

# Livestock Efficiency

## STRATEGIC SUPPLEMENTATION: PLANNED LOW COST SUPPLEMENTATION

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**THE STORY IN BRIEF:** When cattle prices are down the only way to increase margin is to decrease costs. Due to the environment in New Mexico range cattle graze dormant forage for at least 40 weeks every year. Supplementation a certain times are required to maintain a yearly calving interval. What is the minimum amount of supplement required? When should supplement be fed to be the most effective? What should the supplement be composed of? We have been working on discovering the answers to these questions. We have organized our supplementation plan into a program called “New Mexico Strategic Low Cost Supplementation”.

**THE PROBLEM:** Supplementation used effectively can be profit generating. Supplements can enhance health, alter milk production, improve reproduction and maintain body condition. Supplementation however is a cost. The cost is not only composed of the feed itself but also the associated costs of delivery to the pasture, storage, transport from a production site and ????. Every year is different so that calls for a different supplementation regime when supplied strategically. .

### **OBJECTIVES:**

To develop a practical low cost effectively simple strategy for supplementing the cow herd at the Corona Range and Livestock Research Center.

### **EXPECTED OUTCOMES:**

To maintain a 95% pregnancy rate, with 80% of the cows calving in the first 30 days of the breeding season while spending no more than \$30 per cow per year in 3 out of 5 years.

**DURATION:** 1992 to present (ongoing)

**APPROACH:** In New Mexico, cows graze dormant brown-colored vegetation for nearly 9 months of each year. The lack of green color is a sign that this feed is low in nutritional quality. We know that it contains a high concentration of slowly digestible fiber; it is low in highly digestible nutrients such as starch and fat and is less than 7% crude protein (more like 5% crude protein or less). This class of forage is usually less than 50% digestible.

When cattle consume a low protein diet as described above, digestibility, intake and productivity are negatively impacted. Usually this negative effect occurs when forage crude protein content is less than 7%. Protein supplements that supply approximately 0.3 lb of ruminally degradable crude protein per day (1.0 lb of a 40% crude protein

supplement) will usually improve digestibility and intake. Intake may improve from 5% up to 40% (on rare occasions) and digestibility will increase 2 to 5 percentage units. If a cow is consuming 20 lb of forage per day (50% digestible or 50% TDN) and she consumes 1.0 lb of a 40% crude protein supplement (70% TDN), we might expect a 5% (1.0 lb) increase in grazed forage intake. The impact of this is shown below.

1.0 lb improved forage intake \* 50% TDN = 0.5 lb additional TDN from forage

1.0 lb supplement \* 70% TDN = 0.7 lb TDN due to supplement

0.45 + .3 = 1.7 additional lb TDN due to protein supplementation

Both protein nutrition and energy nutrition are improved with protein supplements fed to cattle grazing dormant range forage.

There are many sources of protein available; these include non-protein nitrogen (NPN) such as urea, and natural protein sources such as oil seed meals (soybean, cottonseed, sunflower meals) and byproduct feeds (brewers dried grains, distillers dried grains, corn gluten meal, blood meal, feather meal, fish meal, etc.). Non-protein nitrogen has been shown to improve forage intake in many situations when forage protein was low. Microorganisms living in the rumen that digest fiber use non-protein nitrogen. However, natural protein sources usually improve intake and cow weight change compared to supplements that contain urea as the sole source of protein. The reason for this is due to the rate of protein release from the supplement and the natural protein provides other nutrients needed by the microbial population. Higher-protein, manufactured cubed supplements (30% or more crude protein - CP) can contain as much as 15% of the protein from NPN with little change in animal response compared to supplements without urea. A traditional natural protein supplement is made of 80% or more of an oil seed meal (such as soybean or cottonseed meal). This supplement is very effective when fed at 1.0 lb per day during pregnancy or for a lactating cow in good body condition with access to high quality range forage. This type of supplement is expected to reduce weight loss. Another effective formulation may include a mixture of protein sources. This mixture would include urea (less than 15% of total CP) which is very rapidly released in the rumen, plus an oil seed meal, which is used in the rumen at a moderate rate, plus a byproduct protein source, which is broken down very slowly with a large portion bypassing to the small intestine. The ideal formulation would provide 50% of the protein as available in the rumen and 50% bypassing the rumen to supply approximately 300 to 340 g crude protein per day. These combination types of protein supplements are most effective when nutrient requirements are high and cows are thin and losing weight. The most effective period for feeding this supplement would be during the last month of pregnancy and after calving and before breeding. This supplement stimulates intake and supplies protein directly to the cow that is needed for nutrient balance, fetal development, milk production, and reproduction.

Strategies that may be followed using the above-described supplements would use 4 levels of high protein supplementation (32% crude protein and greater)

- Level 1 – 0.25 lb supplement self fed per day (minute)
- Level 2 – 0.5 lb supplement per day fed 1 day per wk (mini)
- Level 3 - 1.0 lb supplement per day (fed every other day) (moderate)
- Level 4 – 2.0 lb supplement per day (fed 2 times per wk) (max)

Level one is a self fed supplement composed of 50% mineral mix and 50% bypass protein. It is consumed at a rate of 0.25lb per day. It is effective when cows need a little supplement to optimize the environment in the rumen. The protein is used very efficiently.

The 0.5 lb per day level would be used after weaning and during middle gestation to optimize digestibility and intake, diminish weight loss, and minimize costs and labor. This program is most successfully implemented by feeding 1 day per week supplying 3.5 lb per head at one feeding. Cows would be in fair to good condition and forage conditions good so cows could be selective in their diet.

The third level, which is more potent, is appropriate for winter and gestation supplementation to supply 1.0 lb per day of a natural protein (with a little urea) supplement (30 to 40% CP). This could be fed 2 to 4 times per week or every other day. Lastly, the most robust supplement made of a mixture of proteins (NPN + natural proteins + bypass/byproduct protein) would be fed at a rate of 2.0 lb per head per day. It would contain 36% crude protein that is 50:50 ruminally degradable:ruminally bypass protein. This could be effectively fed to thin pregnant cows and lactating cows that are losing weight. This could also be fed 2 to 4 times per week. Studies at New Mexico State University and in Australia (Leng 2003) have shown improvements in body condition and reproduction when supplements like these are fed to range cows after calving and up to 14 days into breeding. This supplement can be further improved by adding 80grams per day of calcium propionate.

The level 1 and 2 of protein supplementation is the most efficient since the biggest benefit occurs with the lowest amount used, following the relationships of a diminishing returns curve. On the other hand level 3 will give the maximum benefit but at the lowest efficiency. However the efficiency is in the range of two units of supplemental protein will give one unit of gain (Figure3).

Studies at New Mexico State University have been conducted to investigate the relationships between the type of supplement fed to range raised replacement heifers and pregnancy rate. In a 4 year, study heifers grazed the NMSU Corona Range and Livestock Research Center and were supplemented with one of two supplements that were both 36% crude protein but differed in proportion of ruminally degradable to bypass protein. The two supplements contained either 65:35 or 50:50 ruminally degradable: bypass protein. At breeding time in the spring, the average heifer weighed less than 275 kg. Even though there were no strong differences in winter weight gain there was a 15% higher pregnancy rate in the heifers fed the 50:50 protein supplement. This demonstrates an influence of bypass protein on reproduction independent of body weight gain.

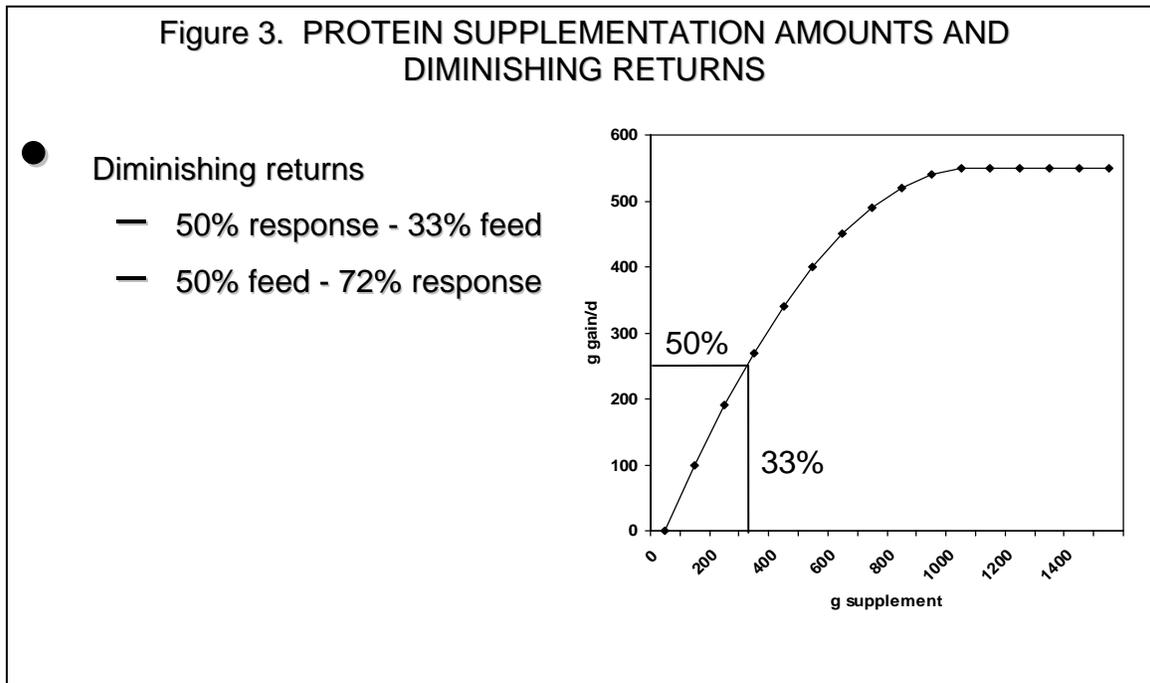


Figure 3. Diminishing returns curve relationships show that the lower amounts of supplement are used most efficiently.

**RESULTS:** The strategic supplementation concept had been applied to the management of the Corona Range and Livestock Research Center cow herd. Our purchased feed costs vary from year to year (ranging from less than \$30 to nearly \$50 per cow per year). The cows have maintained a 90%+ pregnancy rate in the fall with 80% of the cows calving in the first 45 days of the calving season.

There are 2 important underpinnings to an effective strategic supplementation program. The first is that a cow must have the ability

**POTENTIAL APPLICATION:** Ranchers that are motivated by cost reduction may find the additional risk of a strategic supplementation program is worth the exposure. We are continuing to fine tune the program.

**EDUCATIONAL PLAN:**

10. Currently working on a demonstration experiment with 5 cooperator ranches. .

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