By-product Feedstuffs—Nutrition, Costs, & Concerns

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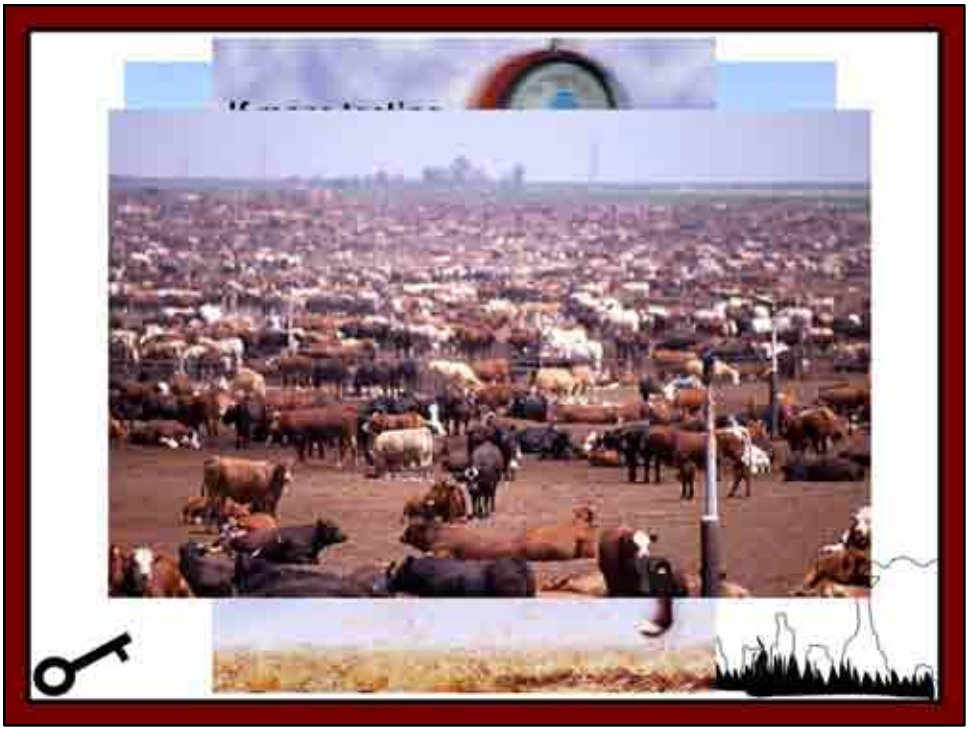
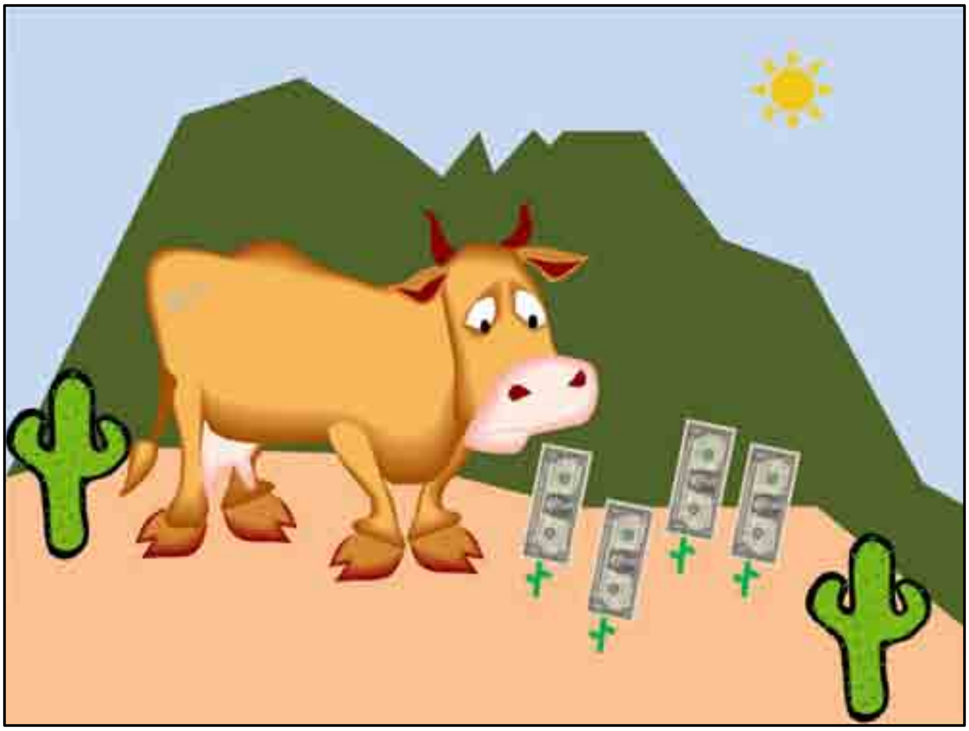
When mother nature is cooperating, management decisions can be relatively simple due to the fact our native range does a good job providing beef cattle with their nutritional needs.

However, there are times when things don’t look so good and we need to provide animals with additional nutrients. Right??? Or are their times when we can let things slide a bit??

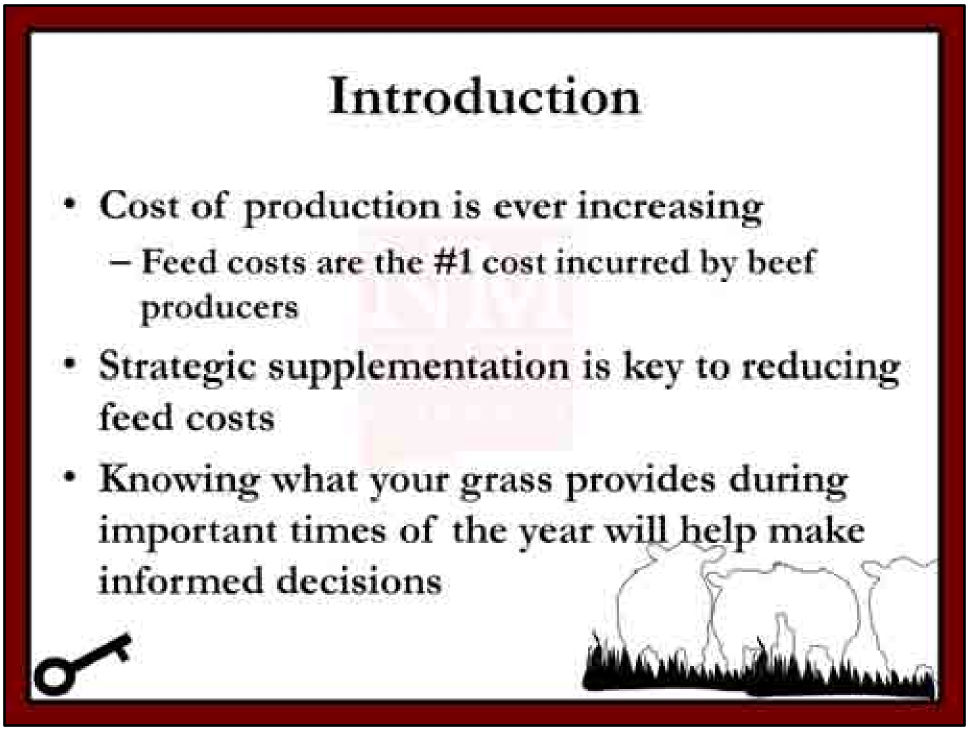
So, I went to my office sat down and thought about what are the critical times in a beef animals life. And tried to define our production goals or areas that may need improvement.



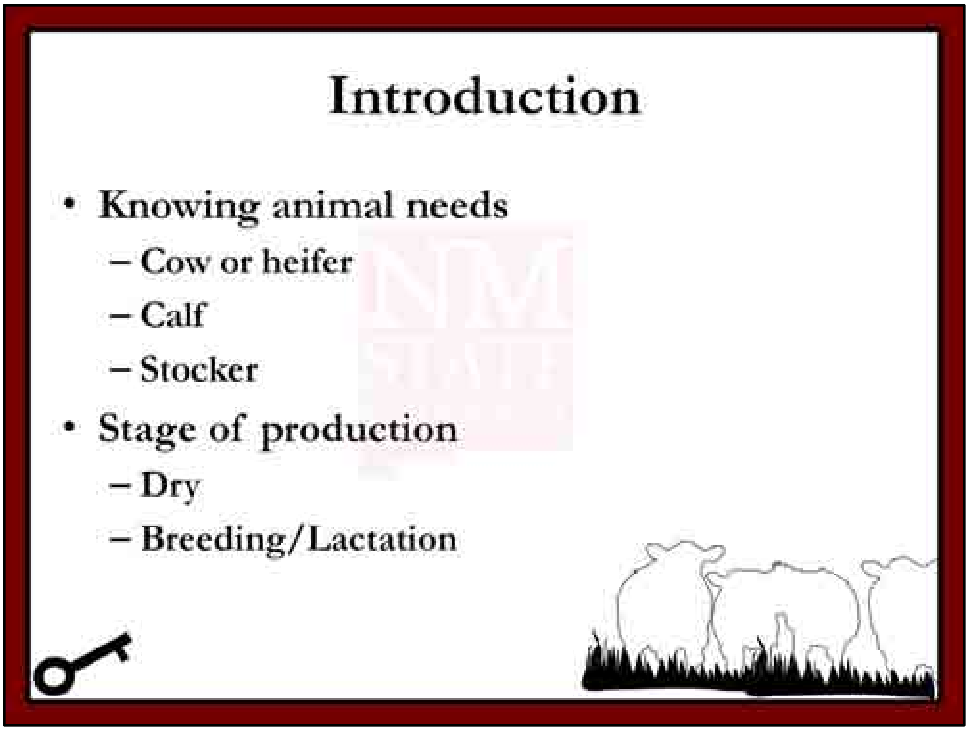
So what do we want, more cycling cows? Heavier cattle? Cattle that can tolerate environmental stresses?



We know we can feed cattle up to allow them to perform at their genetic potential, but we can't simply pour feed/money into these cattle and continue to stay in business.



Strategic supplementation is providing only the nutrients needed at key points in the production cycle. This is in contrast to simply putting out feed when a particular month comes because that's the way we have always done it. Before this can take place we must know what is being provided by the land – so forage analysis is critical. You can't give them what they need unless you know what they don't have.

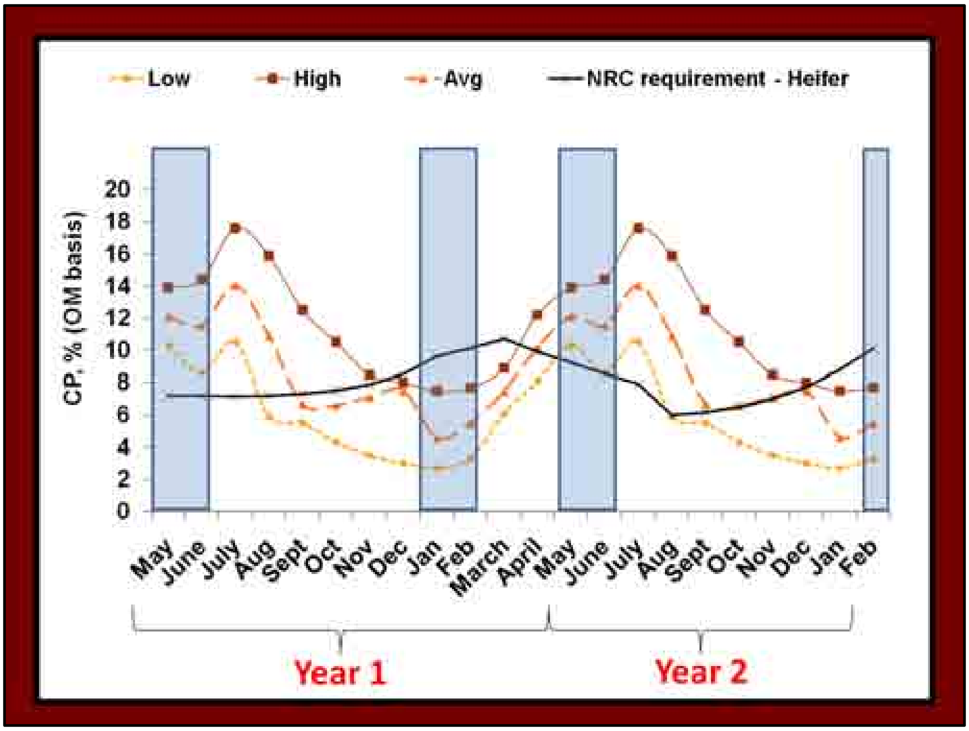


Second, do we know what the animal needs? Cow versus heifers, I am sure all of you, when possible, sort younger and thinner cows from older cows, so that you can more accurately manage their nutritional needs. What about calves, do we just dump weaned calves into a dry lot or can we attempt to cheapen things up by running them on pasture with a modest amount of supplement? How about stockers, although we generally try to put as much cheap gain on these we can, there may be certain years that forage availability/quality does not afford much if any weight gain. Therefore, it may be reasonable to supplement in an effort to improve forage utilization or at least improve their feed efficiency?

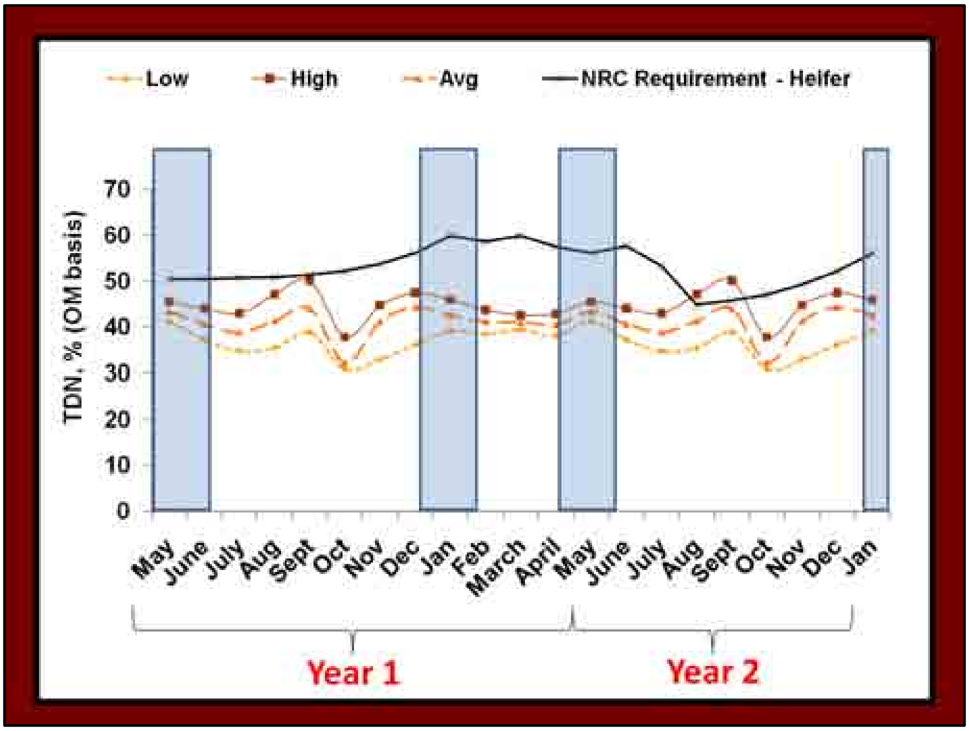
What about the dry cow, does she need to be gaining weight perhaps it is most economical that she maintains or loses a little. Can we get away with roughing her through the winter or perhaps since her nutrient requirements are the lowest right after weaning, can we feed her well to improve condition scores in preparation for winter and late gestation.

Breeding/lactation, I put these together because lactation can influence breeding, meaning the tremendous energetic drain milk production has on the body can hinder reproductive success. And in most cases, peak lactation occurs during the beginning of the breeding season, which can be especially detrimental during artificial insemination.

As an illustration, let us overlay the nutrient requirements of beef heifers on 18 years of forage nutrient analysis from Corona.



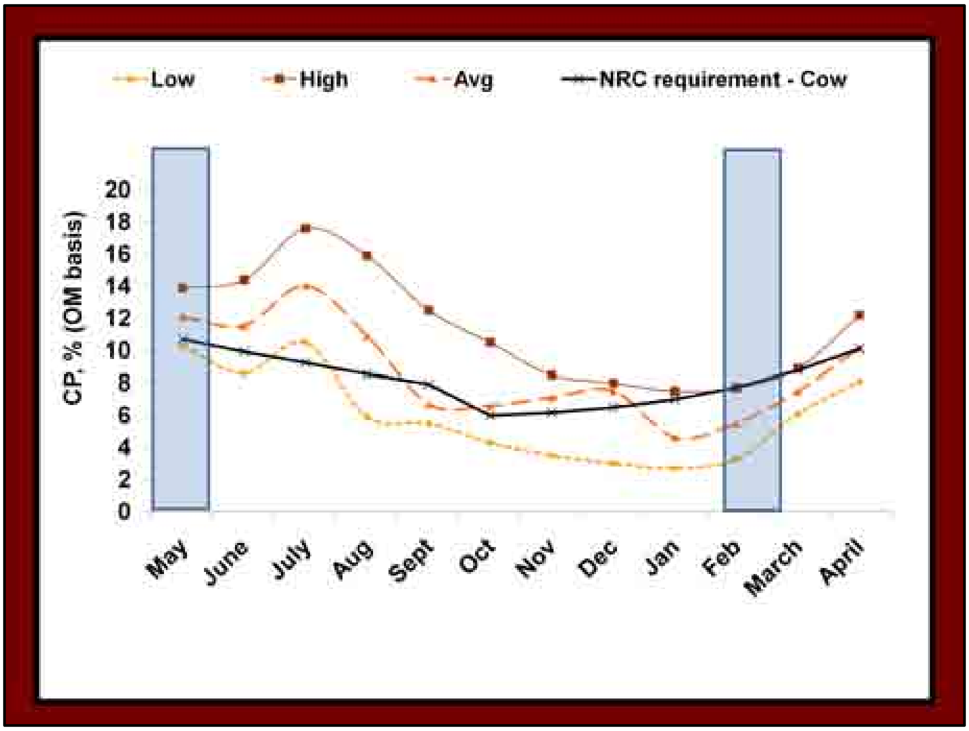
This graph depicts the first two years of a heifers life. I have omitted the time leading up to breeding for sake of brevity. Also, I should define the lines. First the maroon, and yellow line represent the high and low values for forages at Corona as it relates to Crude Protein (CP). The orange line is the average. Again these lines are a representation of what has been collected on various trials for the past 18 years here at Corona. The black line is the Nation Research Council on Beef Cattle Nutrition, other wise known as the NRC, recommendations for the requirements of beef cattle. Lets overlay some blocks on this graph to represent some important time points in the life of this heifer. First we have breeding as a yearling, second the heifers first calving season, third we have the next breeding season and finally, the second calving season. As you can see the black line is below the averages during breeding for the virgin heifer. Not surprising, the black line is above the forage quality lines as she heads into her first calving season. As she heads into her second breeding we see her line increase but start to decrease, as milk production has reached its peak and starts to decline. For the most part, her protein requirements are met fairly well.



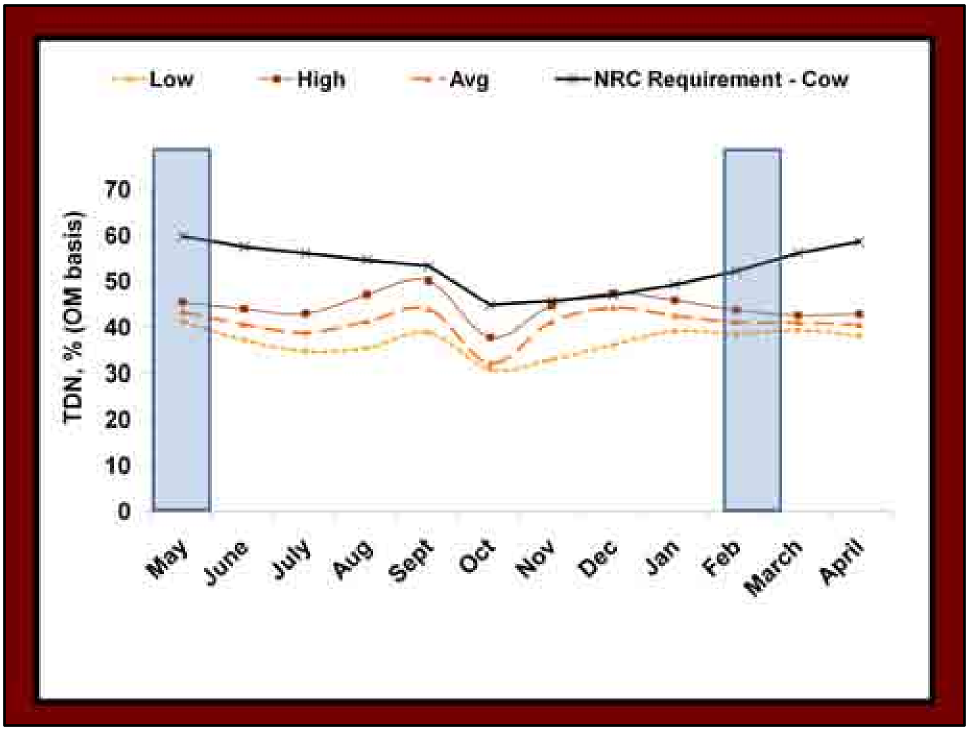
Lets look at the energy requirements for this heifer over the first two years of her productive life. This shows that the forage does not do as well meeting these requirements as did with CP. This may offer some explanation as to why these young cows tend to breed up later and be in poorer condition. This is meant to illustrate that it is important to know what the animals is need of.

SIDEBAR: I realize that this graph makes it look like these young cows need supplemental energy throughout the year, but please remember that the data used to develop the black line are from data developed through out the United States and beyond. The cattle in New Mexico have adapted to these types of forage quality fluxes, so they may not have similar energy requirements or they may be able to utilize the energy better than what our current data would say.

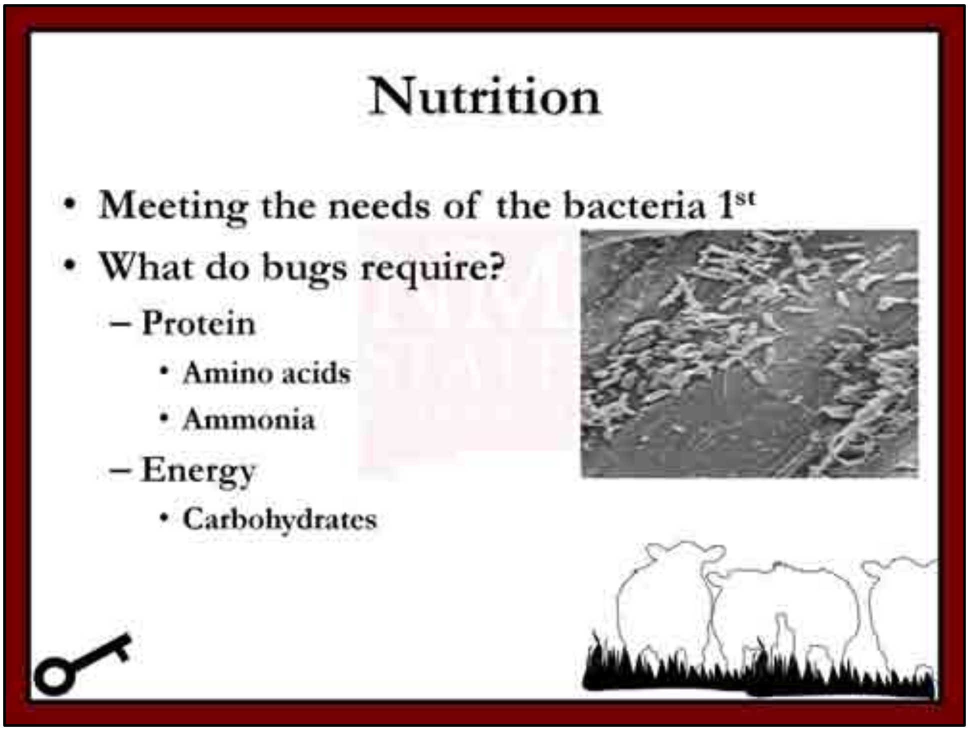
Lets look at mature cows.



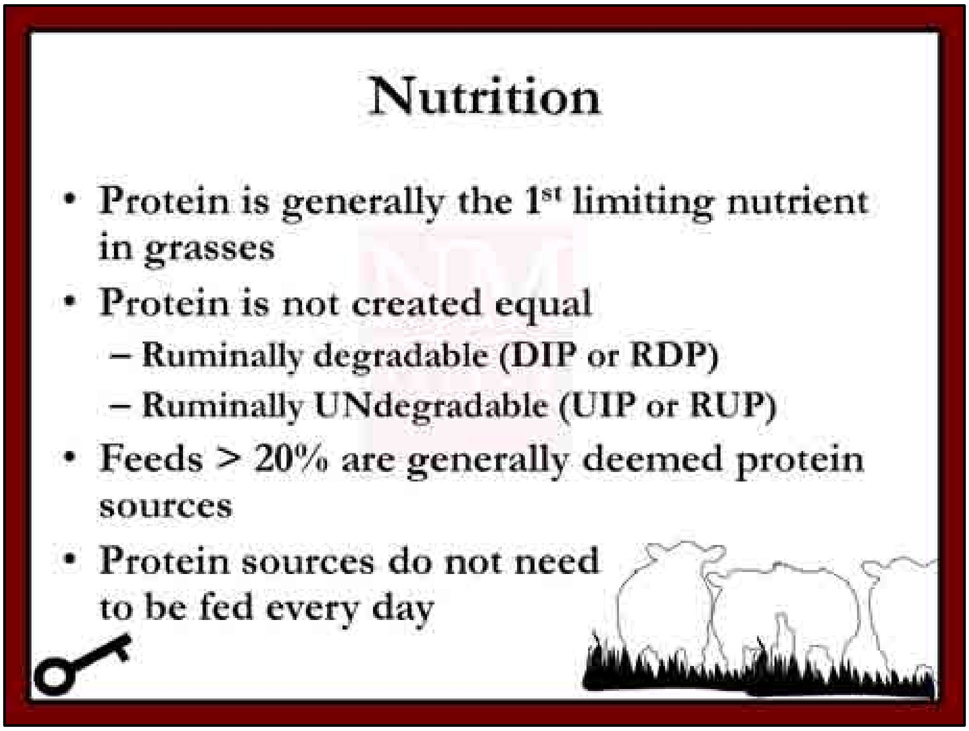
Forage CP looks to do a fair job meeting the requirements of the cattle.



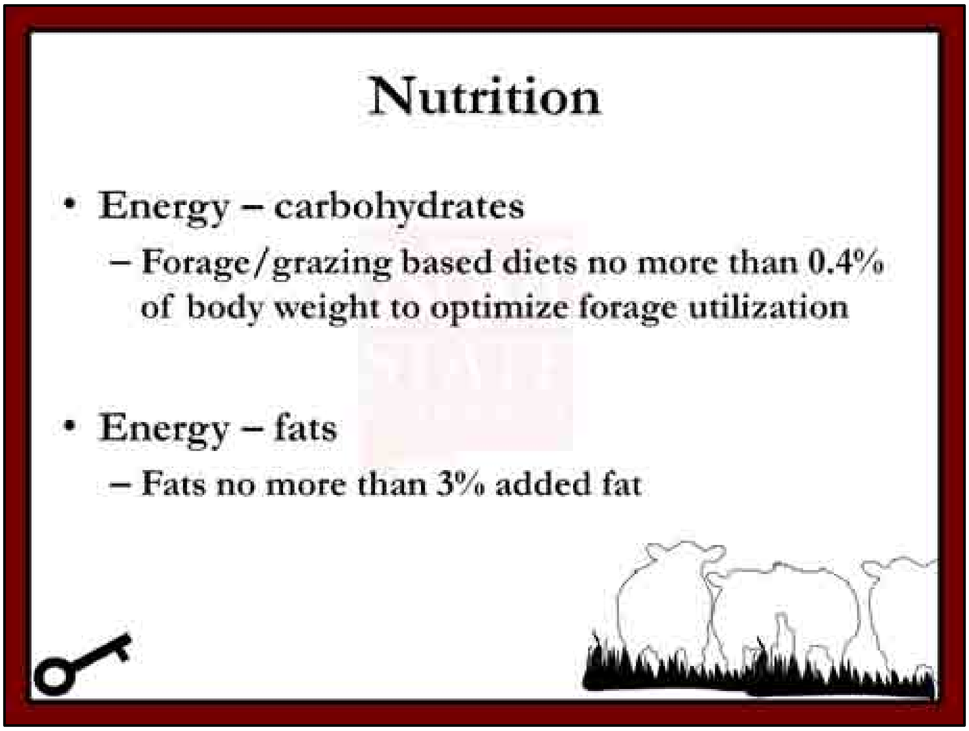
As we saw with the younger cows, energy content of the forage appears to be deficient throughout the year. Especially at the two critical times of breeding and calving.



In grazing animals, it is essential to meet the needs of the ruminal bacteria. Of course we generally take for granted the fact that the bugs are taken care of in most situations. However, there are times when forage quality is so low (> 7% CP) that the bacteria can not effectively ferment what is being consumed. Therefore, supplements are needed to provide essential nutrients like amino acids, ammonia and carbohydrates to the rumen microflora so that they have the appropriate tools to effectively ferment forage.



So, how do we address these issues. I know it seems contradictory based on the previous graphs, but protein is generally the 1st limiting nutrient in grazing cattle. In ruminants, dietary protein is not the same. In other words the site at which the protein is broken down can very for each feedstuff. Anybody who has attended one of these meetings before has heard Dr. Petersen and others speak about the difference between protein that is degraded in the rumen otherwise known as Degradable intake protein (DIP) or Ruminally degradable protein (RDP) and protein that resists fermentation in the rumen (bypass protein), and reaches the abomasum/ small intestine intact which is called undegradable intake protein (UIP) or ruminally undegradable protein (RUP). Feedstuffs greater than 20% crude protein are considered protein sources for livestock otherwise they are considered energy sources. Protein does provide a source of energy.



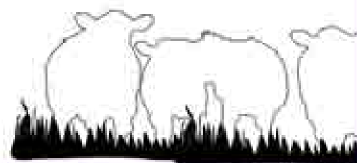
Supplementation of high carbohydrate (high-energy) feedstuffs (cereal grains) should be done with caution. In certain parts of the country, limit feeding cows a high corn diet is often cheaper than purchasing additional hay in drought situations. Feeding cattle at less than 50% of total dietary intake as cereal grains is generally considered safe. For cattle that are grazing forages, it is recommended that cereal grains not be fed at greater than 0.4% of body weight. Feeding above this level may reduce the effective use of forage.

Fats are a good way to increase the energy content of the diet. However, it should be noted that supplements should not provide more than 3% added fat or around 12% total fat in the diet.

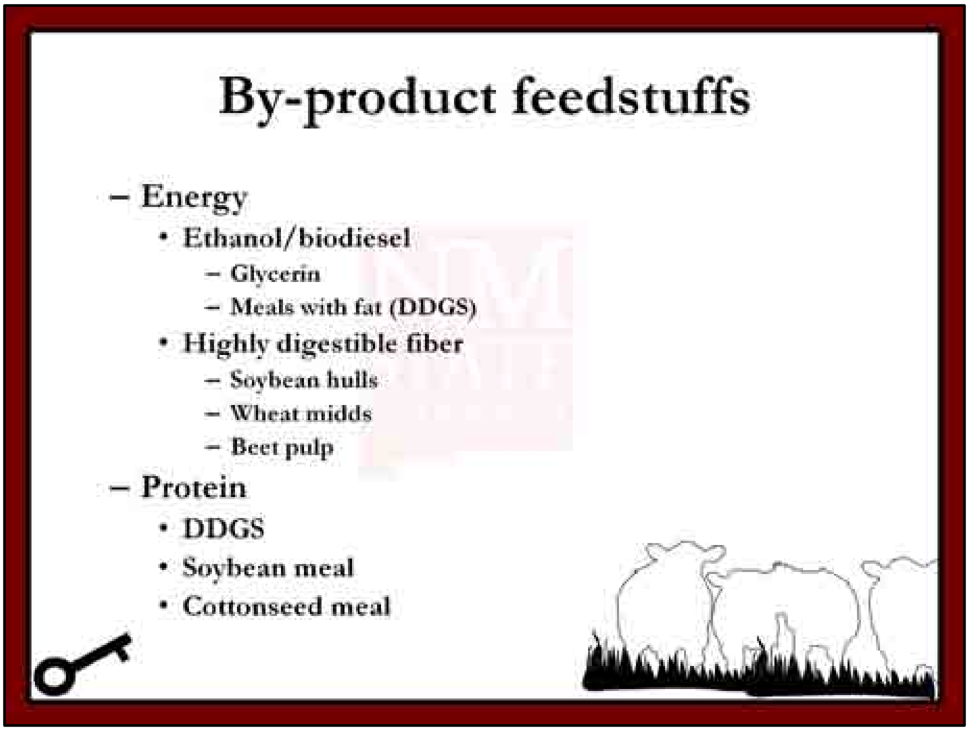
By-products

- Feed by-products are simply the secondary product produced in addition to the principal product
  - Most well known are
    - Soybean meal
    - Cottonseed meal
    - Distillers Dried Grains
    - Fish meal
    - Corn gluten meal
    - Wheat midds

	Dry Matter (%)	Crude Protein (%)	TDN(%)	Ca (%)	P (%)	K (%)	Mg (%)	S (%)	Max Level of Ration (DMB*)	
									Forage-Based	Grain-Based
Corn	90	9.80	88	0.03	0.32	0.44	0.12	0.11	<0.5% BW***	–
Soybean Hulls	90	12.00	80	0.53	0.18	1.29	0.22	0.11	<0.8% BW	30%
Rice Bran	91	14.40	70	0.10	1.73	1.86	0.07	0.20	<0.4% BW	32%
Rice Millfeed	91	9.80	70	0.09	0.60	2.20	0.67	0.30	<0.4% BW	40%
Corn Gluten Feed, dry	90	21.50	80	0.07	0.95	1.40	0.40	0.47	<0.6% BW	50%
Soybean meal	90	49	87	0.29	0.71	2.30	0.33	0.48	<0.75% BW	20%
Wheat Middlings	89	18.40	83	0.15	1.00	1.11	0.40	0.19	50%	
Whole Cottonseed	88	24.40	95	0.17	0.62	1.24	0.39	0.27	0.3-0.5% BW	15-20%
Hominy	90	11.50	91	0.50	0.57	0.65	0.26	0.10	<0.5% BW	Max 5% fat in diet
Brewers Grain, wet	21	26.00	70	0.29	0.70	0.59	0.27	0.34	15-20%	
Brewers Grain, dry	90	29.20	66	0.29	0.70	0.58	0.27	0.40	15-20%	
Distillers Grain, dry	94	23.00	88	0.11	0.43	0.18	0.07	0.40	15 - 30%	
Distillers Grain, wet	40	30.00	90	0.03	1.02	1.50	0.42	0.40	20%	50%
Cottonseed Hulls	90	4.20	42	0.15	0.09	0.89	0.14	0.08	–	10-25%
Cotton Gin Trash	90	7.4	48	0.60	0.12	–	–	–	–	20%



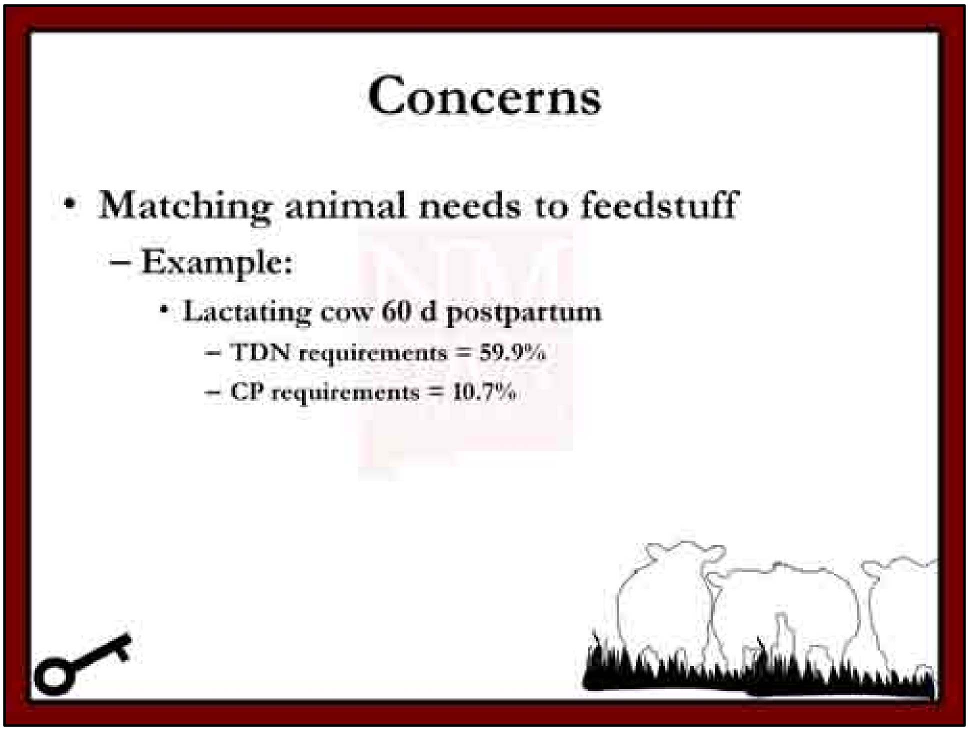
This table shows some of the nutrient analysis of some common by-product feedstuffs. Most important feed information for beef producers developing their own supplement is Crude protein and TDN (energy measure)



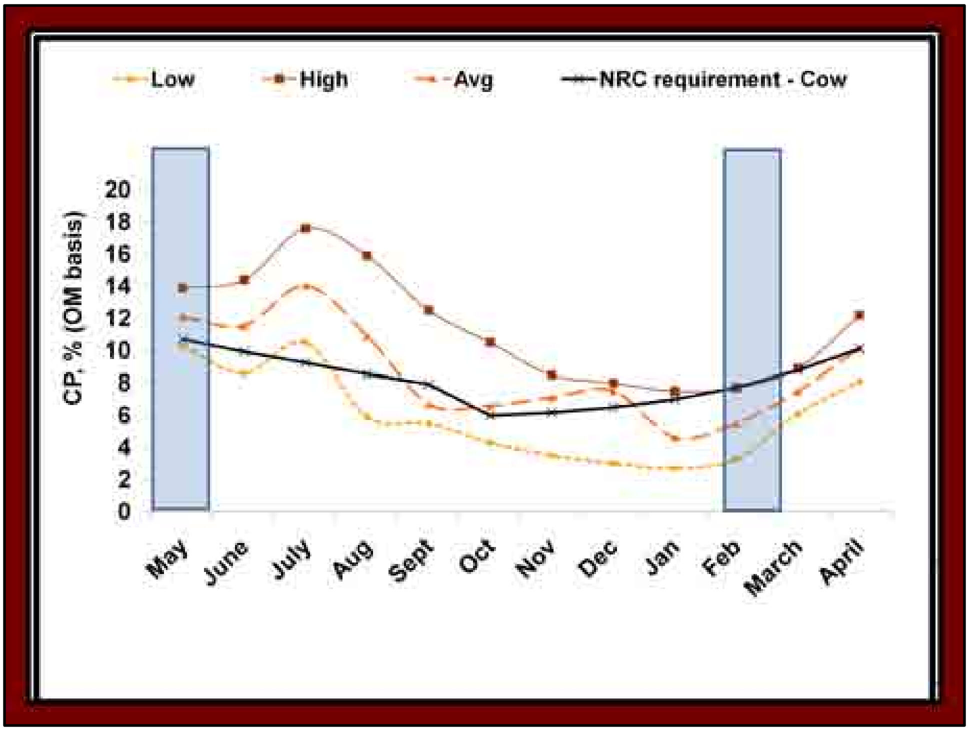
As indicated earlier, certain feedstuffs are better for supplying energy and others protein. Energy supplements can come from biodiesel industry as glycerin or meals with fats added back.

Highly digestible fibers can be fed at much higher levels than cereal grains because they can serve as a source of fiber that is highly digestible.

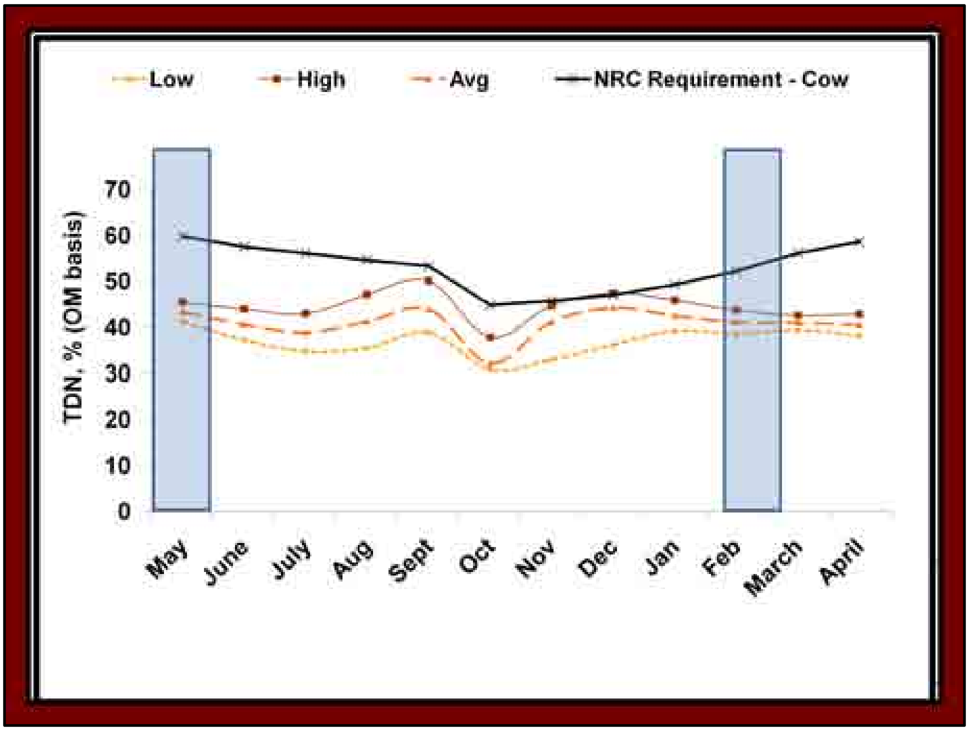
Most often the oilseed meals qualify as protein sources.



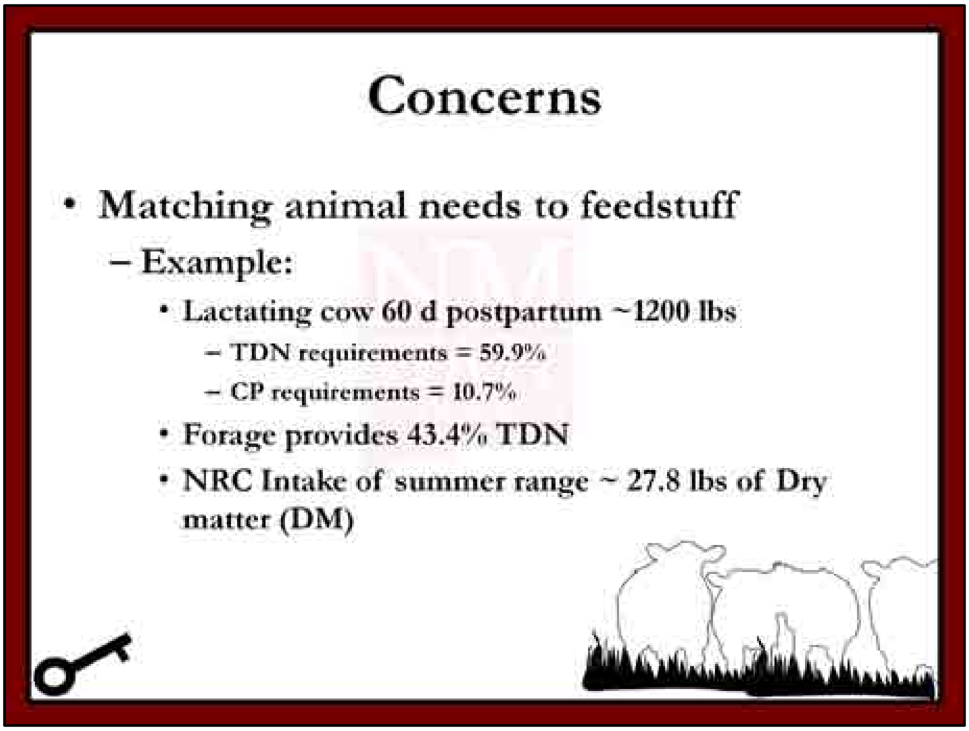
So lets take a 1200 lb cow who is 60 d postpartum. According to the NRC her requirements are 59.9% TDN and 10.7% CP



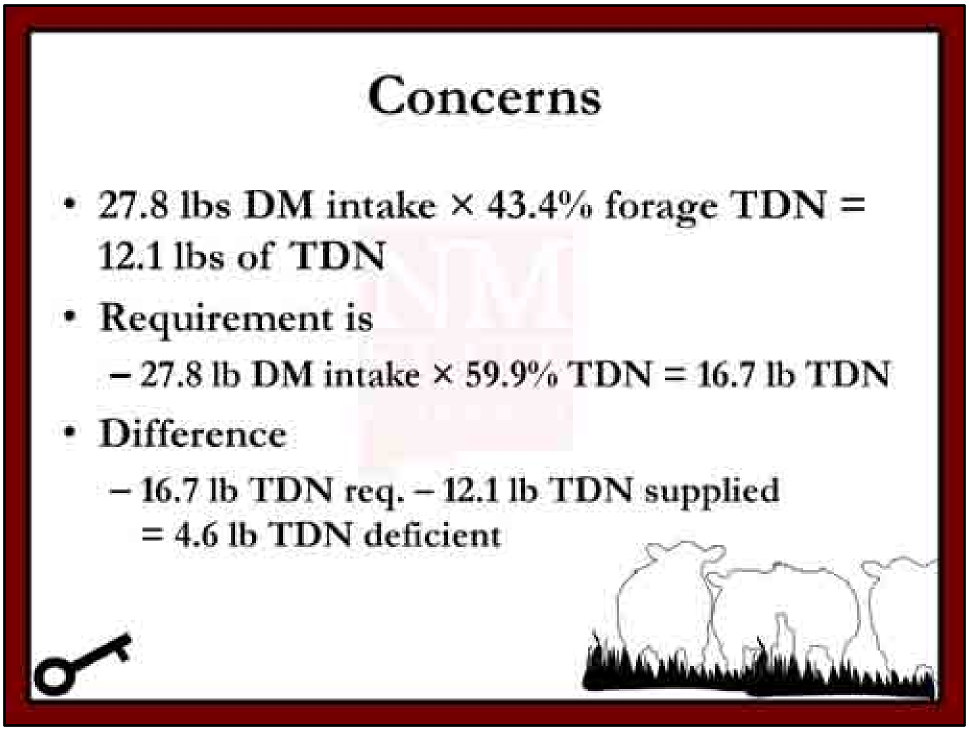
For the Corona cows, this would be around May. You can see the CP in the forage is likely going to be sufficient.



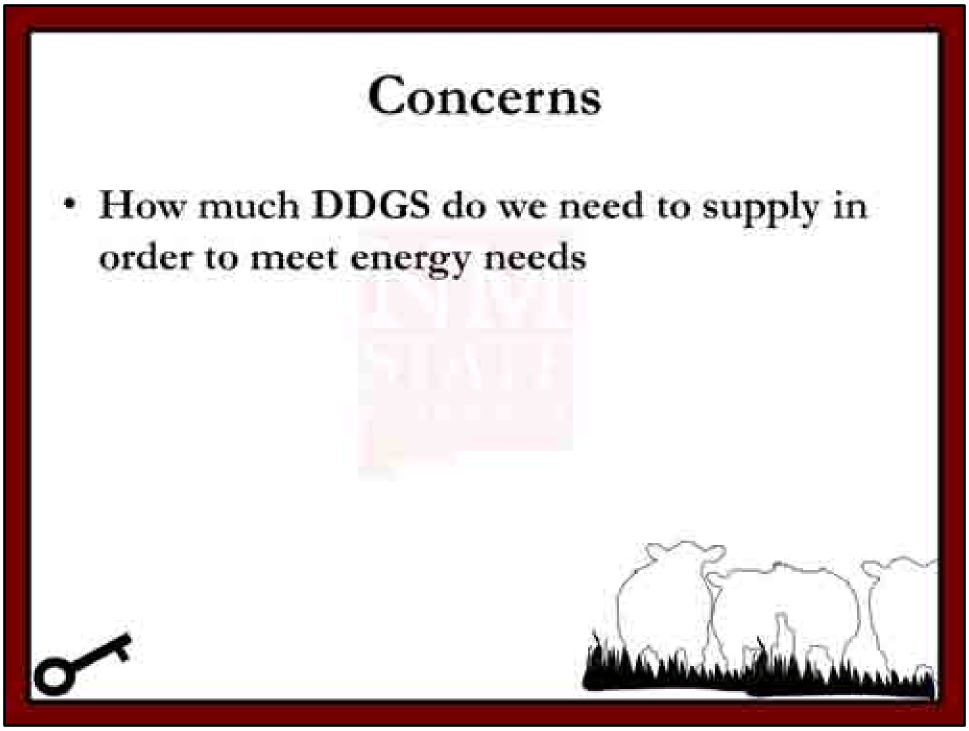
However, energy may be limiting.



Okay, so lets look at what our forage provides. According to 18 yrs of analysis, Corona grasses provide 43.4% TDN. Intake should be around 27.8lbs of Dry matter.



She will consume 12.1 lbs of TDN. The requirement is 16.7 lbs of TDN. Therefore, we need to provide her with 4.6 lbs of TDN.



For illustration purposes, lets look at using Dried Distillers Grains (DDGS).

	Dry Matter (%)	Crude Protein (%)	TDN(%)	Ca (%)	P (%)	K (%)	Mg (%)	S (%)	[illegible]	
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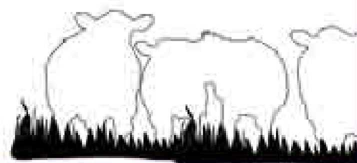
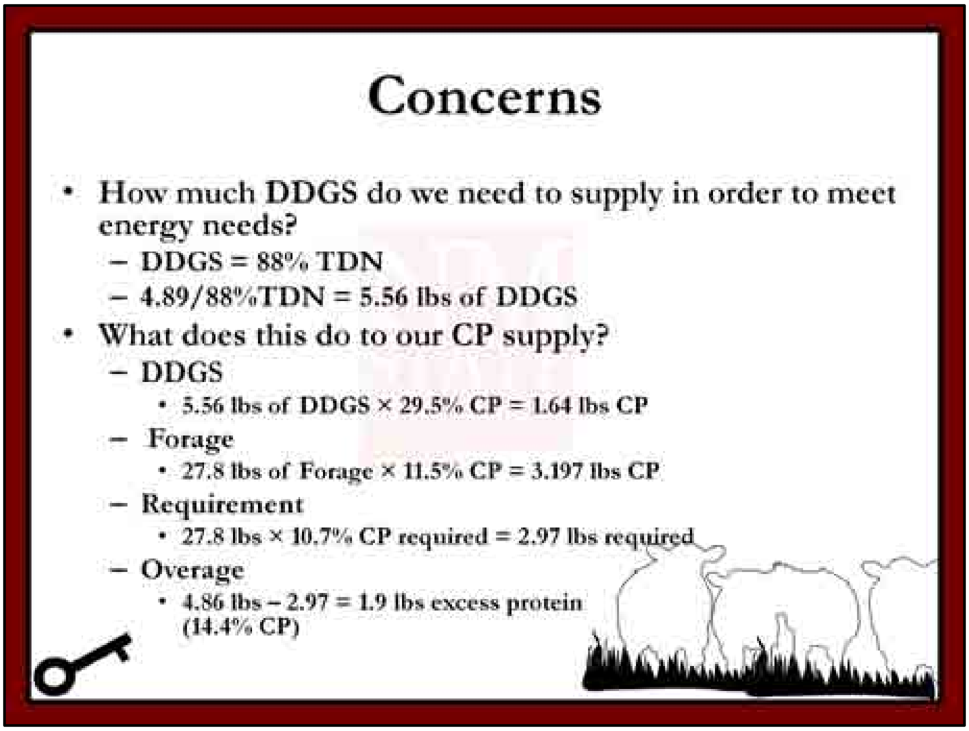
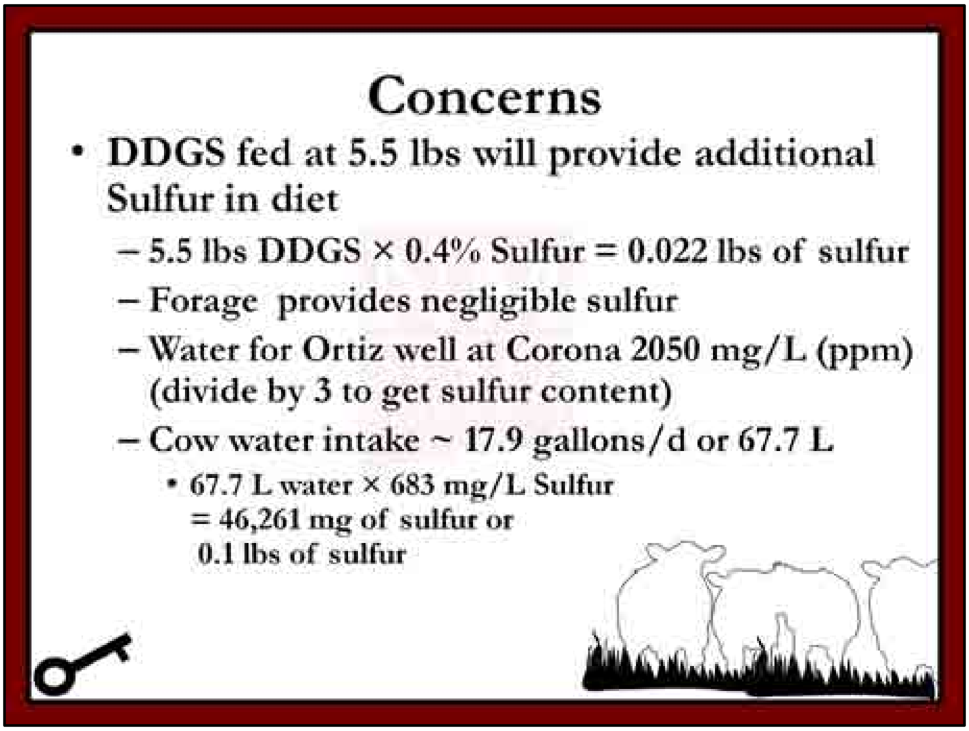


If we go to our table we see that DDGS is high in energy and it is relatively cheap ($170/ton), so lets go with it, even though it is considered a protein source.

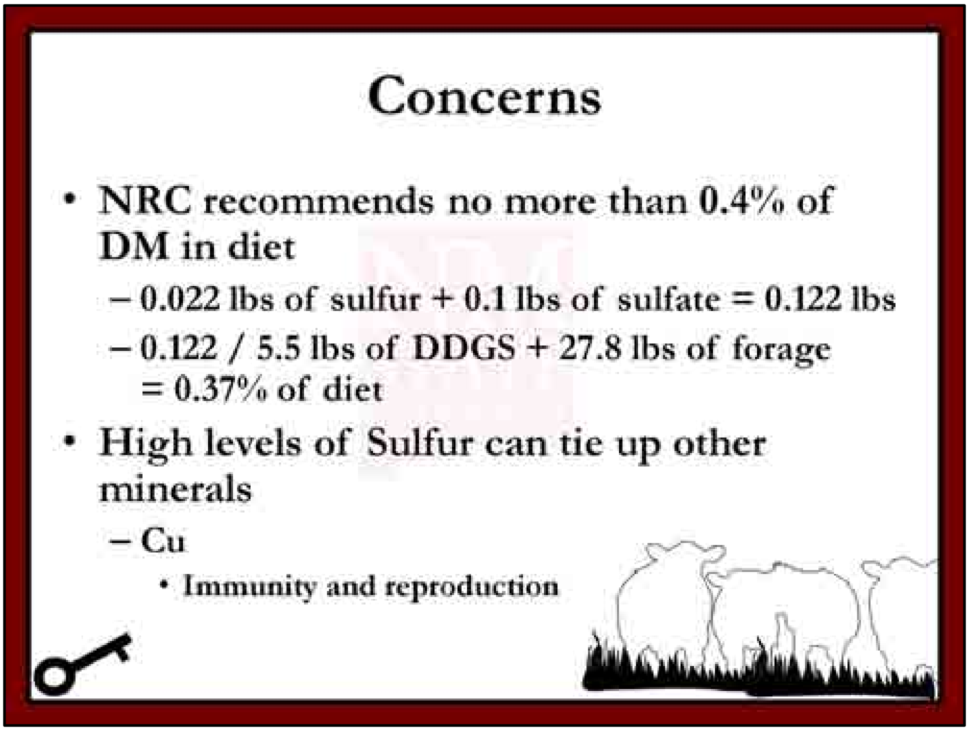


If DDGS is 88% TDN, than we divide what is needed (4.89 lbs of TDN) by the %TDN in DDGS. We will need to feed approximately 5.56 lbs of DDGS to meet the energy deficit. This seems reasonable considering how low the TDN content of forages happen to be. However, most recommendations suggest that producers avoid the temptation to use DDGS as an energy source. Lets see why.

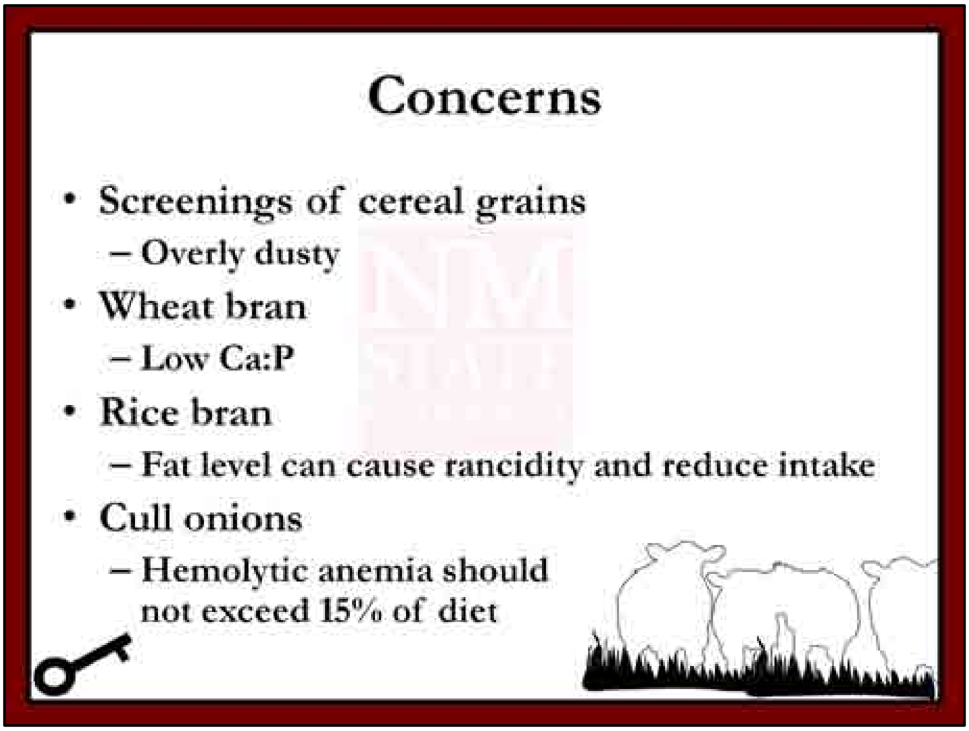
What have we done to the CP % of our diet. By feeding 5.56 lbs of DDGS we have given this cow 1.64 lbs of CP from our DDGS alone. The forage provides 3.2 lbs of CP. The cow's requirement is 2.97 lbs of CP, so we are feeding 1.9 lbs of excess protein. This means the diet is ~ 14.4% CP. Although this is not necessarily bad, this much additional protein will increase the animals energy requirement because it takes energy to metabolize urea.



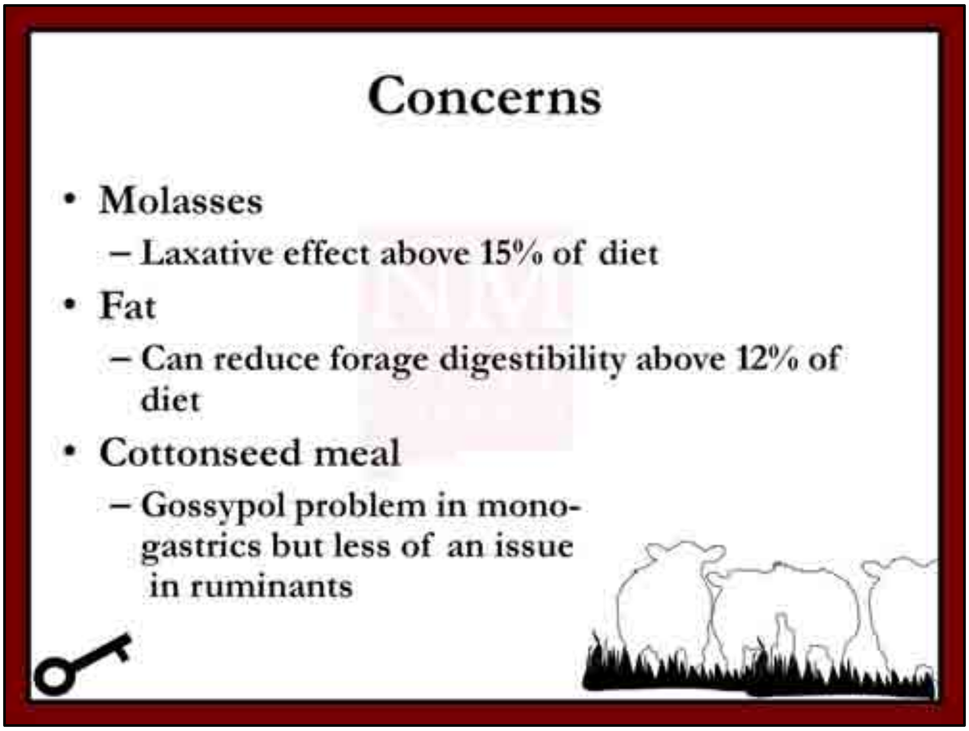
Another point to remember is that by-products can have some negative attributes. With DDGS, it can have a high level of sulfur. This should be a concern when cattle are consuming high sulfate water. Generally speaking, 2000 – 3000 ppm sulfates is considered safe but may reduce performance but should not impact health. 3000 to 5000 ppm sulfate is considered marginal and may reduce performance and affect health. So lets look at what our 5.5 lbs of DDGS will do to sulfur intake. Our DDGS provides the animal with 0.022 lbs of sulfur – not too bad. Keep in mind that the NRC suggests that 0.4% of dietary dry matter is the maximum allowable Sulfur level, above that , health problems may arise. Forages will not contribute a significant amount of sulfur to grazing cattle. If the cattle are drinking from the Ortiz well at the Corona Research ranch, that water will provide 2050 ppm Sulfates, if we divide that number by 3 to put it on a Sulfur basis as our feed we get 683 ppm Sulfur. Mg/L is the same as ppm. A cow at 60 days of lactation will consume around 17.9 gallons of water or 67.7 Liters. Therefore, sulfur intake is 0.1 lbs of sulfur from the water.



Overall, the intake of sulfur will be 0.122 lbs or approximately 0.37% of the diet. This is within the allowable limits, but it would not take too much more to push us over the top. High levels of sulfur can tie up important minerals such as copper. Please don't interpret this discussion as a way to discourage the use of DDGS in livestock diets. On the contrary, DDGS can serve as an excellent supplement but one needs to understand the positive and negative attributes of this feedstuff.



Some other common by-products and causes for concern are:



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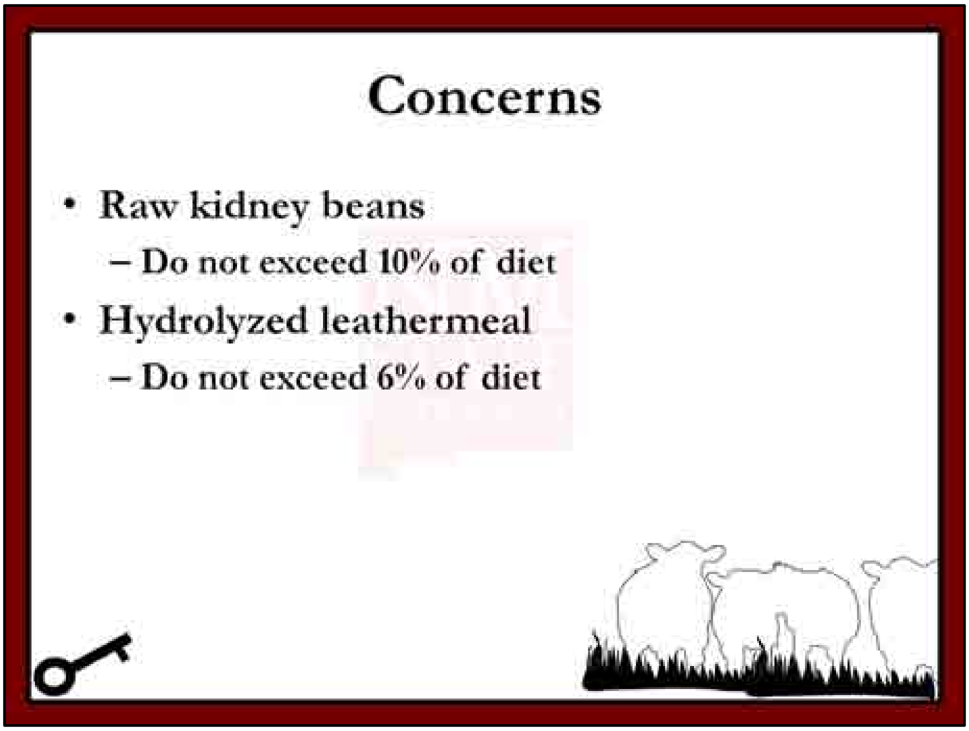

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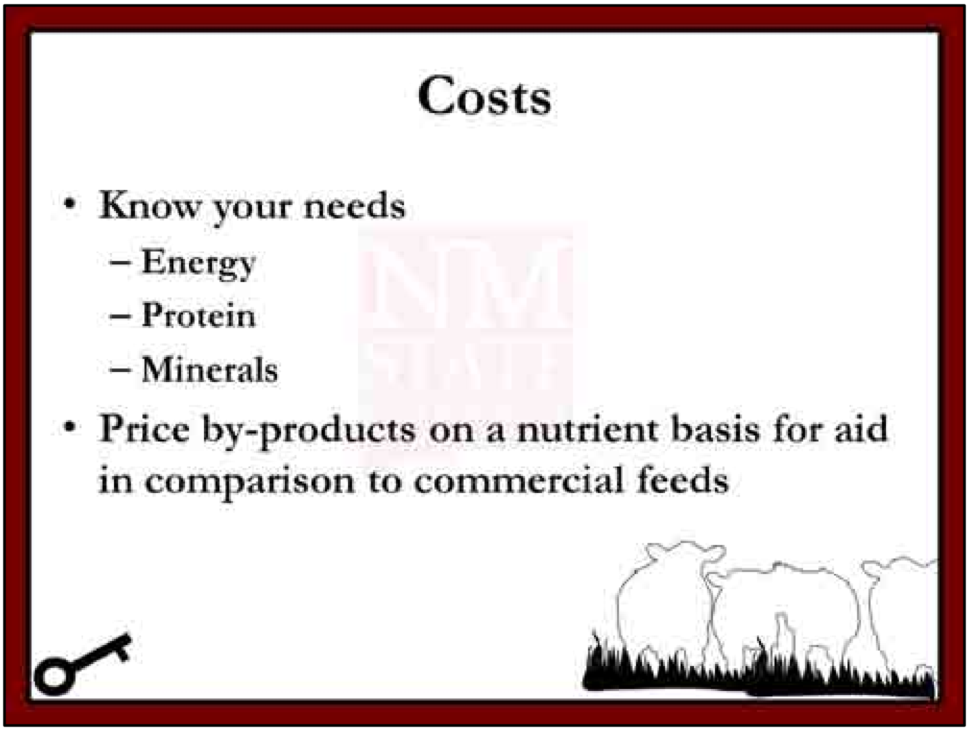
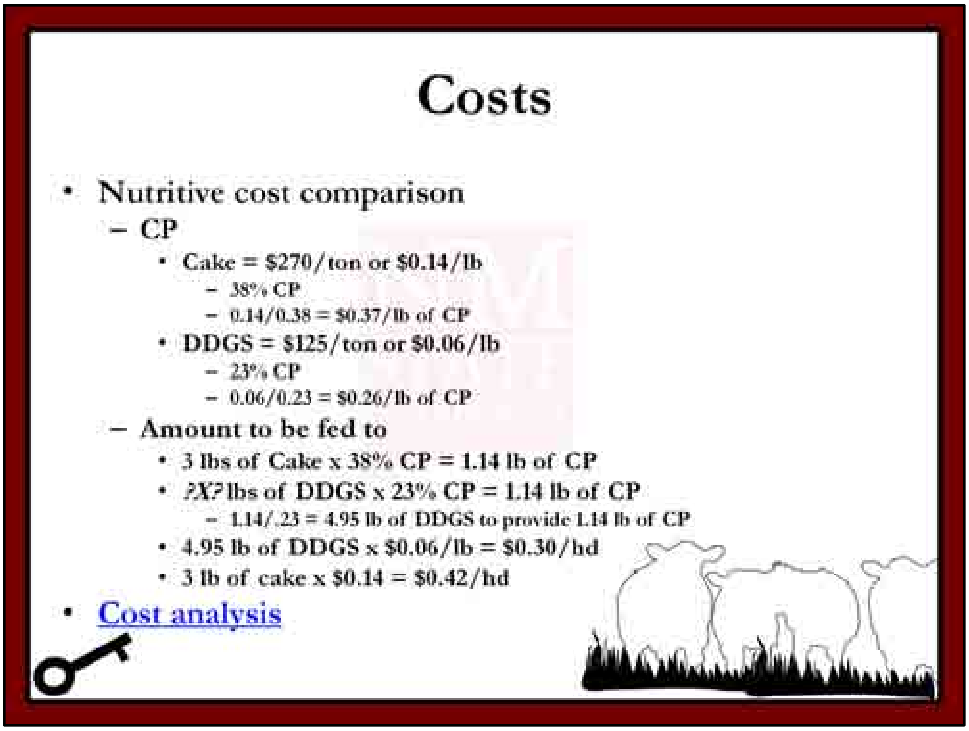


So what is the bottom line? We need to know what we are short, energy, protein or perhaps minerals. What should we pay for these. The most recommended way to price by-products is on a nutrient basis or what does a pound of protein cost from each supplement.



Lets look at some arbitrary prices for common cake and compare that to DDGS since we have used it already. If cake costs $270/ton or $0.14/lb and is 38% CP, the CP in the cake costs $0.37/lb of CP. DDGS at $175/ton is $0.09/lb. At 23% CP, protein costs $0.39/lb of CP. Great, it is cheaper.

But wait! We will have to feed more DDGS than cake due to its lower CP value. In other words, if we feed 3 lbs of cake we are providing the cow with 1.14 lbs of CP. How much DDGS will we have to feed to be equivalent. Divide the amount of CP needed by the % CP in DDGS. We will need to provide the animals with 4.95 lbs of DDGS to provide the same amount of CP as cake. Now look again at the price difference, does it make sense to do so? We can look at the price difference a different way, meaning if DDGS fed at 4.95 lb costs $0.06/lb it will cost $0.30/hd. Cake will be $0.42/hd. So it make sense to feed DDGS. However, DDGS is often in loose form and may be difficult to feed on the ground due to waste or may require feed bunks. (When feeding loose supplements on the ground – I usually figure a 20% loss, including this brings the daily price up to $0.35/hd).

I have put together a spreadsheet to help figure out cost comparisons on other feedstuffs. So lets look at some other feedstuffs.

Conclusions

- Know your needs
- Consider convenience
  - What is the cost of your time
- Specialized equipment
- Forage analysis
- Water analysis if using unique by-products
- Know feeding limitations
- Consult extension expertise
- NMSU Circular

http://aces.nmsu.edu/pubs/_circulars/CR-612.pdf

Feel free to contact me anytime.