National Diploma Animal Production

Livestock Production Part 5

Handout 10

Cattle Feedlot Programme

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Cattle Feedlot Feeding Programme

FINISHING DIETS FOR MARKET CATTLE

- The ultimate purpose of finishing process? -Obviously, produce beef that is desirable to the consumer.
- Finished cattle - Mostly marketed between 1 to 2 yr. of age with over 450kg.
- Some cattle may go intothe finishing feedlot at 90to 100 kg at a few monthsof age (calves) and somemay weigh 270 to 370 kg (yearlings), while other may weigh 450 kg or more and older than 1 yr. of age.
- Because of the differences in kind of cattle being finished, obviously the nutrient requirements differ - See the table for some examples of finishing diets.

Composition of typical beef cattle finishing diets (% DM) [Galyean & Duff (1998)]

Ingredient	Processed Corn & Dry Roughage	Whole Corn & Corn Silage	Dry-rolled Corn & Wet Corn Gluten Feed
Roughages			
Sudan grass hay	4	-	8
Alfalfa hay	6	-	-
Corn silage	-	10	-
Grain and grain by-products			
Steam-flaked corn	74.5	-	-
Dry-rolled corn	-	-	52.5
Whole shelled corn	-	71	-
Wet corn gluten feed	-	-	35
Liquid feeds			
Molasses	5	-	-
Condensed distillers solubles	-	4	-
Fat	3	-	-
Supplement*	7.5	15	4.5

* Supplies Ca and P sources, urea and/or natural protein, trace minerals, vitamins, and feed additives.

- Complete (mixed) rations for finishing cattle generally need:
  - CP - 9 to 14% depending on age, size, and growth rate.
  - Energy - Need high concentrate diets (TDN = 65 to 85% or NEg = 0.40 to 0.65Mcal/lb), which can improve performance & carcass traits, and cost less, but more prone to develop acidosis, founder, and liver abscesses.

- Ca - 0.3 to 0.6%. Supplemental Ca is must when using high-concentrate diets &limited access to forage. Ca:P ratio of 2:1.
- P - 0.2 to 0.4%. Grains and high-protein supplements are generally high in P, thus little or no need for supplementation in high-concentrate diets.

Roughage in Finishing Diets

- Although some feedlots use all-concentrate diets, usually, high concentrate finishing diets contain small amounts (3 to 15%) of roughage.
- On the energy basis, roughage can be one of the most expensive ingredients in finishing diets.
- Can be an important component of feedlot diets and have a large influence onruminal function, e.g., the low dietary roughage content has been associated with digestive upsets such as acidosis and liver abscesses.
- Common sources? Alfalfa hay, grass hays, silages (corn, wheat, and grasses), and by-product feeds (e.g., cottonseed hulls).

Roughage Inclusion Rate Can Affect Cattle Performance - Some Examples:

- Faster, more efficient gains by cattle fed either 5 or 10% roughage compared with those fed 0 or 15% roughage in steam-rolled wheat diets.
- With 0, 3, 6, and 9% 50:50 mixture of alfalfa and corn silage in high-moisture cornand dry-rolled sorghum diets:
  - Observed quadratic effects on DM intake and daily gain, and gain wasmaximized at 9% roughage.
  - But, reduced the efficiency as dietary roughage increased from 0 to 9%.

Source

Often, the source is as important as the roughage content and both can interact with grain processing; the effect of source on performance in cattle fed high-concentrate diets may depend on the grain-processing method.

Matching sources and amounts with grains for optimal utilization in high-concentrate diets is desirable, even though the data are limited.

Effects of Roughage on Digestion and Passage

- Effects of roughage in high-concentrate diets - e.g., increasing roughage can increase passage rate of grain in the rumen.
- A source of roughage affects digestion and passage, but the effect could vary with the type of grain in the concentrate.
- High-grain (starch) diets:
  - Often decrease digestion in the rumen, thus shifting it to the large intestine.
  - The LI may not be able to compensate fully for the ↑fibre load - Thus, ↓fibre utilization may partially explain ↓ feed efficiency with increasing roughage.
- With highly processed grains, which are digested extensively in the rumen, little starch would reach the LI, and compensatory digestion of fibre in the LI could proceed without negative associative effects of starch.
- With unprocessed grains, more starch would reach the large intestine, which might have negative effects on fibre digestion in that organ.
- The amount and source of roughage may influence small intestinal digestion of starch - Increased pancreatic α-amylase activity in forage-fed vs. concentrate-fed calves at equal energy intakes has been reported.

Grains, Grain Processing, and Other Feedstuffs

Grain sources to use. - Depend on many factors including location of the feedlot, feed availability, cost, equipment, and palatability.

- Corn - Readily available in the Midwestern and upper Great Plains states.
- Sorghum grain/milo - Commonly used in Southern Great Plains states.
- Wheat, barley, or oats - May become available during certain periods of the year or certain locations.
- Recent advances in the technology may lead to the increased use of alternative grains, e.g., high-lysine corn.

Starch in Grains and Grain Processing

- Starch granules:
    - Starch exists in grains as granules in the endosperm, and the properties of starch granules depend on the particular grain.
    - Highly organized crystalline region contains mostly amylopectin, which is surrounded by a less dense, amorphous region that is high in amylose.
    - Granules are also embedded in a protein matrix, which, particularly in corn and sorghum, can decrease the potential for enzymatic attack and digestion.
- Gelatinization:
    - Occurs with the sufficient energy applied to break bonds in the crystalline region of the granule - e.g., Mechanical, thermal, and chemical agents can initiate the process, but water is necessary.
    - Processing methods with "heat and moisture" (e.g., steam flaking) can cause extensive gelatinization and rupture of starch granules.
    - Heating also can denature grain proteins, which could affect starch digestion.
- Gelatinized grains are typically digested to a greater extent in the rumen and the total tract vs. unprocessed grains.
- Beneficial effects of processing? - "Inversely" related to the digestibility of the unprocessed grain.
- Even without processing, barley and wheat are digested well in the rumen, but some processing is needed for the efficient use of sorghum/milo.
- Bulk density - A practical means of determining the degree of processing, e.g., bulk density of steam-flaked sorghum from 35 to 18 lb/bu can both enzymatic and ruminal rates of starch breakdown.
- Particle size - Affects the rate of digestion; e.g., as particle size decreased in situ, DM and starch digestion for steam-flaked, dry-rolled, and high-moisture corn increased.
- Mixing different grains or the same grain processed by different methods. - Can be an effective way to take advantages of different digestion characteristics among grains and grain processing methods.

By-Products and other Feedstuffs

- Because of lower costs (often), by-product feeds have become important feedstuffs for feedlot diets and others - e.g., whole cottonseed, brewer's grains, distiller's grains, beet pulp, citrus pulp, soybean hulls, wheat middling, cull potatoes, and many others.

- Soybean hulls - Became popular in recent years and can be used efficiently by feedlot cattle when priced competitively.

- Depending on manufacturing processes and grains used, the composition of these products can be variable, thus important to determine the composition.

- Liquid feeds:

    - Fat (tallow, animal and vegetable blends, and soap stocks) is commonly added at 2 to 4% of finishing diets depending on the price, and also molasses and liquid by-products of the corn milling industry are commonly used.

    - Liquid feed - Generally decreases dustiness and often improves palatability.

Protein and Other Nutrients

Protein

Dietary CP content has been increasing in recent years:

- Based on the old NRC (1984), CP requirements for finishing beef steers started on feed at 700 lb and gaining 3 lb/d ranged from "8.9 to 11.7%,"depending on the BW.

- But, based on one survey of nutrition consultants, CP in finishing diets ranged from "12.5 to 14.4%," and added urea ranged from 0.5 to 1.5% of the dietary DM.

Improved performance with added protein?

- More consistent with the use of ruminally degraded sources of CP (e.g., urea and soybean meal), and limited advantages with rumen undegradable protein sources.

- Highly processed grains are readily fermentable in the rumen, and may increase microbial needs for ruminal N, and N in excess of needs might provide ammonia for the maintenance of acid-base balance by the kidney.

Vitamins

- Vitamin A - Usually recommended & a common approach is to supplement the required doses without considering contributions from feedstuffs.

- Vitamin E - Commonly added to receiving diets, and also to finishing diets.

Minerals

- Generally, diets are formulated to satisfy the needs for required major minerals (Ca, P, K, S, Mg, Na, and Cl) and trace minerals (Co, I, Fe, Mn, Se, and Zn).

- Organic trace mineral complexes - Considerable debate on the merit.

Anabolic Agents and Feed Additives

Anabolic Agents

- Currently approved implants for growing-finishing cattle. - Estrogen-based, androgen (trenbolone acetate)-based, and estrogen + trenbolone acetate-based.

- Implants:

    - Increase the rate of gain, feed efficiency, and carcass weight at Choice grade by 25 to 75 kg.
    - Typically increase daily protein and fat gain in the carcass. The effects of estrogen + trenbolone acetate-based may be greater than estrogen-based.
    - Usually, also increase feed intake, i.e., un-implanted cattle usually consume6% less DM than implanted cattle.
  - Use an estrogen-based implant initially and anestrogen + trenbolone acetate-based implant as a second implant.
  - Finishing heifers - Often receive an initial estrogen-based implant and a final and rogen-based implant.
  - Implant programs may increase dietary protein requirements, presumably because of an increased rate of daily protein gain.

Ionophores

- Fed to the majority of finishing beef cattle.
- Three compounds are approved for use in confined beef cattle diets - Monensin, lasalocid, and laidlomycin propionate.
- Effects of ionophores on performance.
  - Monensin - Decreases feed intake, with little change in daily gain, resulting in improved feed efficiency.
  - Lasalocid - Similar or greater intake with increased daily gain, thus improving the feed efficiency.
  - Laidlomycin propionate - Tends to have little effect on feed intake, but increased daily gain, results in improved feed efficiency.

Other Feed Additives

A variety of other antibiotic feed additives are used:

- Virginiamycin - Approved for use in confined cattle fed for slaughter to increase weight gain, improve feed efficiency, and decrease the incidence of liver abscesses.
- Bambermycins - Approved for increased weight gain and improved feed efficiency in confined cattle fed to slaughter and for increased weight gain in pasture cattle.
- Tylosin - Commonly fed to decrease the incidence of liver abscesses in confined cattle and approved for combination feeding with monensin.
- Chlortetracycline (CTC) - Approved for a variety of purposes in various classes of beef cattle; The CTC is generally used to prevent BRD and anaplasmosis and for growth promotion and improvement of feed efficiency.
- Oxytetracycline - Approved for purposes similar to CTC, and also approved for combination feeding with lasalocid for confined cattle to decrease the incidence of liver abscesses.
- Decoquinate - A compound approved for feeding to cattle for prevention of coccidiosis in cattle.
- Melengestrol acetate (MGA) - Used to inhibit estrus in finishing beef heifers, resulting in improved gain and feed efficiency.

Probiotics - Microbial preparations and growth-media extracts:

- Used widely in ruminant production - Yeast cultures and live cultures of Lactobacillus acidophilus and Streptococcus faecium are the most common.
- Microbial cultures have been used primarily for either food preservation, as an aid to restoring gut function, or an agent to enhance feed utilization by ruminants.