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Using Crop Residues and By-Products to Limit Feed Cows in Confinement

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Introduction

The available forage supply for maintaining beef cow herds continues to be threatened by several factors. High commodity prices encourage the conversion of pasture land into crop ground, cities and towns continue to sprawl out into rural areas creating subdivisions where historically cattle grazed, and drought, fires, hail, and insects continue to periodically deplete forage supplies. When forage supplies cannot be located or are not affordably priced; cattle producers must either sell their cattle or feed the cattle in confinement.

Feeding beef cows in confinement is not a new concept. However, limit feeding them (less than 2% of body weight on a DM basis) an energy dense diet, with the intent of keeping the cows in the production cycle, rather than finishing them out, needs to be thoroughly evaluated. Keeping cows in confinement 12 months out of the year may not be the most economical scenario, but partial confinement when pastures need deferment or forage is not available, may keep at least a core group of cows from being marketed. Producers will need to know how and what to feed the cows while in confinement to make it feasible. Crop residues, poor quality hays such as those from the conservation reserve program (CRP), and by-products tend to be the most economical ingredients to include in confinement diets.

Nutrient Requirements of the Cow

When producers decide to limit feed cows in confinement there are three concepts that become key to successful feeding. The first concept to understand is the cow's nutrient requirements. The cow's nutrient requirements vary with age, size, and stage of production (NRC 1996). Two and three year old cows still have requirements for growth as well as gestation and/or lactation and should be fed separately from mature cows in a limit feeding situation to allow them to consume the feed needed to meet their requirements. When lactation starts, the cow's nutrient needs increase and peak at about 8 weeks of lactation (Figure 1). Producers need to either increase the energy density of the diet or increase the pounds of dry matter fed when lactation starts.

Nutrient Content of the Feedstuffs

Another important consideration is the nutrient content of the commodities used in the limit fed ration. Most producers are familiar with feeding low to medium quality forages to mid-gestation cows. They typically supplement with a protein source to improve forage digestion

and the cows are allowed ad libitum access to the forage. The protein allows the cow to adequately digest the forage and if the forage is not restricted, the cow can usually meet her energy requirements. Limit feeding cows while maintaining body condition requires a mindset shift for producers. While the protein needs of the cow do need to be met, the first limiting nutrient, especially for the lactating cow, is energy. Typically, producers are always encouraged to send feed samples to a commercial laboratory for testing. The TDN value listed on commercial laboratory results is not from an analysis but is actually calculated from acid detergent fiber (ADF). In the case of forages, this is fairly similar to the digestibility and is an acceptable measure of forage energy. However, due to the oil content of some by-products, and the interaction of by-products in residue based diets, the University of Nebraska recommends using TDN values for by-products based on animal performance in feeding trials (Table 1). Estimating too much energy for a commodity can result in poorer than expected cattle performance, while underestimating the energy value of a commodity would cause overfeeding, resulting in an increased expense for the confinement period.

Feed Intake of the Nursing Calf

The third important consideration is the feed intake of the calf. Nursing calves can be seen nibbling at forage within the first three weeks of life. By the time they are three months old, research indicates they are eating about 1% of BW in forage (Hollingsworth-Jenkins et al., 1995). A 300 lb. calf would eat 3 lb. of DM in addition to nursing the cow. If calves are not weaned and in their own pen at this time, additional feed should be added to the bunk for them. Early weaning does not save feed energy but may be a good management practice in the confinement feeding situation. Research conducted at the University of Nebraska indicated that when nursing pairs were fed the same pounds of TDN as their weaned calf and dry cow counterparts, cow and calf performance was similar at the 205 d weaning date (Figure 2, Table 2). While not resulting in an advantage in feed energy savings, early weaning can be advantageous in other ways. Early weaning would allow the calves to be placed in a separate pen from the cows. Producers would then have the flexibility of feeding the calves a growing or a finishing diet, or even allowing them to graze forages if available. The cows then, without the demands of lactation, could be placed on a lower energy diet.

Management Considerations for Young Calves in Confinement

A common misconception producers often have is that calves nursing cows do not need to drink very much water. In reality, they do need water, and especially so, when the temperatures are warm. Young calves need to be able to reach the water tank and have access to sufficient water. In the UNL confinement feeding trial, calves as young as a couple of days drink water during July calving. Tanks need to be banked high enough that calves can reach the edge and water flow needs to be unrestricted enough that the tank can refill quickly after cows drink. The size of the tank needs to be big enough that on extremely hot days calves can access the water without cows pushing them away. In the research trial it was necessary to put small tubs of water out of reach of the cows but accessible to the calves. Feed access is also an issue as calves begin eating at a fairly young age. In the UNL confinement study, creep feeders were placed at the back of the feedlot pen to allow calves access to alfalfa pellets prior to 90 days of age. Although consumption was low (0.37% BW), it probably

served to initiate some rumen function. Calves begin eating at the bunk with cows at an early age and therefore would need to be able to access the feed bunk as well.

Defining Early Weaning

Early weaning can be defined as anything less than 180-210 days which is the more traditional weaning age. Determining the appropriate age for early weaning depends largely on what producers want to accomplish with early weaning. Weaning at 45 days of age is generally done when cows are in poor condition (BCS < 4; 1-9 scale) and discontinuing lactation is necessary to initiate cyclicity. As previously mentioned, early weaning may not actually result in feed energy savings, but may be a useful management tool. Weaning calves at 90 d will not likely impact cow cyclicity but does allow producers to reduce the energy fed to the now non-lactating cow while allowing them to provide a higher quality energy source to the calves. Whether producers choose to use a high quality grass pasture or a mixed diet in a confined pen, the nutrient density of the diet must replace the nutrients in milk if a similar rate of gain is desired.

Reproduction in Confinement

Cows can be successfully bred in confinement consuming a high energy limit-fed diet. The overall conception rate of moderate BCS cows is higher if they are on an increasing plane of nutrition just prior and during the breeding season. This can be done by increasing the DM fed, or increasing the energy density of the diet. Additionally, confinement improves the ease with which synchronization and artificial insemination protocols can be implemented (http://beef.unl.edu/web/cattleproduction/breedingcowsinconfinement). When bulls are confined with cows allow an additional 2 feet of bunk space for every bull and another 15-18 lb of TDN per bull/d depending on the condition of the bulls during breeding.

Defining Confinement Feeding

Feeding in confinement does not necessarily have to be done in a feedlot setting. Although, the advantages of the feedlot often include feed trucks with scales and mixers, concrete bunks, good fences, and access to commodities not always available to ranchers. However, feeding cows in confinement can be achieved by setting up temporary feed bunks or feeding under a hot fence on harvested crop ground, pivot corners, a winter feed ground, or even, as a last resort, a sacrifice pasture. It is important to keep in mind that cattle limit fed a diet on a pasture will continue to consume the forage in the pasture and overgrazing can result if this is the option that has to be implemented. Regardless of location, cows will need a minimum of 2 ft. of bunk or feeding space and calves will need 1.5 ft.

Limit Fed Diet Options for Confined Cows or Pairs

Numerous commodities are acceptable in cow diets and their inclusion will depend on nutrient content, availability, and price. At least in Nebraska, there is large diversity in commodities available, particularly from the eastern to the western ends of the state. As a result, many diets have been formulated for producers. Some diets include ingredients unique

to an area, while other ingredients are available in limited quantities in some areas and therefore cannot be included at very high levels. Purchase price and trucking costs also impact commodity inclusion. The following example diets were formulated by UNL extension specialists for research trials or Nebraska producers (Table 3). These diets have been used to maintain body condition on cows and can be adapted for other regions with the help of a nutritionists or extension personnel. Handling characteristics should be considered as well when determining what ingredients to use. Research has indicated a diet containing 80% ground cornstalks and 20% wet distillers grains will result in some sorting. Ground wheat straw or low quality hay may not result in the same degree of sorting. Corn wet distillers grains often results in less sorting than dry distillers. Unfortunately, many producers do not have access to the wet product. Mixing some water with the diet can reduce sorting or including silage or beet pulp can add enough moisture to reduce sorting. Rumensin can be added up to 200 mg/ton to improve efficiency and limestone should be added at 0.3 lb/cow to enhance the Ca:P ratio.

Calculating Cost on a TDN Basis

When determining the most cost effective way to feed cows in confinement, several factors need to be considered. In addition to availability, handling, trucking costs, delivery costs, and amounts needed, must all factor into the cost of the commodity. To compare commodities, it is often helpful to express all the commodities on a DM basis and then also compare them on a nutrient basis (Table 4). Many producers do this when comparing protein supplements but it can be done to compare energy feeds as well. Because high energy diets allow producers to limit feed, it can also be helpful for producers to determine the cost of a limit fed diet compared to an ad libitum diet (Table 5).

Conclusion

Limit feeding an energy dense diet to cows or pairs in confinement for a segment of the production cycle can be a viable alternative to herd liquidation. Producers choosing to limit feed cows or pairs in confinement must consider the nutrient needs of the cow, changes in nutrient requirements as production phase changes, nutrient content of available feeds, availability and associated costs of available feeds, as well as the increasing feed demands of the growing calf.

Literature Cited

Blasi, D.A., J.S. Drouillard, G.L. Kuhl and R.H. Wessels. 1998. Wheat middlings in roughage based or limit-fed, high concentrate diets for growing calves. Kansas Agric. Exp. Sta. Rep. Progr. Rep. 783:36.

Ham, G., R. Huffman, R. Stock, T. Klopfenstein. 1993. Wet corn gluten feed in beef diets. NE Beef Report MP59-A. p.46.

Hollingsworth-Jenkins, K., T. Klopfenstein, D. Adams, and J. Lamb. 1995. Intake and diet selectivity of cow/calf pairs grazing native Sandhills range. NE Beef Report MP62-A. p.3

Klopfenstein, T. and F. Owens. 1988. Soybean hulls – an energy supplement for ruminants. NE Beef Report MP53. p.34.

Loy, T., T. Klopfenstein, G. Erickson, and C. Macken. 2003. Value of dry distillers grains in high forage diets and effect of supplementation frequency. NE Beef Report. MP 80-A. p. 8.

NRC 1996. Nutrient Requirements of Beef Cattle. National Academy Press.

Nuttelman, B., M. Luebbe, J. Benton, T. Klopfenstein, L Stalker, and G. Erickson. 2009. Energy value of wet distillers grains in high forage diets. NE Beef Report. MP92. p. 28.

Oliveros, B., F. Goedeken, E. Hawkins, and T. Klopfenstein. 1987. Dry or wet corn bran or gluten feed for ruminants. NE Beef Report. MP52. p. 14.

Figure 1. Energy requirement for gestating and lactating cows calving June 15, early weaned calves weaned at 90 days (EW) and normal weaned (NW) at a traditional 205 d weaning

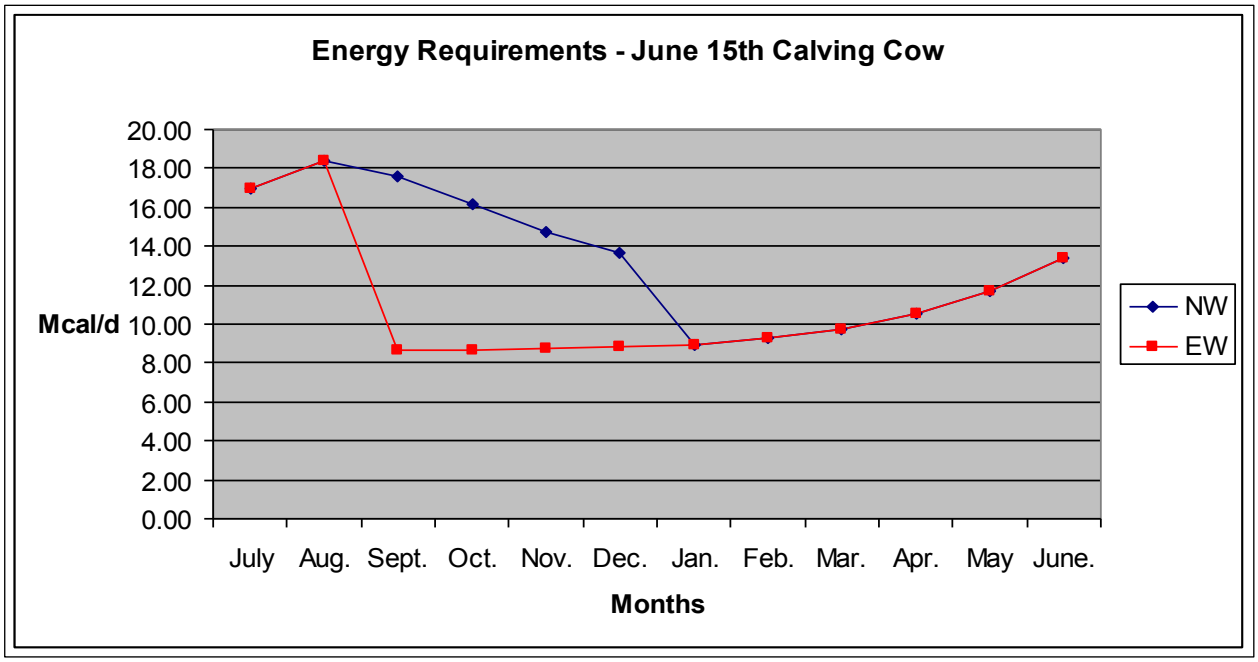

Figure 2. Daily dry matter intake of nursing pairs (NW), weaned calves and their dry cows (EW) from early weaning (90 days) until normal weaning (205 days)

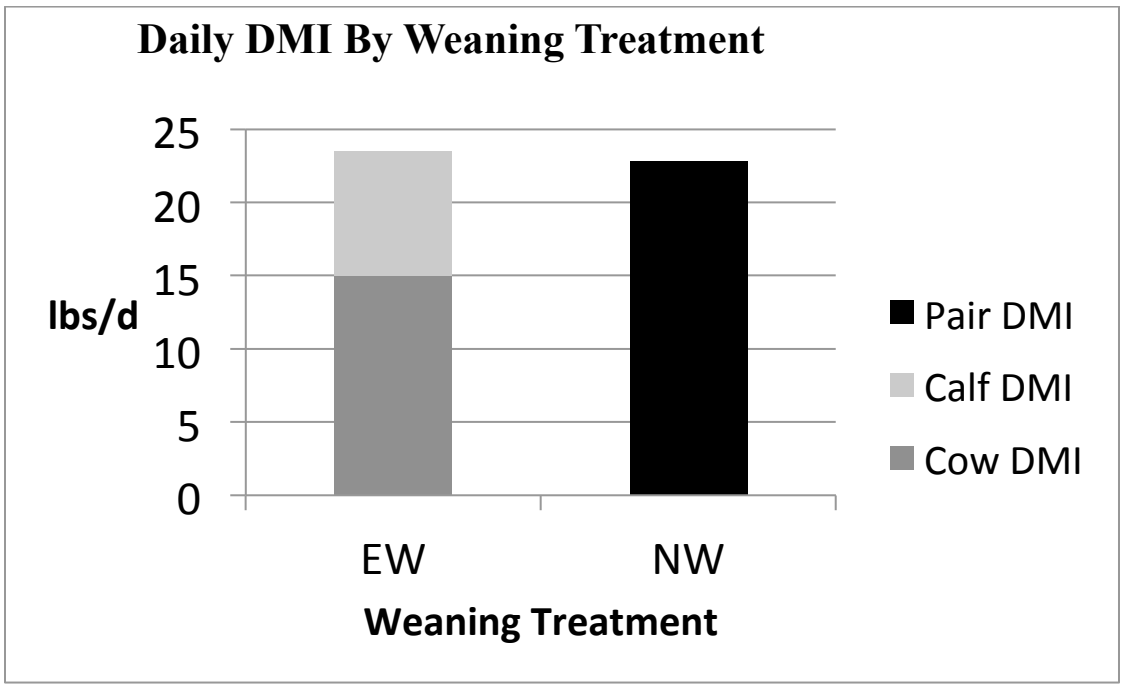

Table 1. Total Digestible Nutrients of common by-products and commodities in forage based diets determined from feeding trials

Ingredient[1]	TDN (% dry matter)
Corn distillers grains, wet, dry, modified	108
Corn condensed solubles	108
Sugar beet pulp	90
Soyhulls	70
Synergy	105
Corn gluten feed	100
Midds	75
Corn	83
Wheat straw/cornstalks	43
Meadow Hay	60
[1]Feeding trials from Blasi et al., 1998; Ham et al., 1993; Klopfenstein and Owens, 1988; Loy et al., 2003; Nuttelman et al., 2009; Oliveros et al., 1987.	

Table 2. Performance of nursing pairs weaned at 205 days (NW) and weaned calves and their dry dams weaned at 90 days (EW)

	ARDC[1]		PREC[2]		*P*-value		
Item	EW3	NW4	EW	NW	Weaning	Location	W*L
Cow BW, lb							
Early weaning (prebreeding)	1115	1101	1150	1134	0.56	0.21	0.95
Normal weaning	1129[a]	1109[a]	1266[b]	1165[a]	0.05	0.01	0.16
Cow BW change, lb	15[a]	7[a]	115[b]	32[a]	0.01	<0.01	0.02
Cow BCS[3]							
Early weaning (prebreeding)	5.4	5.3	5.0	5.0	0.56	0.06	0.91
Normal weaning	5.1	5.1	5.4	5.1	0.23	0.23	0.34
Cow BCS change	-0.3[a]	-0.2[a]	0.3[c]	0.1[b]	0.23	<0.01	0.03
Calf BW, lb							
Early weaning	274	276	295	288	0.85	0.23	0.76
Normal weaning	447[a]	501[b]	494[b]	479[a,b]	0.17	0.36	0.03
Calf ADG, lb	1.48[a]	1.93[b,c]	1.65[c,d]	1.58[a,d]	0.01	0.12	<0.01
[1]ARDC = Agricultural Research and Development Center, Mead, NE [2]PREC= Panhandle Research and Extension Center, Scottsbluff, NE [3]BCS= Body condition score 1(emaciated) to 9 (obese) scale							

Table 3. Example Diets of by-products and residues for gestating, lactating, and lactating cows with 60 day old calves

Diet (DM ratio)	Ingredients	Late Gestation Cow	Lactating Cow	Cow with 60 d old calf
		Dry matter intake, lb		
57:43	Distillers grains:straw	15.0	18.0	20.0
30:70	Distillers grains:straw	19.2	23.0	25.6
40:20:40	Distillers grains:straw:silage	15.4	18.5	20.6
20:35:45	Distillers grains:straw:beet pulp	14.6	17.5	19.4

Table 4. Commodity Cost on a unit of TDN basis

Commodity ($/as is ton)[a]	Commodity[b]	DM content (%)	Commodity ($/DM ton)	TDN (%)	Commodity ($/ton TDN)	Commodity ($/lb TDN)
100	WDGS[c]	35	286	108	265	.13
110	Wheat straw	88	125	43	291	.15
160	Meadow Hay	88	182	57	319	.16

[a]100/.35 = 286, 286/1.08=265, 265/2000=.13
[b]Includes grinding and delivery
[c]Wet distillers grains

Table 5. Diet Cost Comparisons to supply 11 lb TDN/d to gestating cows

Commodity	DM ratio	Amount fed (lb DM)	Total lb fed (DM basis)	Total lb fed (As is basis)	Diet Cost ($/d)
WDGS:straw	57:43	8.6:6.5	15.1	32.0	1.64
WDGS:straw	30:70	5.8:13.4	19.2	31.8	1.67
Meadow Hay	100	19.2	19.2	21.8	1.74