INTRODUCTION

This manual has been developed as a study guide for the Florida State Fair Skillathon that is part of the Champion Youth Program. The topic for this year’s Skillathon is nutrition and feeding management.

The Florida State Fair recognizes that agricultural education instructors, 4-H agents, parents, and leaders provide the traditional and logical instructional link between youth, their livestock projects and current trends in the animal agriculture industry. PLEASE NOTE: This manual is provided as a study guide for the skillathon competition and should be used as an additional aid to ongoing educational programs.

Sections are labeled Intermediate & Senior, or Senior to help exhibitors and educators identify which materials are required for each age level.

** Additional information is noted in the study manual for preparing for the Champion of Champions competition.

** Intermediates (age 11-13 as of September 1, 2006)
- Digestive tract parts identification
- Feed classification & identification
- Digestive tract functions
- Feed tag analysis

** Seniors (age 14 and over as of September 1, 2006)
- all of the above plus....
- Implants
- Evaluating Feed Efficiency
- Evaluating and selecting feedstuffs

GOOD LUCK
Steer Nutrition

What a steer eats, how it is digested, absorbed, utilized and what is excreted are the essence of nutrition. Good nutrition is basic to good health and production. Proper feeding requires knowledge of nutrients in feedstuffs available to the producer and the nutrient needs of their animals. It also includes an understanding of animal behavior and a management strategy that allows the animals to consume all that is required without causing digestive upset. Though general rules of thumb are helpful, each situation may require adjustments in order to optimize growth and production.

*Nutrients* are substances in the diet that support normal body functions. Some nutrients can be manufactured in the animal’s body and are classified as *dietary non-essential*. Dietary essential nutrients must be provided in the ration. Nutrients can be classified into six groups: *water, carbohydrates, fats (lipids), proteins, vitamins and minerals.*

*Water* is the most essential nutrient and is involved in all body functions. It is the most abundant and therefore the cheapest nutrient. Animals receive water from drinking as well as from feeds that contain water. An animal that is not receiving enough water will not eat well. Factors which affect an animal’s water consumption are the animal’s size, dry matter intake, environmental temperature, humidity, and water quality.

*Proteins* function as the basic structural unit of the animal body and in metabolism. Protein is the main component of the organs and soft structures of the animal body except for water. The dietary requirement for protein is highest in young, growing animals. All proteins are composed of simple units called amino acids. The particular amino acids in a protein determine the quality of that protein. Protein is one of the most expensive portions of the diet.

*Carbohydrates* are organic compounds formed in plants by the process of photosynthesis. They constitute about 75% of the dry weight of plants and grain. Carbohydrates serve as a source of energy in the body. A surplus of carbohydrates is transformed into fat and stored.

*Fats* function much like carbohydrates in that they serve as a source of energy. Fats produce 2 ¼ more energy than carbohydrates when digested; therefore a smaller amount is required to serve the same function.

*Vitamins* are essential for the development of normal tissue and necessary for metabolic activity. They are effective in the animal body in small amounts. When not eaten correctly and in the right amounts, a specific deficiency disease can result or toxicity may result if eaten in extremely high amounts. Vitamins are classified as being either fat soluble (A, D, E, K) or water soluble (B complex & C).

*Minerals* are inorganic, solid, crystalline chemical elements. They are classified as being either macro (Ca, P, Na, Cl, K, Mg & S) meaning found in high concentrations or micro minerals (Cr, Co, Cu, F, Fe, I, Mn, Mo, Ni, Se, Si, & Zn) meaning found in trace amounts. Calcium makes up nearly 50% of the total body mineral, phosphorus composes 25%, and other minerals make up the remaining 25%. Minerals function in protein synthesis, oxygen transport, and in skeletal formation and maintenance.
Specific nutrient requirements vary between species but also between individuals. Factors such as weight, environmental temperature, and level of production must be considered when determining optimum nutrient levels in a ration. Though it is tempting to provide more than enough as insurance, some nutrients cause problems (toxicity) if fed in excess. Also, the feeding of livestock accounts for 45-75% of production costs so overfeeding shrinks profits. Too much of a good thing is not good.

**Digestive Anatomy**

You are what you eat sounds silly but is somewhat true. Farm animals are grouped by what they eat, which is based on the type of digestive system they possess. *Herbivores* are vegetarians (cattle, sheep, goats, rabbits). *Carnivores* are flesh eaters (dogs). *Omnivores* eat both flesh and plants (pigs, chickens, humans). Based on the digestive system, animals are grouped as *monogastric* or *simple stomach* (pig), *polygastric* or *ruminant* (cattle, sheep, goats), *avian* (chickens), or *pseudo-ruminants* with a functional cecum (rabbits). Understanding the digestive system is fundamental to selecting the proper feeds and feeding system for your animal.

After studying this manual, you should be able to identify the parts of the digestive tract of a steer and tell the function of each part.
Feed Classification and Identification

The “stuff” fed to animals in order to meet their nutritional needs are called feeds. The National Research Council (NRC) produces many publications on nutrient requirements of animals and nutrient content of most feedstuffs. Most youth purchase “complete rations”, however, it is helpful to know what may go into those rations. Go to the web site: http://www.ca.uky.edu/agripedia/agmania/feedid.html and study feed ingredients so that you can visually identify those typically used in livestock feeds.

Though we generally group feeds into roughages (high fiber, >18% CF, less digestible) and concentrates (low fiber, <18% CF, more readily digestible). There are 8 international feed classes that are based on content and use.

1. Dry forages and roughages - cut and cured products with >18%CF like hay, straw, corn cobs, shells and hulls, paper, wood by-products and stover.
2. Pasture, range plants and forages fed fresh - all forages not cut or cut and fed fresh.
3. Silages and haylages - ensiled forages like corn, alfalfa and grass.
4. Energy feeds - products with <20% CP and <18%CF like cereal grains (corn, oats, wheat), mill byproducts, beet and citrus pulp, molasses, animal, marine and vegetable fats, nuts, roots and tubers.
5. Protein supplements - products with >20% CP or more protein from animal origin as well as oil meals like gluten, legume seeds, milling by-products of grains, brewery and distillery by-products, yeast, non-protein nitrogen.
6. Mineral supplements
7. Vitamin supplements
8. Non-nutritive additives - supplements such as antimicrobials, antifungals, antibiotics, antioxidants, probiotics, buffers, coloring material, flavors, hormones and medicines.

Digestive Function

The physical and chemical changes of feed within the gastrointestinal tract that allow nutrients to be released and absorbed into the body are called digestion. There are significant differences in the digestive processes between species. The type of digestive system an animal has determines what the animal can successfully use as feed. Complicated feed (forage) requires a complicated digestive tract (ruminant). The steps in digestion include: prehension (gathering), mastication (chewing), salivation, deglutition (swallowing), microbial, enzymatic and chemical breakdown, absorption of nutrients, defecation, and micturition (urination). For a review of rumen anatomy visit: http://aged.calpoly.edu/AgEd410/Presentations/PowerPoint.html

Mouth - Upper dental pad, lower incisors and both upper and lower molar teeth used in prehension, mastication, and salivation.

Esophagus - Hollow muscular tube that transports food from the mouth to the stomach.
Stomach - four compartments; Rumen, Reticulum, Omasum and Abomasum (54 gallons)

Rumen - Large, hollow, muscular compartment that almost entirely fills the left side of the abdomen, functions in storage, soaking, mixing and microbial fermentation. (40 gallons)

Reticulum - Nicknamed honeycomb, functions in moving ingested feed into the rumen or into the omasum and regurgitation of partially chewed food during rumination. Has very thick walls, traps foreign objects. (2.5 gallons)

Omasum - Nicknamed “many plies” or butcher’s Bible, reduces particle size and removes water. It is located on the right side and holds 4 gallons.

Abomasum - This is the glandular portion of the stomach which produces acid. It is located on the right, is called the true stomach and is where enzymatic digestion begins. (5 gallons)
Sm. Intestine- Pancreatic and intestinal juices break down proteins and carbohydrates while bile from the liver breaks down fats. The first section (duodenum) is involved in digestion, and the next two sections (jejunum & ileum) are actively involved in nutrient absorption. (17 gallons and 150 feet)

Lg. Intestine- Mainly absorbs water and end products of microbial digestion. The cecum has little function in ruminants. The colon is the site for water resorption and storage reservoir of undigested material which passes out of the rectum as feces. (8 gallons)

Feed Tag Analysis

It is required by law that all commercial feed products carry a proper label. In order to know what you are getting for your money, you should be able to read and understand the information on a feed tag. Some of the information included will be: net weight in pounds, company brand name (trade name), product name (class or use), product type (textured, pelleted, extruded, etc.) purpose statement, warning or cautions, active drug ingredient (when applicable), guaranteed analysis (protein, fat, fiber, etc.), feed ingredients in order of content, company name and address, detailed use directions, other feeds (suggestions for other feeds in the total program). Go to the feed store and look at the tags on several types of feeds and determine which feeds are best suited to your program and which are the best value in terms of nutrients per $. Be prepared to interpret the information on a feed tag.

Guaranteed Analysis:

**Crude Protein**: not less than X%. If all of the protein is not from “natural” ingredients a statement such as, “this includes not more than X% equivalent protein from non-protein nitrogen” must be added. (i.e. urea)

**Crude Fat**: not less than X%, typically 1 to 3%. Fat contributes 2.25 times the energy as carbohydrates. Increased crude fat levels can decrease digestion of forages (e.g., hays and grasses), can be added to the diet in hot weather to maintain energy level when intake decreases

**Crude Fiber**: not more than X%. The higher this figure, the lower the digestibility energy of the feed; The price should reflect this lesser energy, but frequently does not.

Some manufactures also show minimum/maximum quantities of calcium and phosphorus and other macro and micro minerals. Units of vitamins A and D may also be shown; such figures are not required by AAFCO.

**Ingredient** listing on the tag does not necessarily identify individual feedstuffs. Instead, it uses categories of feedstuffs, e.g., grains products (such as corn, oats, barley, wheat), processed grain by-products (bran, brewers grain, hominy), plant protein products (soybean meal, cottonseed meal, etc.), molasses products (cane or beet molasses, dehydrated molasses, wood molasses), and forage products (alfalfa meal or leaf meal). The phrase, roughage products, identifies the presence of cottonseed hulls or other types of hulls or ground hays. This total must be shown as a percentage of the feed. Their presence will cause the crude fiber guarantee to be abnormally high (16-26% or more) and, as indicated above, lowers the digestible energy content.

The tag will also list sources of minerals, any preservatives used, and any vitamin supplements present or used.
Show Stopper Feed

GUARANTEED ANALYSIS

Crude Protein, Minimum ......................... 32.0%
(This includes not more than 11.3% equivalent
  crude protein from non-protein nitrogen)
Crude Fat, Minimum ............................. 2.0%
Crude Fiber, Maximum .......................... 7.5%
Calcium (Ca), Minimum ......................... 1.3%
Calcium (Ca), Maximum .......................... 2.3%
Phosphorus (P), Minimum ....................... 0.9%
Iodine (I), Minimum ............................ 0.00015%
Salt (NaCl), Minimum ........................... 1.0%
Salt (NaCl), Maximum ............................ 2.0%

INGREDIENTS
Ground Newspapers, Ground Uncooked Turkey Feathers, Ammonium Nitrate, Super Phosphate,
Tincture of Iodine, Used Crankcase Oil, Hardwood Sawdust, Ground Marble Chips, Vitamin A
& D Oil, Ground Shoes (without Rubber Soles), Barber Shop Sweepings, Salt.

Manufactured By: LEAST IN THE EAST

Selling Directions: For price conscious feeders who are not interested in results.

Implants

Implants contain either a naturally occurring or a synthetic hormone that acts like a natural
hormone. The implants are placed under the skin on the back of the ear and hormones are
released into the bloodstream in very small, but constant amounts. The net effect is that they
increase muscle formation and decrease fat. The most common reason for using implants is to
increase the efficiency of gain through increased rate of gain and decreased pounds of feed per
pound of gain. Implants must be administered properly in order to be fully effective. In addition, a
calf with an improperly placed implant runs the risk of having residues when slaughtered.
Administer Implants Correctly

1. Properly restrain the animal.

2. Determine which ear you want to implant. Position the implant instrument so that the needle can be positioned next to and parallel to the ear, with the slant side of the needle facing outward. (Implant all calves in the same ear to minimize confusion).

3. Select the proper implant site on the back of the ear. Place the implant between the skin and cartilage in the middle third of the ear.

4. Clean the needle and implant site with a disinfectant to reduce contamination of the needle wound. (Use a paint tray and sponge to lay the implant gun on).

5. Grasp the ear with one hand while the other hand positions the instrument parallel to, and nearly flush with, the ear. Put the point of the needle against the ear with the beveled part facing outward.

6. Use the tip of the needle to prick the skin. Then lift slightly so you can completely insert the needle under the skin.

7. Depress the plunger of the implant gun and withdraw the needle.

8. Feel the ear for the implant under the skin to see that it is inserted properly.

Precautions When Implanting

1. When the ear is grasped and the needle inserted, the animal may throw its head. This can be prevented by using a nose lead, halter, or a headgate equipped with a head and nose bar.

2. Avoid piercing or cutting ear veins with the needle.

3. Do not allow the needle to gouge or pierce through the cartilage. If you feel resistance as you insert the needle, it is quite probable that the cartilage has been gouged, and pellets may be covered with scar tissue and "walled off," resulting in very poor drug absorption and decreased gain.

4. Never sacrifice a careful implantation technique for speed.
Evaluating and Selecting Feeds

It is easy to look at the price of feed per bag and assume that lower cost is the same as higher value. Spend time thinking about your feeding management situation and the types of feeds you have available. Be prepared to judge the relative value of feeds for various scenarios. There are several methods to assess the value of a feed.

1. Physical evaluation of feedstuff: Does it look good and smell good? Is it free of dust and mold? Is it fresh? Can you see indicators of quality such as high stem to leaf ratio in hays or a high percentage of corn in a finishing ration?

2. Cost per unit of nutrients: This requires some analysis and calculations but it is not difficult.

Example:

<table>
<thead>
<tr>
<th>Product</th>
<th>Soy Bean Meal</th>
<th>Linseed Meal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude Protein</td>
<td>44%</td>
<td>35%</td>
</tr>
<tr>
<td>Cost</td>
<td>$9.40 per 100 Pounds</td>
<td>$5.50 per 100 pounds</td>
</tr>
</tbody>
</table>

To solve this problem you must determine the value of each feedstuff for protein:
- Do this by dividing the cost by the percentage of protein
  - Soy bean Meal: $9.40/44 = .21 cents per pound of Crude Protein
  - Linseed Meal: $6.50/35 = .19 cents per pound of Crude Protein
  Therefore linseed meal is cheaper but not by as much as you might think at first.

Another way is to look at productivity. If you must feed your animal twice as many pounds of a low cost, but low protein feed to achieve 100 pounds of gain, it may be more cost effective to pay for a higher price but feed less total pounds.

Example:
Let's look at the feed stuffs from above but add in rate of gain expected for each feed.

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<tr>
<td>Rate of Gain</td>
<td>1 pound of gain per 4 pounds of feed</td>
<td>1 pound of gain per 7 pounds of feed</td>
</tr>
</tbody>
</table>

Solve for cost per pound of gain.
- First, determine cost per pound of feed
  - Soy Bean Meal $9.40/100 pounds = .94 cents/pound
  - Linseed Meal $5.50/100 pounds = .55 cents/pound
- Next, determine cost per pound of gain
  - Soy Bean Meal: .94 cents/pound X 4 pounds feed/pound gain = $3.76/pound of gain
  - Linseed Meal: .55 cents/pound X 7 pounds feed/pound gain = $3.85/pound of gain

On a cost of gain basis, Soy Bean Meal is Cheaper

3. There are a number of chemical analyses that are carried out on feeds by the companies that produce them.

4. One of the most often used methods is to do your own feeding trials. You probably already do this without thinking about it. If you run into problems one year, you make adjustments the next year. With limited numbers of animals, this is a slow, often costly process.
Evaluating Feed Efficiency

Performance in fed cattle is evaluated by calculating average daily gain as well as feed efficiency. Feeding management strategies should strive to optimize growth to reach the desired market end point in an appropriate time frame. For example; if the date of the weigh-in for the show is 150 days away and your calf must gain 375 pounds in order to reach optimum target slaughter weight or .5 inch fat over the eye, the calf must gain an average of 2.5 pounds per day. If the calf eats 15 pounds of feed per day for the last 150 days on feed at that rate of gain, feed efficiency for that period of time is 6 pounds of feed per pound of gain. The cost of gain is determined by multiplying the cost per pound of feed by the pounds of feed per pound of gain. Therefore, in this scenario, $8.00 per 100# feed with 6:1 feed efficiency comes out to $.48 per pound of gain.

As you plan your feeding management program, you should develop some performance goals. Selecting a calf that is the correct starting weight and has the growth potential to reach the targeted slaughter weight in a timely fashion is key. If a high rate of gain is needed, higher energy feeds will be necessary. If slower gains are needed, a medium energy feed will suffice. Gains of 1.8 to 2.8 are reasonable. Calves outside of that range will likely finish too fat or will be under finished and will not perform as well on the rail in terms of yield and/or quality grades. Practice evaluating feed efficiency in different scenarios so that you can plan an appropriate feeding program for your steer.

Processing Feeds**

Because feed constitutes a major portion of the cost of intensive animal production, it is very important that a diet have the right nutrient content and be in a form that will encourage consumption without excessive feed waste. Feeds are often processed by mechanical, chemical or thermal methods in order to alter the physical form or particle size to prevent spoilage, isolate certain parts of the seed or plant, to improve palatability and digestibility, or sometimes to inactivate toxins. Occasionally feed is processed to improve handling, like chopped hay. Some methods include: roller mill cracking, grinding, steam-rolled and steam-flaked, pelleting, extruding, popping, drying and cubing. Obviously there are costs associated with processing so the improvements in productivity must offset price increases.

Poisonous Plants**

There are many plants which are harmful to cattle. Most of the time cattle will not eat them but in drought situations, they may. Some examples are: Low Larkspur, Oak, Tall Larkspur, Timber milk vetch, Water hemlock, Broom weed, Choke cherry, Copper weed, Desert parsley, Halogeton, loco, leu pine, Milk weed, Veratrum, Crotalaria, Lantana, and Nightshade. Visit the following web sites to learn about the poisonous plants in the southeast.

http://www.ansci.cornell.edu/plants/anispecies.html
http://www.caf.wvu.edu/~forage/library/poisonous/page10.htm
### Common Nutritional Disorders**

<table>
<thead>
<tr>
<th>Disorder</th>
<th>Chief Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware disease</td>
<td>Wire or nails lodged in reticulum</td>
</tr>
<tr>
<td>Ketosis</td>
<td>Sudden need for extra energy</td>
</tr>
<tr>
<td>Acidosis</td>
<td>Excess grain consumption</td>
</tr>
<tr>
<td>Grass tetany</td>
<td>Mg deficiency</td>
</tr>
<tr>
<td>Night blindness</td>
<td>Vitamin A deficiency</td>
</tr>
<tr>
<td>Goiter</td>
<td>Iron deficiency</td>
</tr>
<tr>
<td>Rickets</td>
<td>Ca, P, or vitamin D deficiency (young animals)</td>
</tr>
<tr>
<td>Anemia</td>
<td>Fe, Cu, vitamin B₁₂, or folic acid deficiency</td>
</tr>
<tr>
<td>Founder (laminitis)</td>
<td>Too rapid change in the ration</td>
</tr>
<tr>
<td>Liver abscesses</td>
<td>Common rumen bacteria that proliferates excessively with low roughage/high concentrate diet.</td>
</tr>
<tr>
<td>Photosensitization</td>
<td>Some feeds or forages or accumulation of metabolites</td>
</tr>
<tr>
<td>Bloat</td>
<td>Legume, succulent forages causing slime producing bacteria to increase and slime causes trapping of gas.</td>
</tr>
</tbody>
</table>
**BEEF/STEER SHOWMANSHIP**

**Training Your Animal for Showmanship:**

Begin training your beef animal as soon as possible. It takes hours upon hours to effectively halter break your animal, and teach it to respond to commands on the halter and show stick. Practicing often over short periods has been proven a more effective training technique than a few, long sessions. There are many methods of teaching an animal to give in to halter pressure. Choose the method that is the safest and least stressful for the animal considering your own abilities, help available, facilities and equipment. Train the heifer or steer to tie, walk, stop and set up easily and quickly when asked.

**In the Show Ring:**

**Proper Dress:**

1. All exhibitors will be required to be clean and neat and dressed in white, green, dark blue or dark black jeans or slacks with a solid white shirt with a white collar.
2. No caps or hats.
3. Closed-toe shoes or boots are required.

**Use of Show stick and Comb:**

There are three main purposes of the show stick in beef/steer showmanship.

1. **Placing the Feet:** To move hind feet backward, push back on the halter and apply pressure with the show stick on the soft part of the animal's hoof, between the toes. However, remember not to jab too hard, for this is a tender area. To move a hind foot forward, pull forward on the halter and apply pressure with the show stick under the animal's dewclaw. If you find that the animal's hind legs are too close together, you can apply pressure with the show stick on the inside of the animal's leg, just above the hoof.

2. **Keeping the Topline Straight:** This is important for the overall appearance of your animal in the judge's eye. To straighten a topline, apply pressure to the underline or place the hook of the stick inside the rear flank and apply slight pressure.

3. **Calming and Controlling:** Occasionally stroking the animal's underline as you place its feet or as it is standing still will help calm and relax the animal, especially if this technique is used during practice sessions. The show stick can also be used to keep your animal moving at a comfortable pace that is not too fast. Hold the stick in your left hand when leading and use the butt end of the show stick to tap the animal's nose when needed.

**Comb:** All exhibitors should carry a curry comb in their back pocket during the showmanship competition, unless the animals are slick sheared, then there is no need for a comb. The comb is used to fix the animal's coat after the judge feels for body condition on an animal. However, do not correct the hair obviously in front of the judge; wait until he/she has moved on to the next animal. For safety reasons, try to turn the teeth of the comb toward your body when carrying it in your pocket. This keeps other exhibitors from being harmed by your brush if they bump into you.

**Proper Showmanship Procedure:**

1. Enter the show ring, circling in a clockwise direction, with a smile on your face.
2. Keep an eye on the judge and respond quickly to any instructions.
3. When pulling into a line or stopping, leave three or four feet on both sides of your animal and at least five feet between your animal's head and the edge of the ring. This space allows for more freedom of movement both for you and the judge.
4. Always keep your animals legs set up correctly and the animal posed in a position that accentuates the animal's best features.
   - set the hind legs squarely underneath the animal's body.
   - keep the animal's back level and its head up.
   - if the animal is high in the loin, apply pressure to the loin with a fingernail.
4. When leading, hold the halter strap in your right hand, 6 to 12 inches from the animal's head and your show stick in the left with hook down. Upon pulling into a line, switch the lead into the left hand and the show stick into the right. Always use caution when maneuvering the show stick.
4. If your animal acts up and you have to pull out of line, always turn the animal away from you.
7. For close inspection, move a half step to allow the view he/she seeks. Never step in front of your animal.
8. Be courteous to other exhibitors. Do not bump, crowd or strike another exhibitor's animal. However, if an animal in front of you is reluctant to move, you may assist by gently tapping it on the rump or twisting its tail.
9. Do not overwork your animal and always remain calm.
10. Show good sportsmanship by congratulating the winner.

Adapted from: Wrangler Jeans Beef Showmanship for Youth for America In Association with the National 4-H Council, 1987.