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# LAND & LIVESTOCK

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## Low Cost Cow/Calf Program: The School – Part VII

In this issue of Dr. Dick Diven's (Agri-Concepts, Inc.) information we will go through the same production year scenarios we went through in Part VI (Jan 2011) where we looked at the Net Energy maintenance (NEm) needs of the cow and now determine how much protein she will obtain from rangeland forage. We'll also determine how much of a 30% protein supplement will need to be provided to satisfy her rumen microbe needs when degradable intake protein (DIP) is insufficient. We'll then determine how much hay needs to be fed when the herd is held in small pastures close to ranch headquarters for calving and adjust the protein supplement amount accordingly.

**THE COW HERD**

The cows have an average shrunk body weight (SBW) of 1200 pounds when in body condition score (BCS) 5.0 (1 = emaciated; 9 = obese). Thus their empty body weight (EBW) is 1021 pounds (1200 lb * 0.851). Calving season is 60 days; average calf birth weight 100 pounds; peak milk production at week 9 is 17.5 lb/day; calves weaned at eight months.

Production Year

In Part VI (Jan 2011) we looked at the monthly NEm needs of a cow calving the first of Feb, Mar, Apr, May, or Jun and her resultant weight and BCS at the beginning of the breeding period and a year later at calving. We also looked at what affect providing a protein supplement when needed had on her weight and BCS as it allowed her to consume more of the low quality range forage and thus more Mcal NEm. We'll now determine how much of the protein supplement needs to be provided when range forage DIP is lacking.

First we need to determine how much DIP the cow would potentially consume from the range forage. We do this by multiplying the

pounds of dry matter forage consumed by the cow by the %DIP of the forage. In Table 1 the pounds of range forage the cow would potentially consume if DIP was sufficient is listed and in Table 2 percent crude protein of the forage and the amounts of it that are degradable and undegradable are listed for each month of the year. The amount of DIP/lb of range forage is determined by multiplying %CP/100 * %DIP/100. For Feb this would be (5.5/100) * (65/100) = 0.036 lb. Thus the amount of DIP the cow would potentially consume would be 26.4 * 0.036 = 0.95 lb. This is a simpler way to determine DIP consumption than calculating lb DIP/Mcal NEm and multiplying by Mcal NEm consumed. For this exercise I am going to figure that the degradable portion of crude protein for May – Oct range forage is 72% and for Nov – Apr range forage as 65%. Dr. Diven uses 72% regardless of the crude protein content of the forage but the Feed Library (NRC 1996) has winter range forage at 63%. In previous discussions I have used higher and lower values coinciding with the monthly crude protein contents but without laboratory analysis for DIP it is a guess as to what the actual values are and I was probably too high on some and too low on others. My reason for not using the 72% value throughout the year is that I fear the amount of protein supplement needed during the months forage protein content is low would be insufficient.

**Table 1: Range forage dry matter intake (DMI), net energy maintenance (NEm) and degradable intake protein (DIP) consumed, and amount of DIP required by a 1200 lb shrunk body weight cow calving in Feb, calf weaned in Oct, and amount of a 30% protein supplement needed when DIP balance is negative.**

| Mon | DMI (lb/day) | Mcal NEm Consumed[2] | Lb DIP | | DIP Balance[5] | 30% Protein (As is) | |
|---|---|---|---|---|---|---|---|
| | | | Consumed[3] | Required[4] | | Lb/day | Lb/month |
| Feb | 26.4 | 12.7 | 0.94 | 1.27 | -0.33 | 3.3 | 92 |
| Mar | 26.4 | 12.1 | 0.86 | 1.21 | -0.35 | 3.6 | 112 |
| Apr | 26.4 | 13.2 | 1.12 | 1.32 | -0.20 | 2.1 | 63 |
| *May*[1] | 32.4 | 23.7 | 3.85 | 2.37 | 1.48 | | |
| Jun | 32.4 | 21.1 | 2.68 | 2.11 | 0.58 | | |
| Jul | 32.4 | 21.1 | 2.57 | 2.11 | 0.46 | | |
| Aug | 27.6 | 17.7 | 2.09 | 1.77 | 0.32 | | |
| Sep | 27.6 | 17.4 | 1.99 | 1.74 | 0.25 | | |
| Oct | 24.0 | 13.9 | 1.81 | 1.39 | 0.42 | | |
| Nov | 21.6 | 11.7 | 0.98 | 1.17 | -0.19 | 1.9 | 57 |
| Dec | 21.6 | 11.2 | 0.91 | 1.12 | -0.21 | 2.1 | 65 |
| Jan | 21.6 | 10.8 | 0.84 | 1.08 | -0.24 | 2.4 | 74 |

[1]*Beginning of breeding period (approximately 83 days after calving)*

[2]Monthly amounts from Table 9 in Part VI (Jan 2011) divided by number of days in the month

[3]Lb DIP consumed: lb DMI * (%Crude protein in diet/100 * %DIP of CP)

Ex. Feb: 26.4 * (5.5/100 * 65/100) = 26.4 * .03575 = 0.94 lb

[4]Lb DIP required: Mcal NEm consumed from range forage * 0.10; Ex. Feb: 12.7 * 0.10 = 1.27 lb

[5]DIP balance: Lb DIP consumed – lb required

**Table 2: Crude protein (CP), degradable intake protein (DIP), and undegradable intake protein (UIP) aka escape or bypass protein in the rangeland forage.**

| Month | %CP in diet[1] | %DIP of CP | DIP (lb/lb DM)[2] | UIP (lb/lb DM)[3] |
|---|---|---|---|---|
| Jan | 6.0 | 65 | 0.039 | 0.021 |
| Feb | 5.5 | 65 | 0.036 | 0.019 |
| Mar | 5.0 | 65 | 0.033 | 0.018 |
| Apr | 6.5 | 65 | 0.042 | 0.023 |
| May | 16.5 | 72 | 0.119 | 0.046 |
| Jun | 11.5 | 72 | 0.083 | 0.032 |
| Jul | 11.0 | 72 | 0.079 | 0.031 |
| Aug | 10.5 | 72 | 0.076 | 0.029 |
| Sep | 10.0 | 72 | 0.072 | 0.028 |
| Oct | 10.5 | 72 | 0.076 | 0.029 |
| Nov | 7.0 | 65 | 0.046 | 0.025 |
| Dec | 6.5 | 65 | 0.042 | 0.023 |

[1]%CP in diet generally averages 1% to 2% higher than laboratory analysis, thus 1.5% was added.
[2]DIP lb/lb dry matter forage: %CP in diet/100 * %DIP of CP/100. Ex. Jan: 6.0/100 * 65/100 = 0.039
[3]UIP lb/lb dry matter forage: %CP in diet/100 -%DIP of CP/100. Ex. Jan: 6.0/100 - 65/100 = 0.021

Now we'll determine how much DIP the cow needs to meet rumen microbe needs based on the amount of NEm the cow consumed from the forage. To do this we multiply Mcal NEm consumed by 0.1. See Part VI (Jan 2011) as to how NEm amounts were determined. In Part III (May 2010) it was stated that to determine the amount of DIP needed by the rumen microbes the Mcal NEm consumed should be multiplied by 0.13 instead of 0.10 which Dr. Diven used. However, both values are correct depending on the concentration of NEm in the forage. In 'Feeding the beef cow herd for maximum profit' Dr. Simms provides a table that lists the amounts of DIP needed by the rumen microbes dependent upon the NEm content of the forage. For forages that contain 0.62 Mcal or more of NEm per pound of dry matter the microbes need 0.13 lb of DIP/Mcal NEm, whereas for forages with lower Mcal NEm contents the microbes require less. For example, barley and wheat straw that contain no more than 0.44 Mcal NEm/lb of dry matter the amount of DIP needed by the rumen microbes is no more than 0.09 lb/Mcal. For the most part winter range forage will contain more Mcal NEm compared to these straws so 0.10 lb DIP/Mcal NEm should be sufficient. Although it may be more correct to multiply the Mcal NEm content of green, growing grass by 0.13 it really is not necessary and changes little compared to using the 0.10 value. However, it is probably a good idea to use the 0.13 value with regard to high quality supplements which we'll talk about next.

Table 1 shows how much DIP the cow would consume from the range forage, how much her rumen microbes need based on the amount of NEm consumed and thus if there is enough DIP. We find that for Feb the amount of DIP is insufficient by 0.33 lb. So how much of the 30% protein supplement, do we need to provide the cow to make up this deficiency? Unfortunately to determine the amount needed we cannot simply divide the shortfall by 30% as that would be too easy. If the protein in the supplement was 100% degradable and it did not contain any NEm than we could do the above. However, that is

not the case and we need to determine how much DIP the supplement contains and how much of it will be needed by the rumen bugs to utilize the NEm in the supplement. The amount of DIP left over, if there is any, would then be available to meet the shortfall in the range forage. Regrettably protein supplement feed tags do not list how much of the protein is degradable.

However, if part of it is from non-protein nitrogen sources that amount is indicated and gives you an idea as to the minimum level of DIP. Feed tags also do not list the Mcal of NEm or %TDN the supplement contains. Fortunately the Feed Library (NRC 1996) provides this information for many common supplements such as cottonseed meal, wheat middling, brewers and distillers grain, soybean meal, etc. that can be used as a guideline. The 30% protein supplement we are going to use is 72% degradable with a NEm content of 0.90 Mcal/lb on an as is basis (11% moisture). On a dry matter basis the protein and NEm contents are 33.7% (30%/0.89) and 1.01 Mcal/lb (0.90/0.89).

*Note: Most protein supplements are high in NEm, thus can be considered a protein and energy supplement but some are relatively low in DIP. For example; distiller's grain may contain 30% protein but only 26% of it is degradable and its NEm content is about 1.0 Mcal/lb (dry matter basis). Thus the amount of DIP per pound of supplement is about 0.08 lb but the rumen microbes will need 0.13 lb per Mcal to fully utilize the available NEm. As a result this protein supplement would not address the DIP shortage in the range forage and thus the cow would probably not be able to increase her consumption of it. However, if this is not an issue, just meeting the cow's protein needs is than this supplement might be satisfactory but will depend on its price.*

Back to our example: The amount of DIP in the supplement we are going to use is 0.243 lb (33.7% * 72%) per pound of supplement and the amount of DIP needed by the rumen microbes to fully utilize the Mcal of NEm in the supplement would be 0.131 lb (1.01 Mcal * 0.13) leaving 0.112 lb of DIP to address the shortfall in the range forage. The DIP shortfall in Feb was 0.33 lb/day so the amount of the protein supplement needed to address this would be 2.95 lb (0.33 ÷ 0.112) on a dry matter basis or 3.3 lb as is (2.95/0.89) (Table 1). The amount of the supplement for the month would then be 92 lb per cow (3.3 lb * 28 days). Doing the same for Mar, Apr, Nov, Dec and Jan we come up with the amounts in shown in Table 1 for an annual total of about 465 pounds per cow.

Now that we have satisfied the rumen microbe DIP requirements we need to determine if the cow's protein needs have been met. Remember the cow requires a certain amount of protein for maintenance (M), gestation (G), and lactation (L). To determine her protein requirement for M we multiply her Mcal NEm (M) need by 0.07895; for G, Mcal NEm (G) by 009615; and for L, Mcal NEm (L) by 0.2362 and then sum them. However, in order to do this we need to determine how the extra energy the cow receives from the protein supplement affects her weight as this influences how many Mcal of NEm she will require for M.

Table 3 shows the effect of the additional NEm from the protein supplement the cow obtained on her EBW and resultant BCS through the production year (beginning in Feb with calving). Total Mcal of NEm the cow consumed included that from the range forage (Table 1, Column 3). The cow lost about 160 lb between calving and the beginning of the breeding period (May) and was at a BCS of 4.8 at this time which is probably acceptable, especially with her gaining weight and putting

on condition. She gained weight through the summer and early fall then gradually lost weight but was at a BCS of 5.8 at time of calving the next year. Thus, the provision of an energy supplement would not be needed as the protein supplement had a sufficient amount.

Table 4 shows the amount of protein the cow would need for the above production year and the amount she would obtain from the range forage and the 30% protein supplement. Her protein needs were exceeded each month, thus no additional protein would need to be provided and the amounts beyond her needs were not necessarily excessive during the months the protein supplement was provided.

**Table 3: Net energy maintenance (NEm) consumed and required by a 1200 lb shrunk body weight cow in body condition score (BCS) 5.5 at calving in Feb, calf weaned in Oct and resultant changes in her empty body weight (EBW) and BCS through the production year.**

| | NEm Mcal/day Consumed[2] | | NEm Mcal/day Required[3] | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Mon | 30% Protein | Total | NEm (M) | Cold | Activity | Sum | NEm Balance[4] | EBW (lb)[5] | BCS[6] | Mcal $NE_{\Delta}$[7] |
| Feb | 2.9 | 15.6 | 7.9 | 0.3 | 4.0 | 15.3 | 0.3 | 1065 | 5.5 | 226 |
| Mar | 3.2 | 15.4 | 8.0 | | 4.0 | 17.6 | -2.2 | 1068 | 5.5 | 226 |
| Apr | 1.9 | 15.1 | 7.8 | | 3.9 | 17.4 | -2.3 | 1034 | 5.2 | 226 |
| *May*[1] | | 23.7 | 7.6 | | 3.8 | 16.2 | 7.4 | 999 | 4.8 | 196 |
| Jun | | 21.1 | 8.2 | | 4.1 | 16.0 | 5.1 | 1105 | 5.9 | 226 |
| Jul | | 21.1 | 8.5 | | 4.2 | 15.5 | 5.6 | 1166 | 6.6 | 264 |
| Aug | | 17.7 | 8.8 | | 4.4 | 15.2 | 2.5 | 1224 | 7.3 | 311 |
| Sep | | 17.4 | 8.9 | | 4.5 | 15.5 | 1.9 | 1247 | 7.5 | 311 |
| Oct | | 13.9 | 9.0 | 0.8 | 4.5 | 15.6 | -1.7 | 1263 | 7.7 | 311 |
| Nov | 1.7 | 13.3 | 8.8 | 0.9 | 4.4 | 16.3 | -2.9 | 1245 | 7.5 | 311 |
| Dec | 1.9 | 13.1 | 8.7 | 0.6 | 4.3 | 17.1 | -3.9 | 1212 | 7.1 | 311 |
| Jan | 2.2 | 13.0 | 8.4 | 0.6 | 4.2 | 18.5 | -5.6 | 1166 | 6.6 | 264 |
| Feb | | | | | | | | **1092** | **5.8** | |

[1]*Beginning of breeding period (approximately 83 days after calving)*

[2]NEm consumed: 30% protein supplement amount from Table 1 lb/day * 0.9 Mcal/lb
Total = 30% protein amount + amount from range forage (Table 1)

[3]NEm required: NEm (M) = $EBW^{0.75}$ * 0.04256; Cold = from Appendix Table 5, Part V (Sep 2010); Activity = NEm (M) * 0.50; Sum = these three values + NEm (G) from Appendix Table 3, Part V (Sep 2010) + NEm (L) from Appendix Table 5, Part V (Sep 2010)

[4]NEm balance: Mcal consumed – Mcal required (Sum)

[5]EBW: Previous month's EBW + ((days in previous month ÷ (Mcal $NE_{\Delta}$ ÷ NEm balance)) * 90 lb)
Ex. Mar: 1065 + ((28 ÷ (226 ÷ 0.3)) * 90); 1065 + ((28 ÷ 753) * 90); 1065 + (0.037 * 90); 1065 + 3 = 1068 (Note: If balance is negative multiply Mcal $NE_{\Delta}$ by 0.8 then divide by balance)

[6]BCS: Previous month's BCS + ((New EBW – Previous EBW) ÷ 90 lb)
Ex. Mar: 5.5 + ((1068 – 1065) ÷ 90); 5.5 + (3 ÷ 90); 5.5 + 0.03 = 5.53

[7]From Appendix Table 4, Part VI (Jan 2011): When daily balance is negative it takes 1 Mcal of body fat to replace 0.8 Mcal of diet NEm; when positive it is a 1:1 relationship.

**Table 4: Protein required for maintenance (M), gestation (G), and lactation (L) by a 1200 lb shrunk body weight cow in BCS 5.5 at calving in Feb, calf birth weight 100 lb, peak milk 17.5 lb/day, calf weaned in Oct and pounds protein available in forage and supplement.**

| | Protein Required (lb/day) | | | | Crude Protein (lb) | | Total | |
|---|---|---|---|---|---|---|---|---|
| Month | M[2] | G[3] | L[4] | Total | Range Forage[5] | 30% Protein[6] | Net[7] | Balance[8] |
| Feb | 0.63 | | 0.73 | 1.36 | 1.45 | 0.99 | 2.44 | 1.08 |
| Mar | 0.63 | | 1.35 | 1.97 | 1.32 | 1.08 | 2.40 | 0.43 |
| Apr | 0.61 | | 1.36 | 1.97 | 1.72 | 0.63 | 2.35 | 0.38 |
| *May*[1] | 0.60 | | 1.15 | 1.75 | 5.35 | | 5.35 | 3.60 |
| Jun | 0.64 | | 0.89 | 1.53 | 3.73 | | 3.73 | 2.20 |
| Jul | 0.66 | | 0.65 | 1.32 | 3.56 | | 3.56 | 2.24 |
| Aug | 0.69 | | 0.46 | 1.15 | 2.90 | | 2.90 | 1.75 |
| Sep | 0.70 | 0.07 | 0.32 | 1.09 | 2.76 | | 2.76 | 1.67 |
| Oct | 0.70 | 0.12 | | 0.83 | 2.27 | | 2.27 | 1.44 |
| Nov | 0.69 | 0.21 | | 0.90 | 1.51 | 0.57 | 2.08 | 1.18 |
| Dec | 0.68 | 0.33 | | 1.01 | 1.40 | 0.63 | 2.03 | 1.02 |
| Jan | 0.66 | 0.51 | | 1.17 | 1.30 | 0.72 | 2.02 | 0.85 |

[1]*Beginning of breeding period (approximately 83 days after calving)*
[2]Protein for Maintenance (M): Mcal NEm (M) from Table 3, Part VI (Jan 2011) * 0.07895
[3]Protein for Gestation (G): Mcal NEm (G) from Table 3, Part VI (Jan 2011) * 0.09615
[4]Protein for Lactation (L): Mcal NEm (L) from Table 3, Part VI (Jan 2011) * 0.2362
[5]Crude protein consumed from range forage: from Table 1 DMI lb/day * from Table 2 %CP in diet/100
Ex. Feb: 26.4 * (5.5/100) = 26.4 * 0.055 = 1.45 lb
[6]Crude protein consumed from 30% protein supplement: from Table 1 lb/day * (30%/100)
Ex. Feb: 3.3 * (30/100) = 3.3 * 0.30 = 0.99
[7]Total Net protein consumed: Crude protein from range forage + from protein supplement
[8]Balance: Total Net protein consumed – Total protein required

What would be the BCS of the Mar, Apr, May, and Jun calving cows at the beginning of the breeding period and at calving the following year and how much of the 30% protein supplement would they require? They would be in a BCS of 6.0, 6.7, 7.2 and 6.5 at breeding and 5.5, 5.5, 5.3 and 5.6 at calving the following year, respectively (Appendix Tables 1a – 4b). Each cow would require 445, 435, 440, and 310 lb of the 30% protein supplement, respectively. For the Jun calving cow to be in a similar BCS at calving the following year as the other cows it was not necessary to provide her the supplement in Nov and Dec though her rumen microbe DIP needs were not met those months. If it had been provided her BCS would have been 6.1.

Recognizing that most cow/calf ranch operations have a 45 to 60 day calving season combining the results for Feb with Mar, Mar with Apr, Apr with May, and May with Jun the amount of protein supplement needed per cow would average 455, 440, 440, and 375 pounds, respectively. However, except for the May/Jun calving cows, late winter/early spring calving cows are most likely kept in small pastures near ranch headquarters for at least their last month of pregnancy and up to their first three months of lactation. Thus these cows will require hay during this period as a substitute for the lack of available rangeland forage. Based on this assumption the Feb, Mar, Apr, and May calving cows would be fed hay Jan – Apr, Feb – Apr, Mar –

Apr, and in Apr, respectively. It could be argued that hay would also need to be provided the first half of May, especially in year's such as this when Apr/May temperatures where cooler than average but for our comparisons we'll assume hay is not needed in May.

For the months hay is needed we'll provide one of good quality so that there is no need to provide a protein supplement those months. What is good quality hay? It would be hay that has an adequate amount of NEm and protein to meet a lactating beef cow's needs. Thus its NEm content would be at least 0.60 Mcal/lb and its crude protein content at least 10%. Smooth bromegrass, a common hay grass in the Northern Great Plains, when harvested in the bloom stage generally will meet this standard, especially if it had been fertilized with nitrogen. Mid-bloom alfalfa will also contain at least 0.60 Mcal NEm/lb but its crude protein content will be 17% or better; much more than the animal needs.

To keep things simple we are going to figure that in the months hay needs to be provided the cows it is their only forage source. So the Feb calving cow will consume 21.6 lb/day (dry matter basis) of hay in Jan and 26.4 lb/day in Feb, Mar and Apr for a total of 3020 lb or 3430 lb on an as is basis (3020 ÷ 88% if the hay contains 12% moisture). We also need to account for wastage. If the hay is fed on the ground the expected wastage is 25% so the actual amount of hay needed per cow would be about 4575 lb (3430 lb ÷ 75%). If this hay cost $100/T ($0.05/lb) than annual hay cost per cow would be about $229.

How much hay would the Mar, Apr, May, and Jun calving cows require? Using the same logic as for the Feb calving cow these cows in their last month of gestation will be provided 21.6 lb of hay per day and during lactation 26.4 lb/day. Thus the Mar calving cow will require a total of 3355 lb for an annual cost of about $168; the Apr calving cow 2215 lb for an annual cost of about $111; and the May calving one 980 lb for an annual cost of $49. No hay cost for the Jun calving cow.

Although a protein supplement is not needed in the months good quality hay is fed what about those months it is not and range forage is deficient in DIP? For the Feb calving cow the only months that DIP was insufficient in her diet was Nov and Dec (Table 5). Although this would call for a protein supplement it may not be warranted. This cow was in a BCS 7.9 in Nov and thus could afford to lose some weight. Remember the protein supplement contains a significant amount of NEm as well and this additional energy would not be needed. By calving time the following year she was in a BCS 5.7 (Table 6) so not providing additional protein in Nov and/or Dec appeared to be justified. If we had provided a non-protein nitrogen supplement such as urea (that contains no energy) in Nov and/or Dec to make up for the DIP deficiency those months she would have been in a BCS 5.9 to 6.1 at time of calving as a result of her being able to consume more of the rangeland forage and thus more NEm. This may have been warranted but providing her the 30% protein supplement would not have been as her BCS at calving would have been 6.5.

Although the amount of DIP the cow obtained from Nov/Dec range forage was not sufficient to meet her rumen microbes needs she was able to obtain an adequate amount of protein to meet her needs (Table 7). The Mar, Apr, May, and Jun calving cows required 145, 220, 330, and 390 lb of the 30% protein supplement, respectively (Appendix Tables 5a, 6a, 7a, and 8a), and their BCS at calving the following year was 5.8, 5.7, 5.6, and 5.9 (Appendix Tables 5b, 6b, 7b, and 8b).

**Table 5: Range forage or smooth bromegrass hay dry matter intake (DMI), net energy maintenance (NEm) and degradable intake protein (DIP) consumed, and amount of DIP needed by a 1200 lb shrunk body weight cow calving in Feb, calf weaned in Oct, and the pounds of a 30% protein supplement needed when DIP balance is negative.**

| Mon | DMI (lb/day) | Mcal NEm Consumed[2] | | Lb DIP | | DIP Balance[5] | 30% Protein[6] | |
|---|---|---|---|---|---|---|---|---|
| | | Range | Hay | Consumed[3] | Required[4] | | Day | Month |
| Feb | 26.4 | | 15.8 | 1.90 | 1.58 | 0.32 | | |
| Mar | 26.4 | | 15.8 | 1.90 | 1.58 | 0.32 | | |
| Apr | 26.4 | | 15.8 | 1.90 | 1.58 | 0.32 | | |
| *May*[1] | 32.4 | 23.7 | | 3.85 | 2.37 | 1.48 | | |
| Jun | 32.4 | 21.1 | | 2.68 | 2.11 | 0.58 | | |
| Jul | 32.4 | 21.1 | | 2.57 | 2.11 | 0.46 | | |
| Aug | 27.6 | 17.7 | | 2.09 | 1.77 | 0.32 | | |
| Sep | 27.6 | 17.4 | | 1.99 | 1.74 | 0.25 | | |
| Oct | 24.0 | 13.9 | | 1.81 | 1.39 | 0.42 | | |
| Nov | 18.0 | 9.7 | | 0.82 | 0.97 | -0.15 | | |
| Dec | 21.6 | 11.2 | | 0.91 | 1.12 | -0.21 | | |
| Jan | 21.6 | | 13.0 | 1.56 | 1.30 | 0.26 | | |

[1]*Beginning of breeding period (approximately 83 days after calving)*

[2]Monthly amounts for range forage from Table 9 Part VI (Jan 2011) divided by number of days in the month; amounts for hay DMI lb/day * 0.60 Mcal

[3]Lb DIP consumed from range forage or hay: lb DMI * (%CP in diet/100 * %DIP of CP)
Ex. Feb: 26.4 * (10.0/100 * 72/100) = 26.4 * .072 = 1.9 lb

[4]Lb DIP required: Mcal NEm consumed from range forage or hay * 0.1;
Ex. Feb: 15.8 * 0.1 = 1.58 lb

[5]DIP balance: Lb DIP consumed – lb required

[6]As is basis (89% dry matter): See text as to how amounts were determined (Note: It was determined that it was not necessary to supply the supplement to this cow – See Text as to why)

Although the amount of DIP the cow obtained from Nov/Dec range forage was not sufficient to meet her rumen microbes needs she was able to obtain an adequate amount of protein to meet her needs (Table 7). The Mar, Apr, May, and Jun calving cows required 145, 220, 330, and 390 lb of the 30% protein supplement, respectively (Appendix Tables 5a, 6a, 7a, and 8a), and their BCS at calving the following year was 5.8, 5.7, 5.6, and 5.9 (Appendix Tables 5b, 6b, 7b, and 8b). In addition, the total amount of protein these cows obtained from the range forage, the smooth bromegrass hay, and the 30% protein supplement was enough to meet their needs regardless of when they calved (Appendix Tables 5c, 6c, 7c, and 8c). If the protein supplement cost $0.30/lb the annual cost would be $0, $44, $66, $99, and $117 for the Feb, Mar, Apr, May, and Jun calving cows, respectively.

Combining the annual hay costs with that for the 30% protein supplement we come up with a total fed cost of $229, $212, $177, $148, and $117 for the Feb, Mar, Apr, May, and Jun calving cows, respectively. Again assuming most cow/calf ranch operations have a 45 to 60 day calving season averaging the costs for Feb and Mar, Mar and Apr, Apr and May, and May and Jun the amounts per cow would be $220, $195, $163, and $133, respectively.

**Table 6: Net energy maintenance (NEm) consumed and required by a 1200 lb shrunk body weight cow calving in Feb, calf weaned in Oct and resultant changes in empty body weight (EBW) and body condition score (BCS).**

| Mon | NEm Mcal/day Consumed[2] | | NEm Mcal/day Required[3] | | | | NEm Balance[4] | EBW (lb)[5] | BCS[6] | Mcal $NE_{\Delta}$[7] |
|---|---|---|---|---|---|---|---|---|---|---|
| | 30% Protein | Total | NEm (M) | Cold | Activity | Sum | | | | |
| Feb | | 15.8 | 7.9 | 0.3 | 1.6 | 12.9 | 2.9 | 1065 | 5.5 | 226 |
| Mar | | 15.8 | 8.1 | | 1.6 | 15.4 | 0.4 | 1097 | 5.9 | 226 |
| Apr | | 15.8 | 8.1 | | 1.6 | 15.5 | 0.3 | 1103 | 5.9 | 226 |
| *May*[1] | | 23.7 | 8.2 | | 4.1 | 17.1 | 6.6 | 1106 | 6.0 | 264 |
| Jun | | 21.1 | 8.5 | | 4.3 | 16.6 | 4.5 | 1175 | 6.7 | 264 |
| Jul | | 21.1 | 8.8 | | 4.4 | 15.9 | 5.2 | 1221 | 7.2 | 311 |
| Aug | | 17.7 | 9.0 | | 4.5 | 15.5 | 2.2 | 1267 | 7.7 | 311 |
| Sep | | 17.4 | 9.1 | | 4.6 | 15.8 | 1.6 | 1287 | 8.0 | 373 |
| Oct | | 13.9 | 9.2 | 0.8 | 4.6 | 15.8 | -1.9 | 1298 | 8.1 | 373 |
| Nov | | 9.7 | 9.1 | 0.9 | 4.6 | 16.7 | -7.0 | 1280 | 7.9 | 311 |
| Dec | | 11.2 | 8.7 | 0.6 | 4.4 | 17.1 | -5.9 | 1204 | 7.0 | 311 |
| Jan | | 13.0 | 8.5 | 0.6 | 1.7 | 16.0 | -3.0 | 1160 | 6.3 | 264 |
| Feb | | | | | | | | **1100** | **5.9** | |

[1]*Beginning of breeding period (approximately 83 days after calving)*

[2]NEm consumed: 30% protein supplement amount from Table 5 (lb/day * 0.9 Mcal/lb);
Total = 30% protein amount + from Table 5 amounts from range forage and hay.

[3]NEm required: NEm (M) = $EBW^{0.75}$ * 0.04256; Cold = from Appendix Table 5, Part V (Sep 2010);
Activity = NEm (M) * 0.5 when on range, * 0.2 when in small pastures and fed hay;
Sum = these three values + NEm (G) from Appendix Table 3, Part V (Sep 2010) + NEm (L) from Appendix Table 5, Part V (Sep 2010)

[4]NEm balance: Mcal consumed – Mcal required (Sum)

[5]EBW: Previous month's EBW + ((days in previous month ÷ (Mcal $NE_{\Delta}$ ÷ NEm balance)) * 90 lb)
Ex. Mar: 1065 + ((28 ÷ (226 ÷ 2.9)) * 90); 1065 + ((28 ÷ 78) * 90); 1065 + (0.36 * 90);
1065 + 32 = 1097 (Note: If balance is negative multiply Mcal $NE_{\Delta}$ by 0.8 then divide by balance)

[6]BCS: Previous month's BCS + (New EBW – Previous EBW) ÷ 90 lb
Ex. Mar: 5.5 + (1069 – 1065) ÷ 90; 5.5 + 4 ÷ 90; 5.5 + 0.04 = 5.54 or 5.5

[7]From Appendix Table 4, Part VI (Jan 2011): When daily balance is negative it takes 1 Mcal of body fat to replace 0.8 Mcal of diet NEm; when positive a 1:1 relationship.

Combining the annual hay costs with that for the 30% protein supplement we come up with a total fed cost of $229, $212, $177, $148, and $117 for the Feb, Mar, Apr, May, and Jun calving cows, respectively. Again assuming most cow/calf ranch operations have a 45 to 60 day calving season averaging the costs for Feb and Mar, Mar and Apr, Apr and May, and May and Jun the amounts per cow would be $220, $195, $163, and $133, respectively. Unlike the no hay examples the 30% protein supplement was not provided in Nov to any of the cows as their BCS's at calving the following year were all above 5.5 without it.

**Table 7: Protein required for maintenance (M), gestation (G), and lactation (L) by a 1200 lb shrunk body weight cow in BCS 5.5 at calving in Feb, calf birth weight 100 lb, peak milk 17.5 lb/day, calf weaned in Oct and pounds protein available in range forage or smooth bromegrass hay and protein supplement.**

| | Protein Required (lb/day) | | | | Crude Protein (lb) | | Total | |
|---|---|---|---|---|---|---|---|---|
| Mon | M[2] | G[3] | L[4] | Total | Forage[5] | 30% Protein[6] | Net[7] | Balance[8] |
| Feb | 0.63 | | 0.73 | 1.36 | 2.64 | | 2.64 | 1.28 |
| Mar | 0.63 | | 1.35 | 1.97 | 2.64 | | 2.64 | 0.67 |
| Apr | 0.61 | | 1.36 | 1.97 | 2.64 | | 2.64 | 0.67 |
| *May*[1] | 0.60 | | 1.15 | 1.75 | 5.35 | | 5.35 | 3.60 |
| Jun | 0.64 | | 0.89 | 1.53 | 3.73 | | 3.73 | 2.20 |
| Jul | 0.67 | | 0.65 | 1.32 | 3.56 | | 3.56 | 2.24 |
| Aug | 0.70 | | 0.46 | 1.16 | 2.90 | | 2.90 | 1.74 |
| Sep | 0.71 | 0.07 | 0.32 | 1.10 | 2.76 | | 2.76 | 1.66 |
| Oct | 0.71 | 0.12 | | 0.83 | 2.52 | | 2.52 | 1.69 |
| Nov | 0.70 | 0.21 | | 0.91 | 1.26 | | 1.26 | 0.35 |
| Dec | 0.69 | 0.33 | | 1.02 | 1.17 | | 1.17 | 0.15 |
| Jan | 0.67 | 0.51 | | 1.18 | 2.16 | | 2.16 | 0.98 |

[1]*Beginning of breeding period (approximately 83 days after calving)*
[2]Net protein for Maintenance (M): Mcal NEm (M) from Table 3, Part VI (Jan 2011) * 0.07895
[3]Net protein for Gestation (G): Mcal NEm (G) from Table 3, Part VI (Jan 2011) * 0.09615
[4]Net protein for Lactation (L): Mcal NEm (L) from Table 3, Part VI (Jan 2011) * 0.2362
[5]Crude protein consumed from range forage or smooth bromegrass hay: from Table 5 DMI lb/day * %CP in diet/100 (from Table 2 for range forage). Ex. Feb (hay): 26.4 * (10/100) = 26.4 * 0.10 = 2.64
[6]Crude protein consumed from 30% protein supplement: from Table 5 lb/day supplement * 30%/100
See Table 4 for example as no protein supplement provide in this scenario
[7]Total Net protein consumed: Crude protein from range forage or hay + from protein supplement
[8]Balance: Total Net protein consumed – Total protein required

I've stated before that the initial reason for doing this series was to simplify Dr. Diven's information; unfortunately I fear that at times I may have complicated it. I have come to the realization that this type of information does not lend itself to simplicity but by providing good explanations with relevant examples it can go a long ways in making it understandable. I hope that I am achieving this. I do believe there are a few salient points that the ranchers needs to remember with regard to what we have covered: 1) Knowing how to BCS cows (0.5 increments) and what their cows average weight is when in a BCS of 5 to 6; 2) That it is not necessary for their cows to always have their energy needs met, especially if they have had the opportunity to gain weight on green grass; 3) Although the crude protein content of forage is important to know it is even more important to know how much of it is degradable; 4) If the rumen microbe DIP needs are met most likely the cow's protein needs will be met; 5) Although desirable it is not always necessary to meet the DIP needs of the rumen microbes; and 6) Protein supplements vary in the % of the protein that is degradable and many contain a significant amount of energy.

We'll look at minerals in the next installment, what is in the forage and what the cow needs.

**Appendix Table 1a: Range forage dry matter intake (DMI), net energy maintenance (NEm) and degradable intake protein (DIP) consumed, and amount of DIP required by a 1200 lb shrunk body weight cow calving in Mar, calf weaned in Nov, and the amount of a 30% protein supplement needed when DIP balance is negative. Note: See Table 1's footnotes.**

| Mon | DMI (lb/day) | Mcal NEm Consumed[2] | Lb DIP | | DIP Balance[5] | 30% Protein[6] | |
|---|---|---|---|---|---|---|---|
| | | | Consumed[3] | Required[4] | | Lb/day | Lb/month |
| Mar | 26.4 | 12.1 | 0.86 | 1.21 | -0.35 | 3.6 | 112 |
| Apr | 26.4 | 13.2 | 1.12 | 1.32 | -0.20 | 2.1 | 63 |
| May | 32.4 | 23.7 | 3.85 | 2.37 | 1.48 | | |
| *Jun*[1] | 32.4 | 21.1 | 2.68 | 2.11 | 0.58 | | |
| Jul | 32.4 | 21.1 | 2.57 | 2.11 | 0.46 | | |
| Aug | 27.6 | 17.7 | 2.09 | 1.77 | 0.32 | | |
| Sep | 27.6 | 17.4 | 1.99 | 1.74 | 0.25 | | |
| Oct | 27.6 | 16.0 | 2.09 | 1.60 | 0.49 | | |
| Nov | 21.6 | 11.7 | 0.98 | 1.17 | -0.19 | 1.9 | 57 |
| Dec | 21.6 | 11.2 | 0.91 | 1.12 | -0.21 | 2.1 | 65 |
| Jan | 21.6 | 10.8 | 0.84 | 1.08 | -0.24 | 2.4 | 74 |
| Feb | 21.6 | 10.4 | 0.77 | 1.04 | -0.27 | 2.7 | 76 |

**Appendix Table 1b: Net energy maintenance (NEm) consumed and required by above cow and resultant changes in her empty body weight (EBW) and body condition score (BCS). Note: See Table 3's footnotes.**

| Mon | NEm Mcal/day Consumed[2] | | NEm Mcal/day Required[3] | | | | NEm (Mcal) Balance | EBW (lb)[4] | BCS[5] | Mcal $NE_{\Delta}$[6] |
|---|---|---|---|---|---|---|---|---|---|---|
| | 30% Protein | Total[7] | NEm (M) | Cold | Activity | Sum | | | | |
| Mar | 3.2 | 15.4 | 7.9 | | 4.0 | 15.0 | 0.4 | 1065 | 5.5 | 226 |
| Apr | 1.9 | 15.1 | 8.0 | | 4.0 | 17.6 | -2.6 | 1070 | 5.6 | 226 |
| May | | 23.7 | 7.7 | | 3.9 | 17.4 | 6.3 | 1031 | 5.1 | 226 |
| *Jun*[1] | | 21.1 | 8.2 | | 4.1 | 17.1 | 3.9 | 1109 | 6.0 | 264 |
| Jul | | 21.1 | 8.4 | | 4.2 | 16.3 | 4.7 | 1149 | 6.4 | 264 |
| Aug | | 17.7 | 8.7 | | 4.3 | 15.8 | 1.9 | 1199 | 7.0 | 311 |
| Sep | | 17.4 | 8.8 | | 4.4 | 15.1 | 2.3 | 1216 | 7.2 | 311 |
| Oct | | 16.0 | 8.9 | 0.7 | 4.4 | 16.1 | -0.1 | 1236 | 7.4 | 311 |
| Nov | 1.7 | 13.3 | 8.9 | 0.9 | 4.4 | 15.4 | -2.1 | 1234 | 7.4 | 311 |
| Dec | 1.9 | 13.1 | 8.7 | 0.6 | 4.4 | 15.9 | -2.7 | 1211 | 7.1 | 311 |
| Jan | 2.2 | 13.0 | 8.6 | 0.6 | 4.3 | 16.9 | -4.0 | 1181 | 6.8 | 264 |
| Feb | 2.4 | 12.8 | 8.3 | 0.3 | 4.1 | 18.0 | -5.2 | 1128 | 6.2 | 264 |
| Mar | | | | | | | | **1066** | **5.5** | |

[7]Mcal NEm consumed Total: Includes amount from rangeland forage from Appendix Table 1a.

**Appendix Table 2a: Range forage dry matter intake (DMI), net energy maintenance (NEm) and degradable intake protein (DIP) consumed, and amount of DIP required by a 1200 lb shrunk body weight cow calving in Apr, calf weaned in Dec, and the amount of a 30% protein supplement needed when DIP balance is negative. Note: See Table 1's footnotes.**

| Mon | DMI (lb/day) | Mcal NEm Consumed[2] | Lb DIP | | DIP Balance[5] | 30% Protein[6] | |
|---|---|---|---|---|---|---|---|
| | | | Consumed[3] | Required[4] | | Lb/day | Lb/month |
| Apr | 26.4 | 13.2 | 1.12 | 1.32 | -0.20 | 2.1 | 63 |
| May | 32.4 | 23.7 | 3.85 | 2.37 | 1.48 | | |
| Jun | 32.4 | 21.1 | 2.68 | 2.11 | 0.58 | | |
| *Jul*[1] | 32.4 | 21.1 | 2.57 | 2.11 | 0.46 | | |
| Aug | 27.6 | 17.7 | 2.09 | 1.77 | 0.32 | | |
| Sep | 27.6 | 17.4 | 1.99 | 1.74 | 0.25 | | |
| Oct | 27.6 | 16.0 | 2.09 | 1.60 | 0.49 | | |
| Nov | 26.4 | 14.3 | 1.20 | 1.43 | -0.22 | 2.3 | 69 |
| Dec | 21.6 | 11.2 | 0.91 | 1.12 | -0.21 | 2.1 | 65 |
| Jan | 21.6 | 10.8 | 0.84 | 1.08 | -0.24 | 2.4 | 74 |
| Feb | 21.6 | 10.4 | 0.77 | 1.04 | -0.27 | 2.7 | 76 |
| Mar | 21.6 | 9.9 | 0.70 | 0.99 | -0.29 | 2.9 | 90 |

**Appendix Table 2b: Net energy maintenance (NEm) consumed and required by above cow and resultant changes in her empty body weight (EBW) and body condition score (BCS). Note: See Table 3's footnotes.**

| Mon | NEm Mcal/day Consumed[2] | | NEm Mcal/day Required[3] | | | | NEm (Mcal) Balance | EBW (lb)[4] | BCS[5] | Mcal $NE_{\Delta}$[6] |
|---|---|---|---|---|---|---|---|---|---|---|
| | 30% Protein | Total[7] | NEm (M) | Cold | Activity | Sum | | | | |
| Apr | 1.9 | 15.1 | 7.9 | | 4.0 | 15.0 | 0.1 | 1065 | 5.5 | 226 |
| May | | 23.7 | 7.9 | | 4.0 | 17.6 | 6.1 | 1066 | 5.5 | 226 |
| Jun | | 21.1 | 8.4 | | 4.2 | 18.3 | 2.8 | 1140 | 6.3 | 264 |
| *Jul*[1] | | 21.1 | 8.5 | | 4.3 | 17.6 | 3.5 | 1169 | 6.7 | 264 |
| Aug | | 17.7 | 8.7 | | 4.4 | 16.8 | 0.9 | 1205 | 7.1 | 311 |
| Sep | | 17.4 | 8.7 | | 4.4 | 15.9 | 1.5 | 1213 | 7.1 | 311 |
| Oct | | 16.0 | 8.8 | 0.7 | 4.4 | 15.9 | 0.1 | 1226 | 7.3 | 311 |
| Nov | 2.0 | 16.3 | 8.8 | 0.9 | 4.4 | 16.2 | 0.1 | 1227 | 7.3 | 311 |
| Dec | 1.9 | 13.1 | 8.8 | 0.6 | 4.4 | 15.1 | -2.0 | 1228 | 7.3 | 311 |
| Jan | 2.2 | 13.0 | 8.7 | 0.6 | 4.4 | 15.8 | -2.8 | 1205 | 7.1 | 311 |
| Feb | 2.4 | 12.8 | 8.5 | 0.3 | 4.3 | 16.6 | -3.8 | 1173 | 6.7 | 264 |
| Mar | 2.7 | 12.6 | 8.3 | | 4.1 | 17.7 | -5.1 | 1128 | 6.2 | 264 |
| Apr | | | | | | | | **1060** | **5.5** | |

[7]Mcal NEm consumed Total: Includes amount from rangeland forage from Appendix Table 2a.

**Appendix Table 3a: Range forage dry matter intake (DMI), net energy maintenance (NEm) and degradable intake protein (DIP) consumed, and amount of DIP required by a 1200 lb shrunk body weight cow calving in May, calf weaned in Jan, and the amount of a 30% protein supplement needed when DIP balance is negative. Note: See Table 1's footnotes.**

| Mon | DMI (lb/day) | Mcal NEm Consumed[2] | Lb DIP | | DIP Balance[5] | 30% Protein[6] | |
|---|---|---|---|---|---|---|---|
| | | | Consumed[3] | Required[4] | | Lb/day | Lb/month |
| May | 32.4 | 23.7 | 3.85 | 2.37 | 1.48 | | |
| Jun | 32.4 | 21.1 | 2.68 | 2.11 | 0.58 | | |
| Jul | 32.4 | 21.1 | 2.57 | 2.11 | 0.46 | | |
| *Aug*[1] | 27.6 | 17.7 | 2.09 | 1.77 | 0.32 | | |
| Sep | 27.6 | 17.4 | 1.99 | 1.74 | 0.25 | | |
| Oct | 27.6 | 16.0 | 2.09 | 1.60 | 0.49 | | |
| Nov | 26.4 | 14.3 | 1.20 | 1.43 | -0.23 | 2.3 | 69 |
| Dec | 26.4 | 13.7 | 1.12 | 1.37 | -0.25 | 2.6 | 80 |
| Jan | 21.6 | 10.8 | 0.84 | 1.08 | -0.24 | 2.4 | 74 |
| Feb | 21.6 | 10.4 | 0.77 | 1.04 | -0.27 | 2.7 | 76 |
| Mar | 21.6 | 9.9 | 0.70 | 0.99 | -0.29 | 2.9 | 90 |
| Apr | 21.6 | 10.8 | 0.91 | 1.08 | -0.17 | 1.7 | 51 |

**Appendix Table 3b: Net energy maintenance (NEm) consumed and required by above cow and resultant changes in her empty body weight (EBW) and body condition score (BCS). Note: See Table 3's footnotes.**

| Mon | NEm Mcal/day Consumed[2] | | NEm Mcal/day Required[3] | | | | NEm (Mcal) Balance | EBW (lb)[4] | BCS[5] | Mcal $NE_{\Delta}$[6] |
|---|---|---|---|---|---|---|---|---|---|---|
| | 30% Protein | Total[7] | NEm (M) | Cold | Activity | Sum | | | | |
| May | | 23.7 | 7.9 | | 4.0 | 15.0 | 8.7 | 1065 | 5.5 | 226 |
| Jun | | 21.1 | 8.5 | | 4.3 | 18.5 | 2.6 | 1172 | 6.7 | 264 |
| Jul | | 21.1 | 8.7 | | 4.3 | 18.8 | 2.3 | 1198 | 7.0 | 311 |
| *Aug*[1] | | 17.7 | 8.8 | | 4.4 | 18.0 | -0.3 | 1219 | 7.2 | 311 |
| Sep | | 17.4 | 8.8 | | 4.4 | 16.9 | 0.5 | 1215 | 7.2 | 311 |
| Oct | | 16.0 | 8.8 | 0.7 | 4.4 | 16.7 | -0.7 | 1219 | 7.2 | 311 |
| Nov | 2.0 | 16.3 | 8.7 | 0.9 | 4.4 | 15.9 | 0.4 | 1212 | 7.1 | 311 |
| Dec | 2.3 | 16.1 | 8.8 | 0.6 | 4.4 | 15.8 | 0.3 | 1215 | 7.2 | 311 |
| Jan | 2.2 | 13.0 | 8.8 | 0.6 | 4.4 | 15.0 | -2.0 | 1217 | 7.2 | 311 |
| Feb | 2.4 | 12.8 | 8.6 | 0.3 | 4.3 | 15.4 | -2.6 | 1194 | 6.9 | 264 |
| Mar | 2.7 | 12.6 | 8.5 | | 4.2 | 16.2 | -3.6 | 1162 | 6.6 | 264 |
| Apr | 1.5 | 12.3 | 8.2 | | 4.1 | 17.6 | -5.3 | 1115 | 6.1 | 264 |
| May | | | | | | | | **1047** | **5.3** | |

[7]Mcal NEm consumed Total: Includes amount from rangeland forage from Appendix Table 3a.

**Appendix Table 4a: Range forage dry matter intake (DMI), net energy maintenance (NEm) and degradable intake protein (DIP) consumed, and amount of DIP required by a 1200 lb shrunk body weight cow calving in Jun, calf weaned in Feb, and the amount of a 30% protein supplement needed when DIP balance is negative. Note: See Table 1's footnotes.**

| Mon | DMI (lb/day) | Mcal NEm Consumed[2] | Lb DIP | | DIP Balance[5] | 30% Protein[6] | |
|---|---|---|---|---|---|---|---|
| | | | Consumed[3] | Required[4] | | Lb/day | Lb/month |
| Jun | 32.4 | 21.1 | 2.68 | 2.11 | 0.58 | | |
| Jul | 32.4 | 21.1 | 2.57 | 2.11 | 0.46 | | |
| Aug | 27.6 | 17.7 | 2.09 | 1.77 | 0.32 | | |
| *Sep*[1] | 27.6 | 17.4 | 1.99 | 1.74 | 0.25 | | |
| Oct | 27.6 | 16.0 | 2.09 | 1.60 | 0.49 | | |
| Nov | 24.0 | 13.0 | 1.09 | 1.30 | -0.20 | | |
| Dec | 24.0 | 12.5 | 1.01 | 1.25 | -0.23 | | |
| Jan | 26.4 | 13.2 | 1.03 | 1.32 | -0.29 | 2.9 | 90 |
| Feb | 21.6 | 10.4 | 0.77 | 1.04 | -0.27 | 2.7 | 76 |
| Mar | 21.6 | 9.9 | 0.70 | 0.99 | -0.29 | 2.9 | 90 |
| Apr | 21.6 | 10.8 | 0.91 | 1.08 | -0.17 | 1.7 | 51 |
| May | 30.0 | 21.9 | 3.56 | 2.19 | 1.37 | | |

**Appendix Table 4b: Net energy maintenance (NEm) consumed and required by above cow and resultant changes in her empty body weight (EBW) and body condition score (BCS). Note: See Table 3's footnotes.**

| Mon | NEm Mcal/day Consumed[2] | | NEm Mcal/day Required[3] | | | | NEm (Mcal) Balance | EBW (lb)[4] | BCS[5] | Mcal $NE_{\Delta}$[6] |
|---|---|---|---|---|---|---|---|---|---|---|
| | 30% Protein | Total[7] | NEm (M) | Cold | Activity | Sum | | | | |
| Jun | | 21.1 | 7.9 | | 4.0 | 15.0 | 6.1 | 1065 | 5.5 | 226 |
| Jul | | 21.1 | 8.3 | | 4.2 | 18.2 | 2.9 | 1137 | 6.3 | 264 |
| Aug | | 17.7 | 8.5 | | 4.3 | 18.5 | -0.8 | 1167 | 6.6 | 264 |
| *Sep*[1] | | 17.4 | 8.4 | | 4.2 | 17.5 | -0.1 | 1156 | 6.5 | 264 |
| Oct | | 16.0 | 8.4 | 0.7 | 4.2 | 17.1 | -1.1 | 1155 | 6.5 | 264 |
| Nov | | 13.0 | 8.4 | 0.8 | 4.2 | 16.1 | -3.1 | 1140 | 6.3 | 264 |
| Dec | | 12.5 | 8.2 | 0.6 | 4.1 | 14.8 | -2.3 | 1100 | 5.9 | 226 |
| Jan | 2.6 | 15.8 | 8.0 | 0.6 | 4.0 | 14.7 | 1.1 | 1065 | 5.5 | 226 |
| Feb | 2.4 | 12.8 | 8.1 | 0.3 | 4.1 | 13.7 | -1.0 | 1081 | 5.7 | 226 |
| Mar | 2.7 | 12.6 | 8.0 | | 4.0 | 14.2 | -1.6 | 1070 | 5.6 | 226 |
| Apr | 1.5 | 12.3 | 7.9 | | 4.0 | 15.3 | -3.0 | 1047 | 5.3 | 226 |
| May | | 21.9 | 7.7 | | 3.8 | 16.8 | 5.1 | 1004 | 4.8 | 196 |
| Jun | | | | | | | | **1078** | **5.6** | |

[7]Mcal NEm consumed Total: Includes amount from rangeland forage from Appendix Table 4a.

**Appendix Table 5a: Range forage or smooth bromegrass hay dry matter intake (DMI), net energy maintenance (NEm) and degradable intake protein (DIP) consumed, and amount of DIP required by a 1200 lb shrunk body weight cow calving in Mar, calf weaned in Nov, and the pounds of a 30% protein supplement needed when DIP balance is negative. Note: See Table 5's footnotes.**

| Mon | DMI (lb/day) | Mcal NEm Consumed[2] | | Lb DIP | | DIP Balance[5] | 30% Protein[6] | |
|---|---|---|---|---|---|---|---|---|
| | | Range | Hay | Consumed[3] | Required[4] | | Day | Month |
| Mar | 26.4 | | 15.8 | 1.90 | 1.58 | 0.32 | | |
| Apr | 26.4 | | 15.8 | 1.90 | 1.58 | 0.32 | | |
| May | 32.4 | 23.7 | | 3.85 | 2.37 | 1.48 | | |
| *Jun*[1] | 32.4 | 21.1 | | 2.68 | 2.11 | 0.58 | | |
| Jul | 32.4 | 21.1 | | 2.57 | 2.11 | 0.46 | | |
| Aug | 27.6 | 17.7 | | 2.09 | 1.77 | 0.32 | | |
| Sep | 27.6 | 17.4 | | 1.99 | 1.74 | 0.25 | | |
| Oct | 27.6 | 16.0 | | 2.09 | 1.60 | 0.49 | | |
| Nov | 18.0 | 9.7 | | 0.82 | 0.97 | -0.15 | | |
| Dec | 21.6 | 11.2 | | 0.91 | 1.12 | -0.21 | 2.1 | 65 |
| Jan | 21.6 | 10.8 | | 0.84 | 1.08 | -0.24 | 2.5 | 78 |
| Feb | 21.6 | | 13.0 | 1.56 | 1.30 | 0.26 | | |

**Appendix Table 5b: Net energy maintenance (NEm) consumed and required by above cow and resultant changes in empty body weight (EBW) and body condition score (BCS). Note: See Table 6's footnotes.**

| Mon | NEm Mcal/day Consumed[2] | | NEm Mcal/day Required[3] | | | | NEm (Mcal) Balance | EBW (lb)[4] | BCS[5] | Mcal $NE_{\Delta}$[6] |
|---|---|---|---|---|---|---|---|---|---|---|
| | 30% Protein | Total | NEm (M) | Cold | Activity | Sum | | | | |
| Mar | | 15.8 | 7.9 | | 1.6 | 12.6 | 3.2 | 1065 | 5.5 | 226 |
| Apr | | 15.8 | 8.2 | | 1.6 | 15.5 | 0.4 | 1105 | 5.9 | 226 |
| May | | 23.7 | 8.2 | | 4.1 | 18.0 | 5.6 | 1110 | 6.0 | 264 |
| *Jun*[1] | | 21.1 | 8.5 | | 4.3 | 17.6 | 3.4 | 1169 | 6.7 | 264 |
| Jul | | 21.1 | 8.7 | | 4.4 | 16.8 | 4.3 | 1204 | 7.1 | 311 |
| Aug | | 17.7 | 8.9 | | 4.5 | 16.1 | 1.5 | 1243 | 7.5 | 311 |
| Sep | | 17.4 | 9.0 | | 4.5 | 15.4 | 2.0 | 1256 | 7.6 | 311 |
| Oct | | 16.0 | 9.1 | 0.8 | 4.5 | 16.5 | -0.5 | 1273 | 7.8 | 311 |
| Nov | | 9.7 | 9.0 | 0.9 | 4.5 | 15.7 | -6.0 | 1268 | 7.8 | 311 |
| Dec | 1.9 | 13.1 | 8.7 | 0.6 | 4.3 | 15.8 | -2.7 | 1203 | 7.0 | 311 |
| Jan | 2.2 | 13.0 | 8.5 | 0.6 | 4.3 | 16.9 | -3.9 | 1173 | 6.7 | 264 |
| Feb | | 13.0 | 8.3 | 0.3 | 1.7 | 15.5 | -2.5 | 1122 | 6.1 | 264 |
| Mar | | | | | | | | **1092** | **5.8** | |

**Appendix Table 5c: Protein required for maintenance (M), gestation (G), and lactation (L) by above cow in BCS 5.5 at calving in Mar, calf birth weight 100 lb, peak milk 17.5 lb/day, calf weaned in Nov and pounds protein available in range forage or smooth bromegrass hay and protein supplement. Note: See Table 7's footnotes.**

| | Protein Required (lb/day) | | | | Crude Protein (lb) | | Total | |
|---|---|---|---|---|---|---|---|---|
| Mon | M[2] | G[3] | L[4] | Total | Forage[5] | 30% Protein[6] | Net[7] | Balance[8] |
| Mar | 0.63 | | 0.73 | 1.36 | 2.64 | | 2.64 | 1.28 |
| Apr | 0.63 | | 1.35 | 1.97 | 2.64 | | 2.64 | 0.67 |
| May | 0.61 | | 1.36 | 1.97 | 5.35 | | 5.35 | 3.38 |
| *Jun*[1] | 0.65 | | 1.15 | 1.79 | 3.73 | | 3.73 | 1.94 |
| Jul | 0.66 | | 0.89 | 1.55 | 3.56 | | 3.56 | 2.01 |
| Aug | 0.68 | | 0.65 | 1.34 | 2.90 | | 2.90 | 1.56 |
| Sep | 0.69 | | 0.46 | 1.15 | 2.76 | | 2.76 | 1.61 |
| Oct | 0.70 | 0.07 | 0.32 | 1.09 | 2.90 | | 2.90 | 1.81 |
| Nov | 0.70 | 0.12 | | 0.82 | 1.26 | | 1.26 | 0.44 |
| Dec | 0.69 | 0.21 | | 0.90 | 1.40 | 0.63 | 2.03 | 1.13 |
| Jan | 0.68 | 0.33 | | 1.01 | 1.30 | 0.72 | 2.02 | 1.01 |
| Feb | 0.65 | 0.51 | | 1.16 | 2.16 | | 2.16 | 1.00 |

**Appendix Table 6a: Range forage or smooth bromegrass hay dry matter intake (DMI), net energy maintenance (NEm) and degradable intake protein (DIP) consumed, and amount of DIP required by a 1200 lb shrunk body weight cow calving in Apr, calf weaned in Dec, and the pounds of a 30% protein supplement needed when DIP balance is negative. Note: See Table 5's footnotes.**

| | DMI | Mcal NEm Consumed[2] | | Lb DIP | | DIP | 30% Protein[6] | |
|---|---|---|---|---|---|---|---|---|
| Mon | (lb/day) | Range | Hay | Consumed[3] | Required[4] | Balance[5] | Day | Month |
| Apr | 26.4 | | 15.8 | 1.90 | 1.58 | 0.32 | | |
| May | 32.4 | 23.7 | | 3.85 | 2.37 | 1.48 | | |
| Jun | 32.4 | 21.1 | | 2.68 | 2.11 | 0.58 | | |
| *Jul*[1] | 32.4 | 21.1 | | 2.57 | 2.11 | 0.46 | | |
| Aug | 27.6 | 17.7 | | 2.09 | 1.77 | 0.32 | | |
| Sep | 27.6 | 17.4 | | 1.99 | 1.74 | 0.25 | | |
| Oct | 27.6 | 16.0 | | 2.09 | 1.60 | 0.49 | | |
| Nov | 24.0 | 13.0 | | 1.09 | 1.30 | -0.20 | | |
| Dec | 21.6 | 11.2 | | 0.91 | 1.12 | -0.21 | 2.1 | 65 |
| Jan | 21.6 | 10.8 | | 0.84 | 1.08 | -0.24 | 2.5 | 78 |
| Feb | 21.6 | 10.4 | | 0.77 | 1.04 | -0.26 | 2.7 | 76 |
| Mar | 21.6 | | 13.0 | 1.56 | 1.30 | 0.26 | | |

**Appendix Table 6b: Net energy maintenance (NEm) consumed and required by above cow and resultant changes in empty body weight (EBW) and body condition score (BCS). Note: See Table 6's footnotes.**

| Mon | NEm Mcal/day Consumed[2] | | NEm Mcal/day Required[3] | | | | NEm (Mcal) Balance | EBW (lb)[4] | BCS[5] | Mcal $NE_{\Delta}$[6] |
|---|---|---|---|---|---|---|---|---|---|---|
| | 30% Protein | Total | NEm (M) | Cold | Activity | Sum | | | | |
| Apr | | 15.8 | 7.9 | | 1.6 | 12.6 | 3.2 | 1065 | 5.5 | 226 |
| May | | 23.7 | 8.1 | | 4.1 | 17.9 | 5.7 | 1103 | 5.9 | 226 |
| Jun | | 21.1 | 8.5 | | 4.3 | 18.6 | 2.5 | 1174 | 6.7 | 264 |
| *Jul*[1] | | 21.1 | 8.7 | | 4.3 | 17.9 | 3.2 | 1200 | 7.0 | 311 |
| Aug | | 17.7 | 8.8 | | 4.4 | 17.0 | 0.7 | 1228 | 7.3 | 311 |
| Sep | | 17.4 | 8.9 | | 4.4 | 16.1 | 2.0 | 1234 | 7.4 | 311 |
| Oct | | 16.0 | 8.9 | 0.7 | 4.5 | 16.1 | 1.3 | 1246 | 7.5 | 311 |
| Nov | | 13.0 | 8.9 | 0.9 | 4.5 | 16.3 | -0.1 | 1245 | 7.5 | 311 |
| Dec | 1.9 | 13.1 | 8.8 | 0.6 | 4.4 | 15.0 | -3.4 | 1216 | 7.2 | 311 |
| Jan | 2.2 | 13.0 | 8.6 | 0.6 | 4.3 | 15.7 | -1.9 | 1195 | 6.9 | 264 |
| Feb | 2.4 | 12.8 | 8.4 | 0.3 | 4.2 | 16.4 | -2.8 | 1158 | 6.5 | 264 |
| Mar | | 13.0 | 8.2 | | 1.6 | 15.1 | -3.7 | 1114 | 6.1 | 264 |
| Apr | | | | | | | | **1086** | **5.7** | |

**Appendix Table 6c: Protein required for maintenance (M), gestation (G), and lactation (L) by above cow in BCS 5.5 at calving in Apr, calf birth weight 100 lb, peak milk 17.5 lb/day, calf weaned in Dec and pounds protein available in range forage or smooth bromegrass hay and protein supplement. Note: See Table 7's footnotes.**

| Mon | Protein Required (lb/day) | | | | Crude Protein (lb) | | Total Net[7] | Balance[8] |
|---|---|---|---|---|---|---|---|---|
| | M[2] | G[3] | L[4] | Total | Forage[5] | 30% Protein[6] | | |
| Apr | 0.63 | | 0.73 | 1.36 | 2.64 | | 2.64 | 0.67 |
| May | 0.61 | | 1.35 | 1.96 | 5.35 | | 5.35 | 3.38 |
| Jun | 0.64 | | 1.36 | 2.00 | 3.73 | | 3.73 | 1.94 |
| *Jul*[1] | 0.66 | | 1.15 | 1.81 | 3.56 | | 3.56 | 2.01 |
| Aug | 0.67 | | 0.89 | 1.56 | 2.90 | | 2.90 | 1.56 |
| Sep | 0.68 | | 0.65 | 1.33 | 2.76 | | 2.76 | 1.61 |
| Oct | 0.69 | | 0.46 | 1.15 | 2.90 | | 2.90 | 1.81 |
| Nov | 0.69 | 0.07 | 0.32 | 1.08 | 1.26 | | 1.26 | 0.44 |
| Dec | 0.67 | 0.12 | | 0.79 | 1.40 | 0.63 | 2.03 | 1.13 |
| Jan | 0.65 | 0.21 | | 0.85 | 1.30 | 0.72 | 2.02 | 1.01 |
| Feb | 0.61 | 0.33 | | 0.94 | 2.16 | 0.81 | 2.16 | 1.00 |
| Mar | 0.57 | 0.51 | | 1.08 | 2.16 | | 2.64 | 1.28 |

**Appendix Table 7a: Range forage or smooth bromegrass hay dry matter intake (DMI), net energy maintenance (NEm) and degradable intake protein (DIP) consumed, and amount of DIP required by a 1200 lb shrunk body weight cow calving in May, calf weaned in Jan, and the pounds of a 30% protein supplement needed when DIP balance is negative. Note: See Table 5's footnotes.**

| Mon | DMI (lb/day) | Mcal NEm Consumed[2] | | Lb DIP | | DIP Balance[5] | 30% Protein[6] | |
|---|---|---|---|---|---|---|---|---|
| | | Range | Hay | Consumed[3] | Required[4] | | Day | Month |
| May | 32.4 | 23.7 | | 3.85 | 2.37 | 1.48 | | |
| Jun | 32.4 | 21.1 | | 2.68 | 2.11 | 0.58 | | |
| Jul | 32.4 | 21.1 | | 2.57 | 2.11 | 0.46 | | |
| *Aug*[1] | 27.6 | 17.7 | | 2.09 | 1.77 | 0.32 | | |
| Sep | 27.6 | 17.4 | | 1.99 | 1.74 | 0.25 | | |
| Oct | 27.6 | 16.0 | | 2.09 | 1.60 | 0.49 | | |
| Nov | 26.4 | 14.3 | | 1.20 | 1.43 | -0.22 | | |
| Dec | 26.4 | 13.7 | | 1.12 | 1.37 | -0.26 | 2.6 | 81 |
| Jan | 21.6 | 10.8 | | 0.84 | 1.08 | -0.24 | 2.5 | 78 |
| Feb | 21.6 | 10.4 | | 0.77 | 1.04 | -0.26 | 2.7 | 76 |
| Mar | 21.6 | 9.9 | | 0.70 | 0.99 | -0.29 | 3.0 | 93 |
| Apr | 21.6 | | 13.0 | 1.56 | 1.30 | 0.26 | | |

**Appendix Table 7b: Net energy maintenance (NEm) consumed and required by above cow and resultant changes in empty body weight (EBW) and body condition score (BCS). Note: See Table 6's footnotes.**

| Mon | NEm Mcal/day Consumed[2] | | NEm Mcal/day Required[3] | | | | NEm (Mcal) Balance | EBW (lb)[4] | BCS[5] | Mcal $NE_{\Delta}$[6] |
|---|---|---|---|---|---|---|---|---|---|---|
| | 30% Protein | Total | NEm (M) | Cold | Activity | Sum | | | | |
| May | | 23.7 | 7.9 | | 4.0 | 15.0 | 8.7 | 1065 | 5.5 | 226 |
| Jun | | 21.1 | 8.5 | | 4.3 | 18.5 | 2.6 | 1172 | 6.7 | 264 |
| Jul | | 21.1 | 8.7 | | 4.3 | 18.8 | 2.3 | 1198 | 7.0 | 311 |
| *Aug*[1] | | 17.7 | 8.8 | | 4.4 | 18.0 | -0.4 | 1219 | 7.2 | 311 |
| Sep | | 17.4 | 8.8 | | 4.4 | 16.9 | 0.5 | 1215 | 7.2 | 311 |
| Oct | | 16.0 | 8.8 | 0.7 | 4.4 | 16.7 | -0.7 | 1219 | 7.2 | 311 |
| Nov | | 14.3 | 8.7 | 0.9 | 4.4 | 15.9 | -1.6 | 1212 | 7.1 | 311 |
| Dec | 2.3 | 16.1 | 8.8 | 0.6 | 4.4 | 15.8 | 0.3 | 1194 | 6.9 | 264 |
| Jan | 2.2 | 13.0 | 8.8 | 0.6 | 4.4 | 15.0 | -2.0 | 1198 | 7.0 | 311 |
| Feb | 2.4 | 12.8 | 8.6 | 0.3 | 4.3 | 15.4 | -2.6 | 1176 | 6.7 | 264 |
| Mar | 2.7 | 12.6 | 8.4 | | 4.2 | 16.0 | -3.4 | 1147 | 6.4 | 264 |
| Apr | | 13.0 | 8.2 | | 1.6 | 15.1 | 2.1 | 1101 | 5.9 | 226 |
| May | | | | | | | | **1070** | **5.6** | |

**Appendix Table 7c: Protein required for maintenance (M), gestation (G), and lactation (L) by above cow in BCS 5.5 at calving in May, calf birth weight 100 lb, peak milk 17.5 lb/day, calf weaned in Jan and pounds protein available in range forage or smooth bromegrass hay and protein supplement. Note: See Table 7's footnotes.**

| | Protein Required (lb/day) | | | | Crude Protein (lb) | | Total | |
|---|---|---|---|---|---|---|---|---|
| Mon | M[2] | G[3] | L[4] | Total | Forage[5] | 30% Protein[6] | Net[7] | Balance[8] |
| May | 0.63 | | 0.73 | 1.36 | 5.35 | | 5.35 | 3.99 |
| Jun | 0.67 | | 1.35 | 2.02 | 3.73 | | 3.73 | 1.71 |
| Jul | 0.68 | | 1.36 | 2.04 | 3.56 | | 3.56 | 1.53 |
| *Aug*[1] | 0.69 | | 1.15 | 1.84 | 2.90 | | 2.90 | 1.06 |
| Sep | 0.68 | | 0.89 | 1.57 | 2.76 | | 2.76 | 1.19 |
| Oct | 0.69 | | 0.65 | 1.34 | 2.90 | | 2.90 | 1.56 |
| Nov | 0.68 | | 0.46 | 1.14 | 1.26 | | 1.85 | 0.71 |
| Dec | 0.67 | 0.07 | 0.32 | 1.06 | 1.40 | 0.63 | 2.50 | 1.21 |
| Jan | 0.66 | 0.12 | | 0.78 | 1.30 | 0.72 | 2.02 | 1.04 |
| Feb | 0.63 | 0.21 | | 0.84 | 2.16 | 0.81 | 1.99 | 0.93 |
| Mar | 0.60 | 0.33 | | 0.93 | 2.16 | 0.88 | 1.96 | 1.03 |
| Apr | 0.55 | 0.51 | | 1.06 | 2.64 | | 2.16 | 1.10 |

**Appendix Table 8a: Range forage or smooth bromegrass hay dry matter intake (DMI), net energy maintenance (NEm) and degradable intake protein (DIP) consumed, and amount of DIP required by a 1200 lb shrunk body weight cow calving in Jun, calf weaned in Feb, and the pounds of a 30% protein supplement needed when DIP balance is negative. Note: See Table 5's footnotes.**

| | DMI | Mcal NEm Consumed[2] | | Lb DIP | | DIP | 30% Protein[6] | |
|---|---|---|---|---|---|---|---|---|
| Mon | (lb/day) | Range | Hay | Consumed[3] | Required[4] | Balance[5] | Day | Month |
| Jun | 32.4 | 21.1 | | 2.68 | 2.11 | 0.58 | | |
| Jul | 32.4 | 21.1 | | 2.57 | 2.11 | 0.46 | | |
| Aug | 27.6 | 17.7 | | 2.09 | 1.77 | 0.32 | | |
| *Sep*[1] | 27.6 | 17.4 | | 1.99 | 1.74 | 0.25 | | |
| Oct | 27.6 | 16.0 | | 2.09 | 1.60 | 0.49 | | |
| Nov | 24.0 | 13.0 | | 1.09 | 1.30 | -0.20 | | |
| Dec | 26.4 | 13.7 | | 1.12 | 1.37 | -0.26 | 2.6 | 81 |
| Jan | 26.4 | 13.2 | | 1.03 | 1.32 | -0.29 | 2.9 | 90 |
| Feb | 21.6 | 10.4 | | 0.77 | 1.04 | -0.26 | 2.7 | 76 |
| Mar | 21.6 | 9.9 | | 0.70 | 0.99 | -0.29 | 3.0 | 93 |
| Apr | 21.6 | 10.8 | | 0.91 | 1.08 | -0.17 | 1.7 | 51 |
| May | 30.0 | 21.9 | | 3.56 | 2.19 | 1.37 | | |

**Appendix Table 8b: Net energy maintenance (NEm) consumed and required by above cow and resultant changes in empty body weight (EBW) and body condition score (BCS). Note: See Table 6's footnotes.**

| Mon | NEm Mcal/day Consumed[2] | | NEm Mcal/day Required[3] | | | | NEm (Mcal) Balance | EBW (lb)[4] | BCS[5] | Mcal $NE_{\Delta}$[6] |
|---|---|---|---|---|---|---|---|---|---|---|
| | 30% Protein | Total | NEm (M) | Cold | Activity | Sum | | | | |
| Jun | | 21.1 | 7.9 | | 4.0 | 15.0 | 6.1 | 1065 | 5.5 | 226 |
| Jul | | 21.1 | 8.3 | | 4.2 | 18.2 | 2.9 | 1137 | 6.3 | 264 |
| Aug | | 17.7 | 8.5 | | 4.3 | 18.5 | -0.8 | 1167 | 6.6 | 264 |
| *Sep*[1] | | 17.4 | 8.4 | | 4.2 | 17.5 | -0.1 | 1156 | 6.5 | 264 |
| Oct | | 16.0 | 8.4 | 0.7 | 4.2 | 17.1 | -1.1 | 1155 | 6.5 | 264 |
| Nov | | 13.0 | 8.4 | 0.8 | 4.2 | 16.1 | -3.1 | 1140 | 6.3 | 264 |
| Dec | 2.3 | 16.1 | 8.2 | 0.6 | 4.1 | 14.8 | 1.3 | 1108 | 6.0 | 264 |
| Jan | 2.6 | 15.8 | 8.2 | 0.6 | 4.1 | 15.0 | 0.8 | 1122 | 6.1 | 264 |
| Feb | 2.4 | 12.8 | 8.3 | 0.3 | 4.1 | 14.0 | -1.2 | 1130 | 6.2 | 264 |
| Mar | 2.7 | 12.6 | 8.2 | | 4.1 | 14.5 | -1.9 | 1115 | 6.1 | 264 |
| Apr | 1.5 | 12.3 | 8.1 | | 4.0 | 15.6 | -3.3 | 1090 | 5.8 | 226 |
| May | | 21.9 | 7.8 | | 3.9 | 17.0 | 4.9 | 1042 | 5.2 | 226 |
| Jun | | | | | | | | **1102** | **5.9** | |

**Appendix Table 8c: Protein required for maintenance (M), gestation (G), and lactation (L) by above cow in BCS 5.5 at calving in Jun, calf birth weight 100 lb, peak milk 17.5 lb/day, calf weaned in Feb and pounds protein available in range forage or smooth bromegrass hay and protein supplement. Note: See Table 7's footnotes.**

| Mon | Protein Required (lb/day) | | | | Crude Protein (lb) | | Total Net[7] | Balance[8] |
|---|---|---|---|---|---|---|---|---|
| | M[2] | G[3] | L[4] | Total | Forage[5] | 30% Protein[6] | | |
| Jun | 0.63 | | 0.73 | 1.36 | 3.73 | | 3.73 | 1.71 |
| Jul | 0.65 | | 1.35 | 2.00 | 3.56 | | 3.56 | 1.53 |
| Aug | 0.67 | | 1.36 | 2.03 | 2.90 | | 2.90 | 1.06 |
| *Sep*[1] | 0.66 | | 1.15 | 1.81 | 2.76 | | 2.76 | 1.19 |
| Oct | 0.66 | | 0.89 | 1.55 | 2.90 | | 2.90 | 1.56 |
| Nov | 0.66 | | 0.65 | 1.31 | 1.68 | | 1.68 | 0.37 |
| Dec | 0.64 | | 0.46 | 1.10 | 1.40 | 0.63 | 2.28 | 1.21 |
| Jan | 0.63 | 0.07 | 0.32 | 1.02 | 1.30 | 0.72 | 2.22 | 1.04 |
| Feb | 0.61 | 0.12 | | 0.73 | 2.16 | 0.81 | 1.77 | 0.93 |
| Mar | 0.58 | 0.21 | | 0.79 | 2.16 | 0.88 | 1.96 | 1.17 |
| Apr | 0.54 | 0.33 | | 0.88 | 1.57 | 0.51 | 1.91 | 1.03 |
| May | 0.50 | 0.51 | | 1.01 | 5.35 | | 4.95 | 3.94 |

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Sims, D.D. 2009. Feeding the Beef Cowherd *for Maximum Profit.* SMS Publishing, Amarillo, TX 79114. ***Note: This is an excellent resource that every beef cow producer should have. You can obtain a copy through the following website: www.smspublishinginc.com. Cost of the book is $79.95 plus shipping and possibly WY sales tax. I do not get any of the funds for promoting this book but have found it very helpful in trying to explain the material in this and the last installment of this series.***

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