

## Raising Farm Direct Beef: Part 1-Nutrition

Dr. J. Daniel Rivera-Associate Extension/Research Professor, Mississippi State University

Dr. Brandi B. Karisch – Extension Beef Cattle Specialist, Mississippi State University

2020 has been a wild ride so far, and the beef industry has faced many unique challenges. Disruptions in the beef supply chain in the past months have led many people to reconsider their traditional marketing strategies. Consumers have noticed increased prices along with supply disruptions and started to ask local beef producers about options for buying beef locally. Many cattle producers have begun to consider retaining ownership of their beef cattle and finishing them on farm. Much is known regarding feeding cattle out in what we might term “traditional systems” where the animal is maintained in an enclosed lot and fed a high concentrate (grain) diet until finished; however little data exist regarding finishing cattle at home in extensive conditions with non-traditional environments. This 3-part series will focus on some basic information related to raising and marketing farm-direct beef. In the coming months we hope to provide as much data as possible so producers can make their own decisions regarding what to do with their animals. This first article will focus on the nutritional requirements of fed cattle, and subsequent ones will focus on the end product, and the economic considerations for finishing beef at home.

*Nutrient requirements.* For animals to meet targeted goals for growth and finishing, they must be provided with a source (be it a feed or forage) that provides the nutrient requirements. The National Research Council (NRC) has to date published eight editions of the nutrient requirements for beef cattle with the most recent being published in 2016. Table 1 provides the nutrient requirements in diet nutrient density (percent) for cattle at 500, 700, and 900 lbs.

Table 1. Nutrient requirements of growing and finishing steer and heifer calves with an estimated 1,200 lbs at finishing

Body weight (lbs)	ADG (lbs)	Dry matter intake (lbs/day)	Diet Nutrient Density					
			TDN (% DM)	NEm (Mcal/lb)	Neg (Mcal/lb)	CP (% DM)	Ca (%DM)	P (% DM)
500	1.5	12.6	64	0.64	0.37	11.2	0.42	0.22
	3.0	12.1	83	0.92	0.62	16.9	0.74	0.35
700	1.5	16.2	64	0.64	0.37	10.1	0.33	0.19
	3.0	15.5	83	0.92	0.652	14.6	0.54	0.27
900	2.0	23.3	60	0.61	0.35	8.4	0.28	0.16
	3.8	21.5	80	0.90	0.61	12.0	0.44	0.23

*Energy.* Growing and finishing beef cattle have specific nutrient requirements for maintenance and growth. Once maintenance needs are met, any excess energy can go towards growth.

Think of maintenance needs as what the animal needs in order to keep the body functioning at that specific weight and under specific conditions. For example, an animal that weighs 1,200 lbs will have a greater maintenance requirement than an animal that weighs 800 lbs. Additionally, a 1,200 lb animal in an excessively hot/humid environment will have higher maintenance requirement than one in a more temperate environment. Anything that increases maintenance requirements, decreases energy available for gain, thereby reducing gain. Keep this in mind when selecting an animal to finish out. Larger framed animals will have greater maintenance requirements than smaller framed animals, which might lead to more days on feed, and greater overall feed cost. Nonetheless, the large framed animal will provide more pounds of beef, but it will come at a greater cost.

Once maintenance requirements are met, the excess dietary energy will go towards gain. Gain is calculated based upon the energy content of the tissues in question, or the energy content of gain. Roughly speaking, the more weight an animal puts on, the greater the energy required for gain will be. Using 1996 NRC equations, an 850 steer gaining 2 lb/day will need 3.5 Mcal of energy per day to gain 3 lb/day; it would need 5.54 Mcal of energy; and to gain 4 lb/day it would need 7.69 Mcal of energy per day. In order to achieve these higher rates of gain, high energy feedstuffs will need to be utilized. Typically grains (corn, milo, wheat) will be considered high energy feedstuffs used to finish cattle. Dried distillers grains with solubles (DDGS) are also considered high energy, but concerns regarding sulfur and fat content limit the amount that can be fed in a diet. Other "by product" feeds such as bakery waste (breads, doughnuts, cookies, etc.) can be used as well, however it is not recommended due to the high variation in the nutrient content and quality associated with these waste feeds.

*Protein.* Protein in beef diets is especially important if the animal is younger and is still putting on muscle tissue. Cattle will typically grow in a sigmoid curve, with a period of rapid weight gain followed by a plateauing of weight gain as the animal reaches maturity. That period of rapid weight gain is when greater protein is required, typically 14-16% of dietary dry matter, however, once that animal begins to "finish" that requirement can go to 10-11%. Typical sources of protein will be cottonseed meal, soybean meal, DDGS, and to a lesser extent corn gluten. Non protein nitrogen (urea) can be fed, however it is not recommended since it will require being fed at a limited amount and careful monitoring/mixing is required when using urea.

*Fiber.* Fiber in a finishing diet serves the purpose of reducing the potential for acidosis and maintaining rumen health. Fiber will come from the forages used in the finishing diet. High concentrate diets will be rapidly digested which can lead to acidosis. Acidosis is the rapid production of volatile fatty acids from digestion of high starch (grain) feeds. The acid overwhelms the body's ability to expel it. It can cause rumenitis, laminitis, cause animals to go off feed, poor performance and even death. Incorporating forage/fiber into diets can result in diluting the energy content of the feed, slow down rate of digestion, and encourage mastication. Mastication leads to salivation; saliva has natural buffers which can help reduce the potential for acidosis. In general, most complete diets fed in a non-traditional system need 15-20% roughage in them to be both practical and safe from an animal management standpoint.

*Minerals and vitamins.* Minerals and vitamins are often overlooked, however we need to pay special attention to their use in finishing beef cattle. Typical finishing rations will have high levels of grain which will lead to high Phosphorus levels. This will throw the Calcium : Phosphorus ratio out of balance, so a mineral with Calcium is required to ensure that this balance is properly maintained. Various minerals will have differing Ca/P content, therefore it is recommended to talk with your Extension agent with regards to properly choosing a mineral for your finishing operation. Zinc and copper have also shown some benefit in terms of growth in finishing diets.

*Additives.* The use of additives can be somewhat controversial. Some additives have claims that are unfounded, especially some direct fed microbials. Other additives such as monensin and lasalocid are regulated to be mixed only in specific amounts, and could be toxic if improperly mixed, therefore it is our recommendation that if you want to feed monensin or lasalocid (Rumensin and Bovatec are their trade names) you purchase it in a commercially available feed already mixed in.

*Feeding Systems.* While a traditional grain finishing system involves cattle being held in a drylot with a complete feed delivered multiple times a day, this is often not feasible for small scale producers finishing a small number of animals. Find the system that fits best with your resources. Often this may involve having finishing steers on a small pasture or in a small lot with a bale of hay rather than delivering a complete custom mixed ration. Often simple is the best solution, a commercially available feed with a few modifications could be a better fit than a complicated custom mixed ration.

*Notes to ponder:*

When possible, it is better to deliver feed twice per day rather than just once per day.

Dry matter intake will increase with body weight, don't be surprised to see some animals eating 30-35 lbs of feed.

Increasing the energy content will increase ADG, however too much energy in the form of grain can lead to acidosis.

A small-scale finishing study examining three dietary styles is currently being conducted at the White Sand Research Station:

1. Finishing type ration (20% roughage)
2. Limit fed corn/corn gluten mix (animal has access to pasture)
3. Limit fed soybean hull/corn gluten mix (animal has access to pasture).

The finishing ratio is indicative of one we would recommend to a producer. It utilizes ingredients found in MS: Cracked corn, soybean hulls, corn gluten, cotton gin trash, and a mineral mix. The other two rations are fed at 1.95% of Body weight (dry matter basis) to provide the concentrate portion and allow the animal to utilize pasture as the roughage source. The study began in early June and on July 7 we took 28 d body weights. Cattle fed the diet had an ADG of 2.14, and surprisingly the corn and soybean hull diets had similar performance at 1.6 lb/d.