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Maximizing marbling in feedlot cattle

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This issue explains how genetics, early-life nutrition, and management determine marbling and why the opportunity to maximize it begins long before cattle enter the feedlot.

Achieving high marbling remains the holy grail for many feedlot nutritionists. Genetics sets the potential, but nutrition and management determine how much eventually appears in the carcass. Marbling is intramuscular fat, not the same as subcutaneous or internal fat, although all tend to increase as cattle mature. The objective is therefore not simply to produce fatter cattle. Excess external fat adds feeding costs and may be discounted, whereas intramuscular fat can increase carcass value. The challenge is to support muscular growth and marbling while limiting the cost of additional fat deposited elsewhere.

With breeds inclined toward marbling, such as Angus, Hereford, and Shorthorn, the task is naturally easier. Yet, continental European breeds such as Limousin, Charolais, and Simmental can also develop meaningful marbling when managed and fed correctly. These cattle can produce better-marbled beef than breed stereotypes suggest. Unfortunately, many programs address marbling only after cattle enter the feedlot. Earlier nutrition deserves attention, too, although pasture rearing does not necessarily compromise marbling potential. The final carcass reflects a longer chain of genetic selection, maternal and early-life nutrition, growth, health, finishing management, and harvest timing.

Why marbling matters

Marbling improves the eating experience, especially juiciness and flavor, and often contributes to tenderness. It also affects carcass grade and price in markets that reward marbling. Investing in marbling is therefore a commercial decision, not merely a nutritional preference. In my own work, deliberate marbling programs have helped feedlots improve carcass grades and capture higher prices. The additional premium must, however, cover the extra feeding costs and any carcass weight or fat discounts. A higher grade alone does not guarantee greater profit.

Genetics still lead

British-type breeds generally marble more readily than continental breeds that have been selected more heavily for muscularity and lean yield. Cattle with substantial Zebu influence also tend to marble less than British-type cattle. These are broad tendencies, and considerable variation exists within every breed. Some British-type cattle can marble poorly, while selected continental cattle can produce well-marbled carcasses. Reliable carcass information, including marbling expected progeny differences where available, is more useful than breed name alone. Nutrition cannot remove genetic limits, but poor nutrition can prevent good genetics from being expressed.

Nutrition defines the result

Grain-finished cattle tend to develop more marbling than cattle finished heavily on forage because high-energy diets support greater energy intake and fat deposition. Previous growth, health, age, and days on feed also influence the response. Careful adaptation and consistent feed intake help cattle use the finishing diet effectively. Where implants are permitted, the implant program also deserves attention because it can affect marbling and quality grade. Harvest timing must balance marbling against feeding costs and carcass discounts.

The marbling window matters

Intramuscular fat cells begin forming before birth, and their development remains active during early life. The period around early weaning to approximately 250 days of age is often described as a marbling window. This is not a fixed deadline or a guaranteed response to extra feed. Early nutrition can influence intramuscular fat-cell development, but small, developing adipocytes have also been observed in older cattle. As cattle mature, enlargement of existing cells becomes increasingly important. Responses to early feeding depend on genetics and subsequent management.

Early feeding is pivotal

Pasture-reared calves need adequate energy and protein before and around weaning. However, maintaining growth does not guarantee a specific marbling response. Some studies have increased marbling through early weaning combined with high-starch feeding. Creep feeding has produced less consistent results and may increase weight or external fat without improving marbling. Evaluate these approaches separately, avoid preventable growth setbacks, and use extra feed when the expected carcass response justifies its cost. Early weaning requires facilities and management that protect calf health and intake. A balanced growing diet remains necessary whether or not extra marbling is achieved.

Reward the cow-calf producer

A successful marbling program requires cooperation among the cow-calf producer, backgrounder, feedlot, and processor. Cow-calf producers bear the cost of better genetics, maternal nutrition, creep feeding, health management, and early weaning, while much of the benefit may be captured later. They must therefore be compensated for producing calves with documented premium carcass potential. This is difficult in a fragmented industry, where feedlots often buy calves with limited information about genetics, early nutrition, health history, or previous growth. Premium programs work best when cattle remain in an identified chain and payment is linked to carcass results.

In Brief, marbling cannot be treated as something created entirely during the final months in the feedlot. Genetics establishes the potential, early nutrition can influence its development, and finishing management remains essential to the outcome. Success requires a carefully designed feeding program, avoidance of preventable growth setbacks, and cooperation throughout the production chain. The commercial objective is a premium that covers additional costs and rewards the calf producer.

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