WRINKLE
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DakotaGold
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Dakota Gold Benefits for Cold-Stressed Beef Cows

We have all seen the powerful images of beef cattle encrusted with a layer of snow during a blizzard. These pictures have probably made us envious of the cows' ability to withstand the environmental conditions. However, how do these types of conditions affect the energy requirements?

In reality, we need to consider several factors to determine the exact response, but we can use equations published in the Beef NRC to at least estimate response and calculate the amount of additional supplement required.

LOWER CRITICAL TEMPERATURE

All animals have a thermo-neutral zone for temperature (not too hot or not too cold). The Lower Critical Temperature (LCT) represents the temperature at which cattle start to experience stress. For example, if a cow has an LCT of 40° F, then when temperatures drop below this threshold, we will need to increase supplementation.

What factors into LCT? Several things have an impact, but hair coat and body condition probably have the biggest factor. Fleshy cows with more condition can typically tolerate the colder temperatures better than a thin cow. Similarly, cows in dry conditions have a better tolerance to cold temperatures than cows in wet or muddy conditions. The following table shows this relationship based on type of hair coat (heavy winter, winter, fall, or summer) and environmental condition (dry or wet).

Lower Critical Temperature (°F) for Beef Cows - Coat Condition and Thickness

	Dry Coat Condition			Wet or Muddy Coat Condition		
	Thin	**Average**	**Fleshy**	**Thin**	**Average**	**Fleshy**
Heavy Winter	27	19	11	61	53	45
Winter	40	32	24	63	55	47
Fall	53	45	37	66	58	50
Summer	67	59	51	69	61	53

Table 1.

WINDCHILL AND COLD STRESS

In order to determine the response to cold stress, we need to calculate the windchill based on temperature and wind speed.

Windchill Index for Cattle with Winter Coats (°F)
Temperature (°F)

Wind Speed	**-10**	**-5**	**0**	**5**	**10**	**15**	**20**	**25**
0	-10	-5	0	5	10	15	20	25
10	-28	-22	-16	-10	-4	3	9	15
15	-32	-26	-19	-13	-7	0	6	13
20	-35	-29	-22	-15	-9	-2	4	11
30	-39	-33	-26	-19	-12	-5	1	8
40	-43	-36	-29	-22	-15	-8	-1	6

Table 2.

*These results are not a guarantee of nutritional value, as laboratory results are influenced by factors beyond the control of POET Nutrition.

WINDCHILL AND COLD STRESS (CONT.)

Now that we know the LCT and the windchill, we can calculate the impact on cold stress by using the following equation:

Cold Stress = Lower Critical Temperature - Wind Chill Index

We can then use this value to determine the increase in energy requirements by applying the thumb rule that for **each degree of magnitude of cold stress, we need increase energy requirements by 1%.**

For example, let's assume we have a cow in average body condition with a dry coat. According to our first table, that cow would have a LCT of 19° F. Now, let's assume we have a temperature of 10° F with a wind speed of 15 mph. This gives us a windchill index of -7° F. This gives us a cold stress of 26(19- (-7)) or in other words, this increases energy requirement by 26%.

ADDITIONAL DAKOTA GOLD REQUIRED

The amount of additional supplementation depends on the requirements of the cow. However, let's assume a cow requires around 12 Mcal of TDN per day. Going through the calculations, we know that she now requires 15.12 Mcal of TDN (26% increase) or an additional 3.12 Mcal. Dakota Gold contains around 90% TDN, so we would have to supply 3.46 pounds of Dakota Gold to meet the additional energy requirements brought on by the cold stress. The following table shows the relationship for additional Dakota Gold required depending on the wind speed and temperature.

Additional Dakota Gold Required (pounds/hd/day)
Temperature (°F)

Wind Speed	**-10**	**-5**	**0**	**5**	**10**	**15**	**20**	**25**
0	3.93	3.25	2.58	1.90	1.22	0.54	--	--
10	6.42	5.58	4.74	3.89	3.05	2.21	1.37	0.52
15	6.95	6.08	5.21	4.33	3.46	2.59	1.72	0.85
20	7.34	6.45	5.56	4.67	3.77	2.88	1.99	1.10
30	7.93	7.00	6.08	5.16	4.24	3.31	2.39	1.47
40	8.37	7.42	6.48	5.53	4.58	3.64	2.69	1.74

Table 3.

CONCLUSION

Many different variables affect the animals' response to cold stress. However, this simple calculation using only temperature and wind chill highlight the potential deficiency in nutrients that cold stress can cause. As Table 1. clearly shows, cows in good body condition and a dry environment can tolerate cold stress the best. If cattle get wet or muddy, the ability to withstand colder temperatures drops very quickly and we need to provide greater supplements in order to maintain performance.

We can also use these tables and equations to determine more subtle temperature differences. For example, in Table 3., if we dropped in temperature from 15 to 10° F and had similar wind speed of 15 mph, we would increase the Dakota Gold supplementation by approximately 0.90 lb/hd/day. This type of consideration can prevent poor performance as weather conditions change.