Body Weight, lb					
Start of study (day 0; June)	957	907	954	10.5	-
Weaning (day 56; August)	941	966	936	13.9	0.39
Cow Average Daily Gain, lb/day					
June to August	0.09	0.57	0.00	0.249	0.34
Suckling calf Body Weight, lb					
Weaning (day 56; August)	490	498	496	5.5	0.61
Calf Average Daily Gain, lb/day					
June to August, lb/d	1.87	2.02	1.99	0.100	0.52

Treatments	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
	lb of dry matter/cow daily											
Year-round Molasses supp.	0.5	0.5	0.5	1.5	1.5	1.5	2.5	2.5	2.5	2.5	2.5	1.5
Fall/Winter supp.							3.3	3.3	3.3	3.3	3.3	3.3

2016 FCA Proposal #1

Does year-round supplementation of cows pay off?

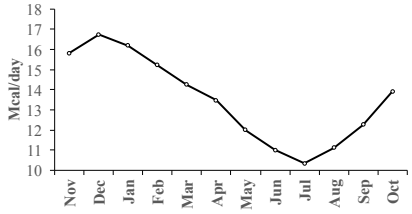
Item	Treatments CON	YCUB	YMOL	SEM	P-value Treatment
Cow plasma concentrations in August (day 56)					
IGF-1, ng/mL	40.6[a]	48.2[b]	38.7[a]	2.46	0.11
NEFA, mEq/L	0.259[b]	0.307[b]	0.166[a]	0.029	0.008
Glucose, mmol/L	3.80[a]	4.79[b]	4.71[b]	0.307	0.06

Treatments	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
	lb of dry matter/cow daily											
Year-round Molasses supp.	0.5	0.5	0.5	1.5	1.5	1.5	2.5	2.5	2.5	2.5	2.5	1.5
Fall/Winter supp.							3.3	3.3	3.3	3.3	3.3	3.3

2016 FCA Proposal #2

Evaluating cost-effective supplementation programs for cows during late-gestation

Figure 1. Total daily energy requirements (NEm), Mcal/day



Treatments	1	2	3	4	5	6	7	8	9	10	11	12
No supplementation	0	0	0	0	0	0	0	0	0	0	0	0
Supp. 90 days	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25
Supp. 30 days	4.5	4.5	4.5	4.5	4.5	4.5						

2016 FCA Proposal #2

Evaluating cost-effective supplementation programs for cows during late-gestation

Item	Treatments CON	SUP6	SUP12	SEM	P-value Treatment
Cow Body Condition Score					
August (Start of study; day 0)	5.04	4.96	5.22	0.097	-
October (day 45)					
November (calving day 90)					
Cow Body Condition Score change					
August to October					
October to November					
Cow Body Weight, lb					
August (Start of study; day 0)	908	939	935	10.2	-
October (day 45)					
November (calving day 90)					
Cow Average Daily Gain, lb/day					
August to October					
October to November					

Treatments	1	2	3	4	5	6	7	8	9	10	11	12
No supplementation	0	0	0	0	0	0	0	0	0	0	0	0
Supp. 90 days	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25
Supp. 30 days	4.5	4.5	4.5	4.5	4.5	4.5						

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Overview of BCS Project

Part 1 = Importance of Body Condition Score (BCS)
- Impact on fertility and profitability

Part 2 = BCS system
- Test your knowledge
- Tips for evaluating cow BCS
- Re-evaluate your knowledge

Please visit for more details:

Range Cattle REC, Ona FL — rcrec-ona.ifas.ufl.edu
South Florida Beef Program — sfbfp.ifas.ufl.edu
UF Electronic Data Information Source — edis.ifas.ufl.edu

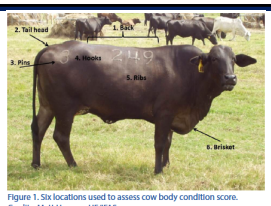
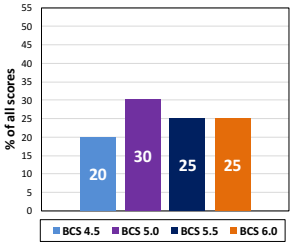


Figure 1. Six locations used to assess cow body condition score.
Credits: Matt Hersom, UF/IFAS



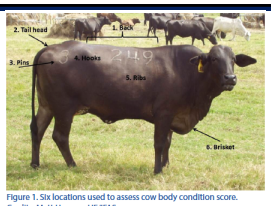


Figure 1. Six locations used to assess cow body condition score.
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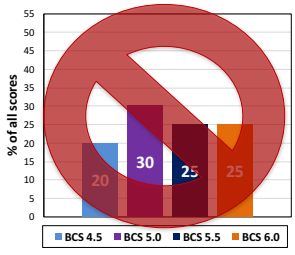

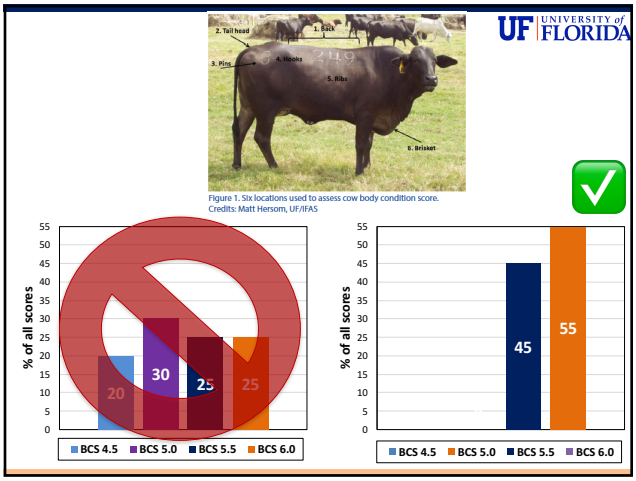
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2. Tail head
1. Back
3. Pins
4. Hooks
5. Ribs
6. Brisket
Figure 1. Six locations used to assess cow body condition score.
Credits: Matt Hersom, UF/IFAS
% of all scores
55
50
45
40
35
30
25
20
15
10
5
0
20
30
25
25
BCS 4.5
BCS 5.0
BCS 5.5
BCS 6.0
% of all scores
45
55
BCS 4.5
BCS 5.0
BCS 5.5
BCS 6.0


Thank you
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