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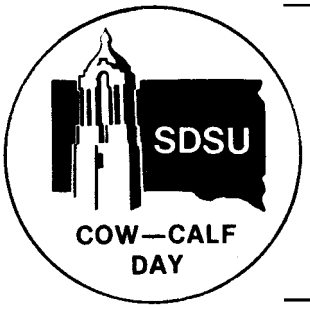

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Dept. of Animal Science Report

Supplementation programs are very much a part of our cow-calf program. The type of supplementation may vary throughout the year as well as from year to year. A good manager knows the type of supplement that his herd needs. Supplements are available in many forms from commercial distributors and can consist of many types of feeds, minerals and vitamins. Many producers choose to develop their own supplements utilizing feeds produced on their ranch or that can be purchased locally.

A "supplementation program" may be defined as "a program which provides the difference between the nutrients required by livestock and the nutrients available in their major food supply." For a producer to evaluate the needs of his herd, he must know the nutrient requirements for his cattle and the nutrient availability in the feed supply.

Nutrient Availability and Requirements

The nutrient requirements of beef cattle are well documented by research and are readily available to producers. Table 1 shows the recommended daily nutrient allowances for the brood cow during different periods of her production cycle. A close look at the requirements shows the periods in her productive cycle which are most critical, those being the last third of pregnancy and calving through breeding.

Unlike the nutrient requirements for beef cattle, the nutrient content of feeds is not as well documented. For example, barley raised on the west coast may be only 11% protein, while barley in our region may average 13%. There are also large variations in grains and forages produced within the same state and even within the same county. Therefore, it is recommended that analysis be done on forages and grains to determine nutrient content.

Table 2 indicates the average nutrient composition of feeds common to South Dakota. The values given are only averages and may differ substantially from your feed, depending on climatic and soil differences.

When and With What to Supplement

Mineral Supplements. Beef cattle should always be provided a palatable source of salt. Salt in the loose form is preferable, as cattle have no trouble obtaining adequate intake (1.0 to 1.5 ounces per head per day).

Prepared for presentation at Cow-Calf Day, Brookings, South Dakota, December 10, 1980.

TABLE 1. NUTRIENT REQUIREMENTS FOR BEEF CATTLE BREEDING HERD[a]

Weight (lb)	Minimum dry matter consumption (lb)	Total protein (lb)	TDN (lb)	Ca (g)	P (g)	Vitamin A (1000 IU)
	Pregnant Yearling Heifers - Last 3 to 4 Months of Pregnancy					
827	15.9	1.4	8.4	15	15	20
937	17.2	1.5	9.0	16	16	22
	Dry Pregnant Mature Cows - Middle Third of Pregnancy					
882	13.4	.80	7.3	11	11	17
1102	15.9	.90	8.6	13	13	20
1323	18.3	1.1	9.8	15	15	23
	Dry Pregnant Mature Cows - Last Third of Pregnancy					
882	15.4	1.0	8.7	14	14	21
1102	17.9	1.1	10.0	15	15	24
1323	20.3	1.3	11.2	17	17	27
	Cows Nursing Calves - First 3 to 4 Months Postpartum					
882	19.4	1.8	10.4	25	25	21
1102	21.6	2.0	11.7	27	27	24
1323	24.2	2.2	13.0	28	28	27

[a] Nutrient Requirements of Beef Cattle, Fifth Revised Edition, National Academy of Sciences, Washington, D. C. (1976).

Calcium and phosphorus are needed for proper development and reproduction. These should be provided in a form that is readily accessible. Again, a loose form is preferred to a block for insuring adequate intake. Since the brood cow is primarily consuming forage which is adequate in calcium, her primary need for supplementation is phosphorus. A supplement high in phosphorus is what the cow-calf operator needs.

Tests of soil and forage indicate that iodine and cobalt levels may be borderline or deficient in some parts of South Dakota. While severe deficiencies are seldom seen, borderline levels are likely to be present in many areas where low quality feeds are used. Therefore, these elements should be supplemented. The most effective way to supplement is through the salt source. Thus, it is recommended that iodized salt be used routinely at the minimum and preferably trace mineralized salt, which contains both iodine and cobalt, in areas which are known to be borderline in both elements.

TABLE 2. COMPOSITION OF FEEDS COMMONLY USED IN BEEF CATTLE DIETS[a]

Name	Dry matter (%)	TDN (%)	Protein (%)	Ca (%)	P (%)	Vitamin A (1000 IU) (per lb)
Alfalfa hay, full bloom	87.7	53	15.9	1.28	.20	6.7
Barley, grain	89.0	83	13.0	.09	.47	--
Barley, straw	88.2	41	4.1	.34	.09	--
Brome, hay	89.7	52	11.8	--	--	--
Brome, grazed, early vegetative	32.5	63	20.3	.59	.37	83.5
Brome, grazed, mature	56.1	50	6.4	.30	.26	--
Corn, grain	89.0	91	10.0	.02	.35	.36
Corn, ear	87.0	80	8.9	.06	.30	--
Corn, silage	30.0	70	8.4	.28	.21	--
Blue grama, grazed, early vegetative	41.0	64	13.1	.53	.19	--
Blue grama, grazed, mature	63.4	58	6.5	.34	.12	5.5
Needleandthread, grazed, stem cured	86.0	--	4.0	.88	.07	--
Oats, grain (32 lb)	89.0	76	13.2	.11	.39	--
Oats, hay	88.2	60	9.2	.26	.24	18.3
Oats, straw	90.1	48	4.4	.33	.10	--
Prairie hay, mid-bloom	91.0	51	8.1	.34	.21	3.65
Sorghum, grain	89.0	80	11.7	.05	.35	--
Sorghum silage, grain type	30.0	61	7.5	.25	.18	--
Sudangrass, hay	88.9	59	12.7	.56	.31	--
Sudangrass, grazed, mid-bloom	22.7	63	8.7	--	--	--
Sudangrass, silage	25.0	59	10.2	.64	.22	--
Wheat, grain	86.5	88	16.1	.06	.47	--
Wheat, straw	90.1	46	3.6	.17	.08	--
Wheatgrass, hay	92.0	58	10.8	.33	.21	--
Wheatgrass, grazed, early vegetative	30.8	67	23.6	.46	.35	78.8
Wheatgrass, grazed, full bloom	50.0	55	9.8	.39	.28	27.9
Wheatgrass, grazed, mature	60.0	52	5.7	.29	.17	13.7
Wheatgrass, grazed, post-ripe	80.0	40	3.1	.27	.07	--

[a] Table values adapted from National Research Council publications on Nutrient Requirements of Beef Cattle, Fifth Revised Edition, National Academy of Sciences, Washington, D. C. (1976).

A simple way to make a mineral supplement is to mix a source of phosphorus (dicalcium phosphate, bonemeal, etc.) with iodized or trace mineralized salt. A mixture of 50% phosphorus source and 50% salt source will be adequate for most situations. Increasing the phosphorus component to 67% may be desirable and advantageous during the breeding season to provide extra phosphorus. If these individual components are not available, the use of commercial high phosphorus mineral mixtures is recommended.

Vitamin Supplements. Vitamin A is the vitamin of most concern for beef cattle. Lush pastures and green, leafy forages, especially legumes, are very high in vitamin A activity. Poor quality roughages and grains are almost devoid of this nutrient.

Thus, vitamin A may only be deficient in the brood cow's diet during the late fall and winter while grazing poor quality forages or during drought years when little or no green grass is available. Due to the animal's ability to store vitamin A in the liver and fat depots during times of abundance, a producer need only be concerned with availability over the long haul. Therefore, if daily supplementation is not practical, cattle can be injected with 1 to 2 million I.U. of vitamin A, which should provide sufficient quantities for about 100 days.

Vitamin A demands are highest in late gestation and early lactation, a time when vitamin A activity of feeds may be low due to storage losses. Therefore, it is a good practice to liberally supplement with vitamin A starting 60 days prior to calving, especially if high quality green forages are not being fed. The cost of supplementing vitamin A is so cheap that a producer should not take the risk of being deficient.

Protein Supplementation. Adequate protein is needed to achieve maximum growth, reproduction and milking ability. The protein content of actively growing forages and properly cut and cured hays is adequate for the cow during most of her productive cycle. Protein supplements may be needed during the fall and winter when cows are grazing crop aftermath or low quality range grasses. Extra protein may also be needed above that provided in the hay immediately prior to and following calving.

The best source of protein for the cow herd is protein from natural sources such as alfalfa hay, soybean meal, cottonseed meal, etc. The performance of cows fed high nonprotein nitrogen (urea) supplements has consistently been lower with respect to percent cows pregnant and weaning weight of calves. Many studies have confirmed that nonprotein nitrogen sources are relatively poorly utilized in low energy rations which are typical of what our cow herds receive.

Protein supplements do not have to be offered on a daily basis. Providing protein two to three times a week is sufficient. However, keep in mind that the total protein provided each feeding must then be doubled or tripled to provide what the cow needs on a daily basis.

Energy Supplementation. Unlike protein, energy supplements should be provided daily. The amount of energy needed for a brood cow varies with her stage of production. Energy demands are lowest in late fall and early winter after the calf is weaned and during the second 3 months of gestation. During the last 60 to 90 days of pregnancy, her energy demands increase by 15% as the fetus begins its rapid growth. Therefore, it is recommended to save the best quality feed for the last 2 months of gestation and the first 3 months of lactation.

Calving through rebreeding is the most critical stage in the cow's production cycle when energy requirements peak. Feed intake increases by 50% and energy demands increase by 70% compared to the dry cow. Due to high water content (75 to 85%) of spring grasses, it may be profitable to provide additional energy during the early pasture season. If cows are not gaining weight, grain or hay supplementation may be necessary.

Generally, good pastures will meet the energy demands of the cow after rebreeding. Situations where this is not true are overstocked rangelands and pastures, range in poor condition or drought stricken ranges where only last year's grass is present.

Grains are the best source of energy. They may be offered in various forms to the brood cow. The form of supplementation used will depend on labor, feed bunk availability, cost and availability of feed.

Systems of Pasture and Range Supplementation

The method of supplementation will vary from one operation to the next, depending upon the feeds raised on the ranch, the type of feeding equipment available and the nutrient being supplemented. Economics will dictate the method of supplementation chosen. This does not always mean that the cheapest supplement is the most economical.

The best way to make an economical comparison is to determine the cost of a unit of the nutrient under consideration. An example will help illustrate. If we want to compare the cost of protein supplementation between alfalfa hay costing $60 per ton and soybean meal costing $225 per ton, we need to know the protein content of each feed. If alfalfa hay is 15% crude protein, a pound of protein would cost 20 cents ($60/2000 lb x 1/.15 = $.20). If the soybean meal is 45% crude protein, a pound of protein would cost 25 cents ($225/2000 lb x 1/.45 = $.25). The same procedure can be used for energy, minerals or vitamins to determine the best buy.

Cattlemen can lessen the daily labor required in feeding supplements by (1) hand feeding cubes at intervals rather than daily, (2) use of protein or energy blocks, (3) use of liquid protein supplements or (4) self-feeding salt-feed mixtures. Although more labor is required, many ranchers choose to supplement daily using grain, hay or alfalfa cubes.

In most situations, feeds raised on the ranch are more economical to use than purchased cakes, cubes or blocks. However, the use of commercially prepared products may be a viable alternative under some situations and may provide a means of supplementation without the additional expense of feed bunks or other equipment.

Range Cubes, Pellets or Blocks. Cubes, pellets and blocks can generally be fed on the ground with little or no waste. They can be purchased with low (12% crude protein) to high (40% crude protein) protein content. High protein products generally contain a portion of the protein as nonprotein nitrogen such as urea. When supplementing cattle on poor quality forages, the utilization of urea will be low (30 to 60%). Therefore, the amount of digestible protein obtained from supplements high in urea will be considerably lower than protein supplements containing all natural protein. Read the tag carefully for the urea content on high protein supplements.

When energy is the nutrient needed, low protein blocks and cubes are the best buy. One should also be careful of the feed source comprising the cake. Low protein cakes made from poor quality screenings which contain a high percentage of hulls and weed seeds may not be much better than good hay for energy. Generally, the high energy cakes should be mostly composed of corn or a combination of corn, barley, wheat, milo and oats. One should avoid products with over half of the cake as wheat due to the tendency of wheat to ball up in the intestine. This may not present a problem when fed at rates below 5 pounds of cake per head per day.

Intake of blocks is controlled by degree of hardness and/or salt or fat additions. A producer must determine how much intake is desirable of such a product and find the block which best fits his needs. Most blocks are fed at the rate of one per 15 head of livestock. However, this will vary with desired consumption and hardness of the block.

Liquid Supplements. The use of lick wheels or other dispensing devices for liquid supplements has been very popular the past few years. The use of liquid supplements provides a means of supplying protein, energy and other nutrients that is convenient as long as cattle do not consume more than they need. Most liquid supplements contain a high proportion of nonprotein nitrogen. This increases the chance for ammonia toxicity, especially when intake cannot be well controlled. Many deaths have been documented due to ammonia poisoning as a result of over consumption of a liquid supplement. It generally occurs following a few days of inclement weather in which the cows do not eat or drink normally and, when the weather clears, they over consume the liquid.

Table 3 presents performance data obtained from a study where cows were wintered on poor quality roughage with no supplement, with a supplement of liquid molasses or with liquid molasses plus urea. Change in body weight of the cows was more favorable when no liquid supplement was provided, illustrating the poor utilization of nonprotein nitrogen with low quality forages. This, combined with the difficulty of regulating liquid intake, makes it difficult to justify the use of nonprotein nitrogen liquid supplements from an animal health or nutrition standpoint.

Salt-Feed Mixtures. The practice of using salt to limit feed consumption on pasture or range has been used for quite some time. It has been used as a labor-saving device for cattle in inaccessible and rough areas.

The proportion of salt to feed may vary anywhere from 5 to 40% with the actual intake of feed supplement limited to 1 to 5 pounds daily. A good way of starting cattle on salt-feed mixtures is to mix 1 pound of salt with 4 pounds of feed and to increase the proportion of salt in the feed as animals

TABLE 3. PERFORMANCE OF DRY BEEF COWS FED LIQUID SUPPLEMENTS FOR 118 DAYS (WINTERING TRIAL)[a]

Measurement	Timothy hay[b]	Timothy hay + molasses[c]	Timothy hay + molasses + urea[d]
Number of cows	22	22	22
Initial body weight, lb	721	719	712
Total change in body weight, lb	-2.0[e]	-25.0[f]	-30.0[f]
Daily hay intake, lb	18.3[e]	13.2[f]	13.8[f]
Daily supplement intake, lb	--	4.6	4.6

[a] Bond, J. and T. S. Ramsey. 1973. USDA, Beltsville. J. Anim. Sci. 37(2):593.
[b] Crude protein content of timothy hay was 4.3%.
[c] Molasses contained 2.6% crude protein equivalent.
[d] Urea was added to molasses to bring protein content to 8.2%.
[e,f] Means on the same line having unlike superscripts are different (P<.05).

become accustom to the mix. By varying the proportion of salt in the mixture, it is possible to hold the consumption at any desired level. However, when the desired level has been reached, continue to monitor consumption as it may change for various reasons.

When using a salt-limiting feed mixture, a good supply of drinking water is important. High levels of salts or other minerals in the water may reduce the intake of the supplement substantially. Locacion of the self-feeders near water may restrict the grazing distribution on range. Therefore, moving the location of the salt-feed mixture periodically will help obtain a more desirable distribution due to animals following the feed supply.

Summary

This paper reviews the need for various supplements and different ways by which they can be provided. The quantity of supplement needed is not discussed and will vary from one situation to another. Therefore, cattlemen needing this type of information should contact their local extension agent who will be able to help with these questions.