

BACKGROUNDING



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Backgrounding

Introduction

Backgrounding calves is the growing of steers and heifers from weaning until they enter the feedlot. It is a beef cattle production system that uses pasture and other forages. Calves generally gain from 100 to 400 pounds, depending on the available forages, ration fed and length of time involved. The weight gain comes primarily from muscle and frame development, with little fattening. In Arkansas these gains are accomplished as economically as possible by making maximum use of pasture forages.

There are a number of different backgrounding programs. The most common program is purchasing calves in the fall and selling them four to six months later. Calves can also be purchased in the spring and sold in the fall. Traditionally, most beef operations in Arkansas are oriented toward cow/calf, with calves being sold at or shortly after weaning. More and more cow/calf operators are not selling their weaned calves in the fall but grazing them for 60 to 180 days.

Backgrounding is appropriate for cow/calf operators who want to retain ownership or for producers who do not want to maintain a cow herd. Backgrounding is suited for the producer who has extra time during the year to work cattle, has a good pasture/grazing program, has excellent cattle management/marketing skills and wants a flexible cattle business. With a temperate climate, abundant forage and an extensive marketing infrastructure, the southeastern United States is well suited to backgrounding calves.

Oftentimes, cow-calf producers can add value to their calves by fenceline weaning them and retaining ownership during a short backgrounding period. For five calf crops (2008 through 2013), the 300 days grazing cow-calf demonstration conducted at the Livestock and Forestry Research Station near Batesville, Arkansas, fenceline weaned calves and retained

ownership for an average of 58 days. During the extra 58 days of grazing, calves gained 1.5 pounds per day and returned an extra \$66 per head. That's an extra \$1.14 per head per day due to a short retained backgrounding period. Therefore, backgrounding home-raised calves represents a relatively simple means of adding value; however, it is a value-adding opportunity that many producers may not view as attractive for a number of reasons. Cash flow obligations may compel some producers to sell calves at weaning. Producers may not have the cattle-working facilities needed to process calves, and if loan payments are due, can they be deferred until the calves are sold? The advantages and disadvantages are listed in Table 1.

Receiving Management

Proper health management is a vital part of any successful backgrounding program. The investment in disease prevention is always less than the subsequent cost of disease treatment. Management of newly received or weaned calves during the first three to four weeks may very well determine the profit or loss of a backgrounding program.

It is very desirable for all calves to be delivered during a short period of time (one day to a few days). Do not mix new calves with calves that have been settled. If new calves are purchased, keep them separate and handle them as a different group. Assume that all incoming calves of unknown history need complete processing.

Calves should be placed in a large, clean pen or small pasture directly off the truck and be given free access to good-quality grass hay and fresh, clean water. Provide ample feed trough space for each animal. Eighteen inches of feed buck space per calf is adequate. Process calves within a few hours of their arrival; however, if the cattle have traveled a great distance, a good rule of thumb is to wait one hour for every hour they were on the truck before processing. This

Table 1. The advantages and disadvantages of a backgrounding program

Advantages:
Adapted to an intensive type of farming – that is, a large volume of business can be done on either small or large farms that can produce large tonnages of roughages.
Returns come quickly, as early as 4 to 6 months. In some instances, this quick turnover permits feeding two to three sets of cattle per year.
If used in winter only, the program is complete by the time labor is needed for spring and summer work.
Calves can utilize large quantities of harvested roughages and aftermath, thus cheapening the price of feeders and thus improving profitability.
The program is quite flexible because adjustment in numbers is easily made.
In grazing systems, little equipment is required except for the handling of harvested forages.
Disadvantages:
Capital or available credit is generally required.
Buying and selling skills are extremely important.
May have conflicting labor requirements with other farm duties.
Producers must be well skilled with identifying and treating sick calves.
Risk of drastic market change.
It is very important for producers to understand the economics of the backgrounding program.
Confinement systems can be equipment intensive, including forage harvest and handling equipment as well as feed storage, processing, mixing and delivery equipment.

allows the cattle to rest and settle down before undergoing processing.

Vaccination

Typically buyers do not know the vaccination history of purchased cattle; therefore, it is reasonable to assume the calves have not received any previous vaccinations. Vaccination should include administering a 5-way viral vaccine that includes Infectious Bovine Rhinotracheitis (IBR), Bovine Viral Diarrhea (BVD) type I and II, Parainfluenza₃ (PI3) and Bovine Respiratory Syncytial Virus (BRSV). Calves should also receive a 7-way clostridial vaccine (“Blackleg”). Cattle should receive booster injections of both vaccines approximately 14 days following the initial injections.

Other vaccines for bacterial causes of bovine respiratory disease (BRD) are commercially available. These include *Mannheimia haemolytica*, *Pasteurella multocida*, *Haemophilus somnus* and *Mycoplasma bovis*. Many producers and veterinarians have differing opinions on how effective these bacterial vaccines are for a backgrounding operation. Since situations vary from farm to farm, consult with your veterinarian about the vaccination requirements for your particular operation.

Additional processing should include providing each calf with an ear tag with a unique number, castrating all intact males, administering a dewormer and dehorning or tipping the horns of any horned calves. If scales are available, weigh each calf during processing. Record keeping is an important part of receiving management. Use the chart provided in Addendum 1 to help keep an accurate record about the details of vaccinating and processing each group of calves.

Mass Medication

Metaphylactic antibiotic therapy – mass medication of an entire group of animals to minimize an anticipated disease outbreak – should be considered for “high-risk” groups of cattle. Generally, it is worthwhile to mass medicate an entire group if 25 percent or more of the group is expected to get sick with respiratory disease. The number of animals that exhibit illness can be affected by many risk factors including weather, vaccination history, size/age of cattle, time of year, commingling and weaning status.

Respiratory Disease

By far the most common disease in receiving cattle is bovine respiratory disease (also known as pneumonia or shipping fever). Clinical signs

can include decreased activity or depression, lowered head, increased respiratory rate, runny nose, poor appetite, separation from the herd, soft coughing and gaunt appearance. Early detection and treatment of respiratory disease is essential. If treatment is delayed, the number of deaths or chronically infected animals will only increase. As the disease progresses, severe lung damage occurs. Typically, the damage that takes place with this disease is irreversible. That is why early detection and early treatment are important.

Calves should be observed each morning for signs of respiratory disease or other ailments, and a clinical illness score should be assigned to the calves exhibiting signs of illness (see Table 2). Calves selected to be examined should have their temperature taken. Normal temperature for cattle is 101.5°F, and cattle should receive appropriate antibiotics if their body temperature exceeds 104°F. Cattle will exhibit a

somewhat fluctuating body temperature based on diurnal patterns and ambient temperature. Therefore, it is best to check cattle in the morning hours when those factors are least likely to affect the body temperature. All calves showing a rectal temperature of greater than 104°F or exhibiting a clinical illness score greater than 2 (regardless of rectal temperature) should undergo treatment.

Records should be kept for each calf pulled and treated. For each sick calf, a treatment card should be prepared that includes date, calf number, a clinical illness score and the antibiotic treatment administered (see Addendum 2). Record keeping allows the tracking of treatment expenses and documents the proper drug withdrawal periods. Consult with your veterinarian to assist with the establishment of antibiotic treatment program(s) for sick cattle. Table 3 gives an example of a treatment schedule that could be implemented for a backgrounding operation.

Table 2. Clinical Illness Scores (CIS) for calves

Score	Description	Appearance
1	Slightly ill	Mild depression, gaunt, +/- ocular/nasal discharge
2	Moderately ill	Ocular/nasal discharge, gaunt, lags behind other animals in the group, coughing, labored breathing, moderate depression, +/- rough hair coat, weight loss
3	Severely ill	Severe depression, labored breathing, purulent ocular/nasal discharge, not responsive to human approach
4	Moribund	Near death

Table 3. Example treatment schedule for Bovine Respiratory Disease (BRD)

<p>Therapy 1: Drug X (_cc/100 lbs)</p> <ul style="list-style-type: none"> After administering Therapy 1, recheck calf in 48 to 72 hours. If clinical illness score is greater than the initial score OR if rectal temperature is still $\geq 104^{\circ}\text{F}$, then treatment failure has occurred and go to Therapy 2; otherwise consider this a treatment success.
<p>Therapy 2: Drug Y (_cc/100 lbs)</p> <ul style="list-style-type: none"> After administering Therapy 2, recheck calf in 48 to 72 hours. If clinical illness score is greater than the initial score OR if rectal temperature is still $\geq 104^{\circ}\text{F}$, then treatment failure has occurred and go to Therapy 3; otherwise consider this a treatment success. Also use Therapy 2 for calves that responded to Therapy 1 but relapsed less than 21 days since receiving Therapy 1.
<p>Therapy 3: Drug Z (_cc/100 lbs)</p> <ul style="list-style-type: none"> After administering Therapy 3, recheck calf in 48 to 72 hours. If clinical illness score is greater than the initial score OR if rectal temperature is still $\geq 104^{\circ}\text{F}$, then treatment failure has occurred and the calf is identified as a "Chronic"; otherwise consider this a treatment success. Also use Therapy 3 for calves that responded to Therapy 2 but relapsed less than 21 days since receiving Therapy 2.
<p>(If clinical signs reoccur greater than 21 days after administering any previous therapy, then this is considered a new episode and you should begin with Therapy 1.)</p>

Table 4. Calf Health Schedule

Day	Major Activities	Comments
0-1	Calves arrive. Place calves in pasture/pens near working facility.	Provide good quality grass hay and fresh water.
	Process calves. Vaccinations: IBR-BVD-PI ₃ -BRSV 7-way Clostridial	Process calves within a few hours of arrival. Consult your veterinarian for total health program.
	Parasite control	Treat all calves for intestinal parasites. Use fly control during summer months as needed. Treat for lice and grubs as needed.
	Further processing: Ear tag each calf. Implant. Castrate intact males. Weigh each calf. Dehorn (if needed). Abort pregnant heifers. Mass medicate (if needed).	Record processing information about group using copies of Addendum 1. Record arrival weights to track gain.
Each day	Observe calves for illness each morning. Treat calves exhibiting signs of respiratory disease.	Signs include nasal discharge, gauntness, decreased activity, coughing, labored breathing, rough hair coat. Calves exhibiting signs of illness and a body temperature greater than 104°F should be treated.
~ 14	Repeat vaccinations.	Follow label instructions or check with your consulting veterinarian for vaccines that should be boosted.
65-100	Re-implant calves (if needed).	Follow label instructions and check withdrawal periods for implanting.
Notes: a. Keep epinephrine on hand when vaccinating calves to treat for anaphylactic shock, which may occur on rare occasions. b. Always read and follow all label instructions, precautions and withdrawal times on pharmaceutical products that are used on calves.		

Feeding Practices

Feeding management decisions are critical to minimizing cost per pound of weight gain. A few of the most common errors observed in backgrounding operations include not making provisions for meeting the nutritional requirements of newly received calves, placing too much emphasis on cheap feed without considering nutrient density, exclusion of medicated feed additives and not properly balancing macro-mineral supply.

Types of Rations

Receiving Ration

A receiving ration is a specially formulated ration designed to restore nutrients in cattle as they recover from stress associated with weaning, marketing and commingling with unfamiliar cattle in an unfamiliar environment. Cattle that experience a great deal of stress are prone to become sick, and both stress and illness cause reduction in feed consumption (Table 5). Therefore, the concentration of protein, minerals and vitamins is formulated at a

greater level to account for the reduction in feed intake (Table 6).

Receiving rations are usually fed over a two- to four-week receiving period. This is the time when calves recover from illness, intake is normalized and all vaccine boosters are administered. Selecting familiar and palatable ingredients is important to quickly restore intake of new cattle. If receiving calves into a drylot, make sure calves are provided access to good-quality hay. Most calves purchased in Arkansas will be familiar with grass-type dry hays, and as a result, alfalfa hay, grass haylages, silages and other high-moisture feeds should be initially avoided.

High levels of energy in receiving rations should also be avoided. The objective of the receiving program is to restore rumen function and animal health, not maximize gain. High energy diets usually come with the potential of increased morbidity and digestive problems. Receiving rations may also include supplements such as yeast cultures, water-soluble vitamins and medicated feed additives that may not be beneficial in the diet of calves with restored health and intake.

Non-protein nitrogen supplementation should be avoided with newly received calves. A calf's ability to utilize non-protein nitrogen, such as urea, is a result of rumen microbes converting this nitrogen pool into microbial protein. At receiving, the microbial population of high-risk cattle becomes challenged through reduced intakes of water and nutrients. Rapidly fermentable energy is also important to the efficient use of non-protein nitrogen but is usually supplied in modest amounts in receiving rations. As a result, the use of non-protein nitrogen becomes inefficient, especially during the critical first few days after arrival.

Table 5. Average dry matter feed intake of newly arrived calves (% body weight)

Age, days	Healthy	Diseased
0-7	1.55	0.90
0-14	1.90	1.43
0-28	2.71	1.84
0-56	3.03	2.68

Source: D.P. Hutcheson and N.A. Cole, 1986, Journal of Animal Science 62:555-560.

Table 6. Suggested nutrient concentrations for stressed calves (dry matter basis)

Nutrient	Unit	Suggested Range
Dry matter	%	80 – 85
Crude protein	%	12.5 – 14.5
Net Energy of maintenance	Mcal/lb	0.59 – 0.72
Net Energy of gain	Mcal/lb	0.36 – 0.41
TDN	%	60 – 68
Calcium	%	0.6 – 0.8
Phosphorus	%	0.4 – 0.5
Potassium	%	1.2 – 1.4
Magnesium	%	0.2 – 0.3
Sodium	%	0.2 – 0.3
Copper	ppm	10 – 15
Iron	ppm	100 – 200
Manganese	ppm	40 – 70
Zinc	ppm	75 – 100
Cobalt	ppm	0.1 – 0.2
Selenium	ppm	0.1 – 0.2
Iodine	ppm	0.3 – 0.6
Vitamin A	IU/lb	1,800 – 2,700
Vitamin E	IU/lb	35 – 45

Receiving programs may consist of diets formulated and supplied as total mixed rations or designed where hay is provided free choice and a supplement is bunk fed daily (Table 7). If the hay and supplement portions are fed separately, some hay should be placed in the bunk, initially, for new cattle along with the supplement. This can help familiarize the calf with the bunk and supplement discovery.

Receiving pens should be designed where they are well drained to avoid deep muddying, which will result in reduced feed consumption. Water troughs should be located along the fence. New cattle will circle pens and discover the troughs more quickly. Remember, most calves received will not be familiar with a water trough. Troughs should be kept clean because depressions in water consumption are correlated with depressions in feed consumption. Feed bunks are usually located along the fence to assist calves with finding the feed as they pace along the fence. This also provides easy access for feeding. Adequate bunk space should be available for all calves to eat simultaneously.

Receiving supplements and rations may include:

- Coccidiostat – prevent coccidiosis outbreak. Example products include Bovatec, Corid and Deccox.
- Cottonseed hulls – very palatable; helps prevent digestive upset if the supplement is overconsumed; price sometimes makes it cost prohibitive.
- Ionophores and large, nontherapeutic antimicrobials – increases rate of gain; some help regulate intake. Example products include Bovatec, Gainpro and Rumensin.

- Rumen undegradable protein (bypass protein) – helps establish supply of protein to the animal as the rumen environment recovers.
- Vitamin E – up to 400 IU/head/day.
- Thiamin – 1 gram/head/day. May be beneficial in high-sulfur diets.
- Lactobacillus and yeast cultures – animal growth and immune response is variable (either no improvement or improvement observed), but intake response is generally improved.
- Antibiotics (tetracyclines and/or sulfamethazine) – feeding antibiotics should not be used when time is available to observe and pull cattle for individual animal therapy.
- Conditioners – if mixing receiving rations on the farm, adding liquid molasses, condensed distillers solubles, condensed fermented corn extractives or water at 5 percent of the mix can improve mixing uniformity, reduce dustiness and improve palatability.
- General mineral and vitamin (A) supplement. Receiving diets contain a high percentage of forages, but in cases where forage use is limited, check the calcium to phosphorus ratio of the diet (at least 1:1 calcium to phosphorus ratio in the entire diet).

Growing Ration

The growing ration follows the receiving ration and is fed until marketing. The growing ration may be formulated, mixed and delivered as a total mixed ration, or feedstuffs high in energy and possibly protein are used as a supplement or substitute to hay or pasture.

Table 7. Balanced diet for a newly received calf consuming 4 pounds of a receiving supplement plus hay during the first two weeks following arrival

	Supplement		Hay		Total	
	As-fed	Dry Matter	As-fed	Dry Matter	As-fed	Dry Matter
Intake, lbs/d	4.0	3.2	5.5	4.8	9.5	8.0
Intake, % BW	0.9	0.7	1.2	1.1	2.1	1.8
Component, % of diet	42	39	58	61		
Nutrient supply	Dry Matter Basis					
CP, %	18.5		12.0		14.5	
NE _m , Mcal/lb	0.89		0.56		0.69	
NE _g , Mcal/lb	0.61		0.31		0.43	
TDN, %	80		58		67	

Rations for growing cattle are generally formulated for rates of gain to exceed 2 pounds per day. As a result, hay or lower energy ingredients such as rice mill feed, peanut hulls and cottonseed hulls are limited to no more than 40 percent of the diet. The remaining portion of the diet consists of feed ingredients that are high in energy and ingredients that are moderate to high in protein content.

Table 8. Common feed ingredients

Ingredient	Protein	Energy
Broiler litter	High	Low
Corn	Low	High
Corn gluten feed pellets	High	Moderate-high
Cottonseed hulls	Low	Low
Cottonseed meal	High	High
Defatted rice bran	High	Moderate
Distillers dried grains	High	High
Full fat rice bran	Moderate	Moderate
Hominy	Moderate	High
Rice mill feed	Low	Low
Soybean hulls	Moderate	Moderate

Ration balancing programs should be used to calculate expected intakes and feed conversions based on dietary nutrient supply. Feedstuff price should also be included to determine the diet composition that delivers the most economical gain. Generally, when keeping protein and energy in balance, as energy density increases, rate of gain increases and the amount of feed per pound of gain decreases. As a result, increasing nutrient density may be an economically sound practice. Cattle producers often lean toward purchasing cheap feeds. Remember, cheap feeds are cheap for a reason. This reason usually involves the limited supply of nutrients they provide, these feeds actually become more costly long-term because of reduced growth rates and more days on feed to reach target market weight.

Feeding supplements to hay and pasture should be based on the purpose of either complementing the forage by overcoming the shortfalls in protein and/or energy or overcoming limited supplies by substituting alternative feeds in place of forages. Supplementation is most efficient when rates are kept below 1 percent body weight. Above this rate, the feedstuffs are beginning to substantially replace forage in the total diet. Protein supplementation is more

efficiently converted to weight gain than energy supplementation; however, energy supplementation is usually sought after to increase total daily weight gain.

When protein to energy (total digestible nutrients or TDN) ratio is between 1:4 and 1:7, there is an adequate supply of protein to energy in the forage. Providing supplemental feed to forage-fed cattle at rates above 0.5 percent body weight when the ratio is within this range will usually result in a substitution response. A substitution response occurs when the supplement replaces forage intake instead of sustaining or increasing forage intake. When supplementing grazing cattle, the cost of additional weight gain above not supplementing needs to be cheaper than the value of the additional weight gain. This is difficult to determine on-farm unless a group of cattle is managed without supplementation or historical records indicate the gain expected by not supplementing. County agriculture extension agents have access to research and researchers that can assist in recommending supplementation practices for different types of forages.

Cattle grazing small grains such as wheat are often exposed to forages with a protein-to-TDN ratio that is greater than 1:4. As a result, providing supplemental energy can capture more protein for animal use. When providing high-energy supplements such as corn, soybean hulls or hominy above 0.5 percent body weight, expect a substitution ratio of 0.8 to 1.

Cattle grazing native pasture or improved summer pasture with low fertility can have a protein-to-energy supply less than 1:6. As a result, the potential extent of digestion of these forages will not be realized until protein supplementation is provided. Cattle grazing fertilized, improved summer pastures respond efficiently to energy supplements when fed up to 0.5 percent body weight and combined protein and energy supplements such as cottonseed cake or dried distillers grains at rates up to 1 percent body weight with feed conversions less than 5 to 1 (pound of feed to pound of gain).

Total mixed rations and forage-based diet supplements may include:

- Coccidiostat – prevent coccidiosis outbreak.
- Ionophore – increase rate of gain; some help regulate intake, reduce risk of acidosis somewhat and have coccidiostat properties.

- Conditioners – if mixing receiving rations on the farm, adding liquid molasses, condensed distillers solubles, condensed fermented corn extractives or water at 5 percent of the mix can improve mixing uniformity.
- Salt or commercial intake limiter – to prevent over-consumption with limited buck space or allow free-choice feeding of supplements (rule of thumb: 0.1 pound salt per 100 pounds body weight).
- Mineral and vitamin supplement.

Mineral and Vitamin Supplementation

Supplementation of minerals and vitamins is most easily accomplished by purchasing a commercially available supplement and mixing it into the receiving ration and growing ration mixed feed diets. This ensures adequate consumption by all cattle. Diets that contain low levels of forage and high levels of grains or byproduct feeds will have an imbalance between calcium and phosphorus. One exception is soybean hulls. Correcting this imbalance is accomplished by the addition of 30 to 40 pounds feed grade limestone or calcium carbonate per ton of mixed feed or purchasing a complete mineral that contains 20 to 24 percent calcium. Ration balancing programs can determine the proper amount of supplements to balance requirements without adding excessive amounts of calcium.

Free-choice salt can be provided when mineral supplements are mixed into the rations; however, if minerals are going to be offered free choice, do not provide free-choice salt unless the label states otherwise. Cattle crave salt, and this salt craving helps stimulate consumption of the complete mineral. Trace mineralized salt block products should be avoided. These products may not contain sufficient trace minerals and often contain sources of trace minerals that are poorly digested.

Research with organic forms of trace minerals has produced variable results. Organic sources are more available for digestion and absorption and some, but not all, studies have shown improved animal growth performance or reduced morbidity. Injectable mineral products have shown a benefit in some studies. Injectable minerals have resulted in fewer sick cattle or improved weight gain during the receiving period. The background of newly received calves is often unknown. Some calves may originate from farms that did not provide adequate mineral supplementation or vaccination prior to

marketing. As a result, mineral status and immune function may be compromised in these calves during the receiving period. Establishing mineral status through advanced mineral forms and methods of mineral delivery can be important during receiving, but doing so may not always benefit these calves in sufficient time to reduce incidence of disease.

Forage Systems

There is a variety of forages grown in Arkansas that can be used for backgrounding, but animals perform better on some forages than on others. Depending on production goals and marketing strategies, the type of forage and time of year can have a large impact on cattle gains. Tall fescue and bermudagrass are the predominant perennial forages on Arkansas beef farms, but there are other forages that can complement existing ones. In general, cool-season perennial grasses exhibit pronounced growth curves in spring and fall with little dry matter (DM) production during the hot summer months in Arkansas, while warm-season grasses produce most biomass between May and September provided water and soil fertility are not the limiting factors.

Cool-Season Forages

Fescue

Kentucky 31 tall fescue is the most common cool-season perennial forage species grown in Arkansas. Historically, animal gains have been better on wheat or rye than on fescue. Therefore, it has not been the species of choice for backgrounding. However, in most cases this is the forage already present on many farms. There is a variety of management practices that can maximize animal gains, even with possible negative effects from fescue toxicity.

Numerous research studies have indicated that cattle gain less on toxic endophyte-infected fescue (E+) than on either friendly endophyte fescue (NE+) or endophyte-free (E-) varieties. In addition, there is evidence that E- varieties are not as drought- and grazing-resistant as NE+ or E+ fescue varieties. Most producers will have Kentucky 31 (an E+ variety) on their farms. Examples of NE+ varieties currently on the market include Estancia with ArkShield, BarOptima Plus E34 or Texoma MaxQII. These fescue varieties can potentially overcome

the reduced weight gains associated with E+ fescue. NE+ varieties need to be managed appropriately, as these varieties may not tolerate overgrazing as readily as Kentucky 31 fescue. In general, NE+ varieties are not cheap to establish and converting existing pastures to a new variety requires some strategy and financial planning.

Regardless of the fescue variety being used, there are some rules that should be followed with regard to grazing management. In spring when plant growth is rapid, cattle should be stocked in a fashion that allows for high forage utilization and for keeping the plant within the vegetative stage as long as possible. This is especially important for E+ fescue pastures. Because the endophyte accumulates in the seeds, grazing should be managed so that development of reproductive tillers is minimized. By keeping the plant in the vegetative phase, forage nutritive value remains high and vegetative tillering is encouraged, which results in dense forages stands and good canopy cover. Toxic effects of Kentucky 31 fescue can be further diluted by overseeding other forage species such as clovers, but establishment success and persistence is not always certain. It is probably better to plant summer annual forages on separate areas with the goal to complement the overall forage program.

A good soil fertility program is mandatory and helps keep tall fescue pastures productive. Soil tests provide fertilizer and lime recommendations based upon forage type and desired productivity. Your local extension agent can help interpret the soil test results and determine fertilizer needs. Nitrogen should be applied before each seasonal grazing starts, since nitrogen fertilizer effects do not carry over from fall to spring. Depending on the amount of forage required for your operation, calculate with 50 to 100 pounds nitrogen per acre. For every pound of nitrogen added, there is an increase in DM production of approximately 10 to 30 pounds. Do not overfertilize as this may increase fescue toxicity. It is also important to keep the balance of other required nutrients. Soil test reports show recommended amounts for a variety of minerals including P and K. Soil samples should be taken at least every other year to stay current.

Sometimes other fertilizer sources such as poultry litter are being used. While litter provides many different minerals and also adds some organic material to pastures, obtain a

chemical analysis of the litter to stay within the range of what the crop needs to avoid excess fertilization. As a general rule, no more than 1 to 2 tons per acre of poultry litter should be applied to Kentucky 31 fescue. With high nitrogen rates, high levels of nitrate (levels of 1,500 ppm nitrate-nitrogen and higher are considered potentially lethal doses for cattle) can be of concern. However, this problem has rarely been observed in tall fescue. When in doubt, contact your local county extension agent to advise you on obtaining a laboratory analysis of the forage.

Other Perennial Cool-Season Grasses

Because of the prevailing climate in Arkansas, there are not many additional choices for perennial cool-season grasses to be used as part of a backgrounding operation. Species such as perennial ryegrass or Kentucky bluegrass are not good choices as both forages will not persist under Arkansas conditions. Orchardgrass can be successfully grown on some soils in the northern part of the state, but sufficient research data is lacking that compares this forage with tall fescue in terms of DM production and animal gains in Arkansas.

Making the Best Cool-Season Perennial Species Better

Depending on the latitude, certain legumes, small grains or annual ryegrass can provide supplemental forage. However, overseeding tall fescue with either clovers or ryegrass may not be the most efficient use of these forages. Competition of tall fescue with other species is usually high, and seasonal growth curves of clovers and ryegrass are similar to fescue. In addition, annual ryegrass can be a serious weed in newly established NE+ fescue stands and overseeding should be avoided. Tall fescue pastures can be overseeded with clovers, but the establishment in strips using higher seeding rates than normal will likely show better results. Proper soil pH (minimum of 6.2) and phosphorus and potassium levels are necessary for successful legume establishment. Mixtures need to be managed differently than pure grass stands. Legume forages usually require several weeks of rest between grazing cycles, and canopies should be grazed short to allow for sufficient light penetration for legume growth to reduce competition from the forage grasses in the mixture.

A demonstration project by University of Arkansas extension faculty has shown that white clover seeded in strips on 25 percent of the pasture area using seeding rates four times the normal rate resulted in excellent stand persistence and establishment of clover plants in non-overseeded areas of the pasture. Legumes can also be established in dedicated areas using more aggressive establishment strategies including stunting of the perennial grass with an herbicide and lightly disking before planting. These areas can then be rotationally stocked without having the disadvantage of managing a multi-species pasture. Similar to legumes, small grains can complement forage early in the season, but forages such as wheat or rye should also be established on separate areas. The University of Arkansas Extension Service has published a number of fact sheets regarding the establishment and management of small grains and legumes that can be used as reference.

Cool-Season Annuals

As indicated above, small grains and annual ryegrass can be used to supplement perennial forages. They can be planted as pure stands into prepared seedbeds or are sometimes sod-planted into dormant warm-season perennial pastures. After heavy rains, it may be difficult to graze forages on prepared seedbeds. Sod-planting small grains or annual ryegrass into dormant bermudagrass in fall has been shown to provide forage early in the year and also alleviate problems with soft ground. Before planting in fall, the bermudagrass canopy should be clipped or grazed to a 2-inch height to facilitate planting and light penetration for emerging seedlings. No-till drills are the equipment of choice. Given the climatic diversity across Arkansas, different forages and varieties may have to be used, depending on the location. Sod-seeding annual ryegrass into lightly disked bermudagrass swards has been successfully used in the southeastern part of the state.

Calculating the stocking rate for a small grain pasture depends, as with other forages, on DM produced during the time of stocking. It should be considered that forage intake is about 3 percent of body weight and that approximately 60 percent of the canopy is grazed. The rapid growth of small grains during the spring months makes it nearly impossible to recommend a single stocking rate that might work as a general guideline. As small grains are planted

in early fall, some growth occurs before winter, while the majority of DM production occurs in the following spring. Therefore, a single stocking rate cannot be carried through the entire production cycle. Producers should seek information from the local extension service or USDA databases on small grain DM production data applicable to their area. Based on these data or own experience from growing small grains on their property, producers can predict an approximate stocking rate, but the overall grazing management plan should leave room for adjustments such as adding or removing animals or supplementing with hay during the winter months if necessary.

Warm-Season Forages

Some producers background their cattle during the summer months. In these cases, improved bermudagrass is the most common perennial grass and sorghum-sudan or pearl millet is a popular choice of summer annual forage used. Both sorghum-sudan and pearl millet should be established on fields that can be at least lightly disked or otherwise prepared. Although producers might prefer overseeding fescue with a summer annual forage, establishment success is uncertain because diminished growth in fescue and optimum planting times of the summer annuals may not coincide.

Optimum fertilizer rates for warm-season pastures depend on the situation and production goals. Dry matter production can be manipulated by varying the amounts of nitrogen applied to bermudagrass pastures. Research conducted showed that per pound of nitrogen added, there is an increase of 20 to 40 pounds in DM production. As with other forages, fertilizer should be applied based on soil test recommendations, and rates may vary depending on the productivity of the soil. Deeper soils with a higher water-holding capacity can use nitrogen more efficiently than areas with thinner, sloped soils.

Bermudagrass can be continuously stocked, but hybrid types and summer annual grasses should be rotationally stocked because of their low tolerance to frequent and close grazing. The use of electric fences to restrict animals to small areas of a pasture results in higher forage utilization and likely more beef production per unit area, but it also requires closer supervision. If DM production exceeds utilization, surplus forage should be harvested for hay.

Forage Management Summary

1. Select the best forage species and variety suited for your location. Improved tall fescue and bermudagrass are the best species for use under the climatic conditions of Arkansas. Legumes, small grains and annual ryegrass can be used as supplemental forage.
2. Fertilize and lime pastures based on regular soil testing to keep plants healthy and productive.
3. Stock pastures according to management goals of your grazing system and maximize forage utilization through appropriate grazing methods.

Marketing

The marketing alternatives that are economically feasible for cattle backgrounders are often limited or dictated by certain characteristics of the cattle operation itself. Both the marketing methods and pricing options that can be considered are influenced by (1) the size of the herd, (2) the priority given the cattle operation in the overall farming and nonfarming activities, (3) the kind of cattle produced, (4) the level of management applied to the operation and (5) the available feed supply.

Before selecting a backgrounding program, have a good marketing plan. A marketing plan might include putting cattle in a commercial feedlot for finishing or selling them as feeders. Purchases of calves should be grouped according to quality, weight and sex to increase their value at market time.

A marketing plan also includes a complete budget (see Addendum 3). It is very important to include all the costs associated with backgrounding calves. Oftentimes, income is overestimated and expenses are underestimated. A complete, honest backgrounding budget is a very important tool to assist with management decisions. A complete budget may include the following costs: feeder calf, pasture, hay, supplemental feed, vaccination, trucking, insurance and taxes, interest on operating capital, labor, equipment, etc. A complete project backgrounding budget will aid in managing risk. It is important to keep accurate records of costs throughout the backgrounding program and to compare the actual costs to the projected costs. By knowing the breakeven costs throughout the backgrounding phase, marketing

opportunities may present themselves, making the backgrounding enterprise more profitable.

Purchasing the right kind of calf that fits the backgrounder's management and farm resources is critical. If the backgrounder isn't experienced with purchasing cattle, he or she should secure the services of a well-respected cattle buyer. Purchasing preconditioned calves can reduce mortality and morbidity rates. Preconditioned calves usually have enhanced immunity to withstand the stress of trucking, commingling, etc. Preconditioning includes weaning six weeks before selling, starting on feed, dehorning, vaccinating, deworming, castrating males and perhaps implanting them with a growth promotant. These practices help ensure that the calves will stay healthy and have a good start in a backgrounding program.

Not every calf is suited for a backgrounding program. Generally, calves less than eight months of age in above average body condition are not suitable because they lose weight and condition rapidly when fed high roughage rations. Heifer calves also do not fit well into a lengthy backgrounding program. The exception would be for a cow/calf operation where backgrounding heifer calves would allow for a better selection of replacement heifers.

Steer calves weighing 400 to 600 pounds in thin to moderate condition are best suited for most backgrounding programs. These calves are ready for finishing when they reach 900 to 1,000 pounds and usually are in high demand by cattle feeders.

Backgrounding requires some additional time to finish an animal. However, the savings gained by purchasing less feed grains during the major growth phase generally outweigh the extra finishing time. Rather than feeding lightweight calves high-concentrate rations early on, cattle feeders often buy heavier-weight cattle in hopes of reducing the grain requirements for producing finished beef.

Marketing Methods

Several marketing methods are available to cattle producers in Arkansas. They are (1) weekly auction markets, (2) direct selling at private treaty and (3) retaining ownership while finishing cattle in a commercial feedlot. Identifiable differences in the marketing costs

and prices exist among these market outlets. Each method tends to serve certain types of producers best. Other methods of marketing feeder cattle, such as electronic systems of marketing, could be effective in the state but have not developed.

Weekly Auction Markets – The local weekly livestock auction is the primary method of marketing feeder cattle in Arkansas. There are 24 livestock auctions in the state located in every major cattle-producing area. The weekly auction is a convenient source of cattle for a backgrounding operation and a convenient way to sell cattle at the end of the backgrounding period. Weekly auctions are best suited to the small producer with limited time to spend on marketing. Auctions sell all classes of cattle, and a market price on sale day is virtually assured. However, commission rates may be high, and the indirect marketing costs associated with assembly are reflected in prices that may be lower than other marketing methods. This may be especially true at smaller auctions.

Direct Selling at Private Treaty – This method of marketing is best suited to producers who have uniform load-lots of cattle to sell at one time. A smaller producer may sell direct to an order buyer or dealer who, in turn, sorts and assembles the cattle with others of similar kind for shipment to their destination. Selling direct is usually less convenient than selling through a weekly auction since the backgrounder must stay abreast of market conditions and prices and serve as his own marketing agent, locating buyers, negotiating the sale and arranging for shipment. Compared to public markets, such as weekly auctions, selling direct is more efficient, does not place as much physical stress on the cattle and can return a higher price with lower marketing costs.

Retaining Ownership – Retaining ownership of backgrounded cattle and finishing them in a commercial feedlot eliminates many marketing costs such as commission charges, hauling, shrink and death loss incurred with other marketing methods. However, substantially more capital investment is necessary.

Other Livestock Auctions – Other livestock auctions are available such as regional auctions, satellite auctions, video auctions,

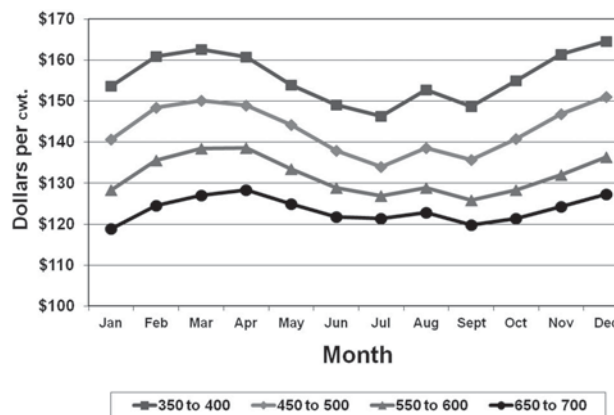
internet auctions, special calf/feeder sells, age and source verification sales, commingled sales, etc. Each of these auction types has advantages, disadvantages, costs and restrictions.

Buy/Sell Margin or Rollback

The buy/sell margin or rollback is the price difference between the purchased price of the lightweight calf and the selling price of the heavier calf. Generally speaking, large buy/sell margins favor selling at weaning and smaller buy/sell margins favor the selected post-weaning production/marketing alternative. The buy/sell margins can be adjusted in three ways: 1) calf cattle prices can be reduced, 2) feeder calf prices can increase or 3) a combination of calf prices adjusting downward and feeder calf prices adjusting upward. Figures 1 and 2 summarize the 5- and 10-year average selling prices of 300 to 400, 400 to 500, 500 to 600 and 600 to 700 pound large/medium frame muscle score #1 steers sold at Arkansas livestock auctions.

The buy/sell margin is important because it can be used to calculate the breakeven cost of gain. For example, in Figure 1 the purchase price of a 350-pound steer calf in October averages \$154.95 per cwt with a total value of \$542 (\$154.95 times 3.5). The selling price of a 700-pound steer calf in April averages \$128.33 per cwt with a total value of \$898 (\$128.33 times 7.0). For this example, the 350-pound steer is projected to gain 350 pounds from October to

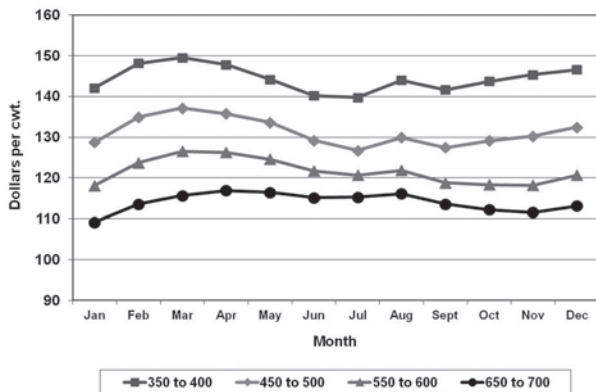
Figure 1. Five-Year Average Selling Price of Large/Medium Muscle Score #1 Steers



Source: Arkansas Livestock Market News

April. The buy/sell margin is \$26.62 per cwt (\$154.95 minus \$128.33) or \$356 per head. The breakeven cost of gain, or the point where returns equal costs, is \$1.02 (\$356 divided by 350 pounds gain). If the cost of gain is calculated to be \$0.58 per pound, then for every pound the calf gains, the calf makes \$0.44 per pound or \$154 for the growing period (\$0.44 time 350 pounds).

Figure 2. Ten-Year Average Selling Price of Large/Medium Muscle Score #1 Steers

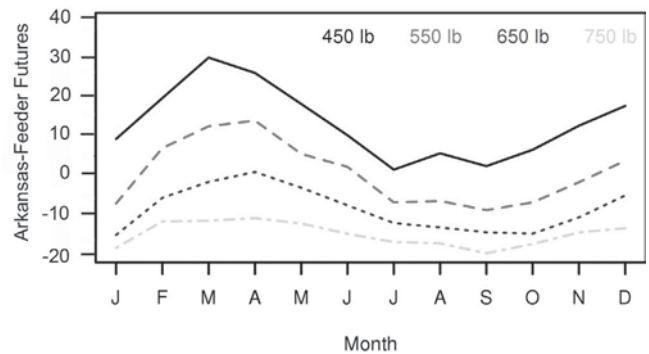


Source: Arkansas Livestock Market News

Basics of Basis

Basis is the difference between the market price of calves at a particular location and the futures price. For backgrounding cattle, the feeder cattle futures price is of interest. Basis is influenced by distance and time. In respect to distance, the closer the cattle market location to the actual delivery site of contract cattle, the lesser the basis. In respect to time, as market date approaches the futures contract ending date, the closer the prices converge. Understanding the local basis is valuable for budgeting based on feeder calf futures, and the chart below summarizes the difference between Arkansas steer prices (Medium and Large frame #1 muscle) and feeder calf futures from 2010 through 2012. During this period, 750 calves sold in March received \$10/cwt below the feeder futures price; if the feeder futures price was \$150/cwt, a calf marketed in Arkansas might receive \$140/cwt. Tracking basis is important for planning; however, basis can be influenced by other economic conditions at the time of sale such as drought and economy turmoil. In addition, demand or discounts for certain calf quality characteristics will also influence the final market price.

Figure 3. Arkansas Basis 2010-2012



Backgrounding Calf Quality

At the general price levels established by aggregate supply and demand, great differences in value exist among cattle. The value of slaughter cattle is dependent upon the quantity and quality of beef produced from the animal. Quality determines the uses that can be made of beef. Cutability and dressing percentage affect the quantity of beef available to sell from an animal.

Some well-experienced backgrounders can take mismanaged calves, straighten them out and improve their value. Mismanaged calves often sell for less than the average calf due to their condition, but the risks are higher (increased mortality and morbidity rates).

The value of feeder calves and yearlings bought and sold in a backgrounding program depends on the potential value of the animal when finished for slaughter and the cost of finishing the animal to a slaughter point. Several factors that affect the value of feeder cattle in the market are:

Gender – Steers, heifers or bulls may be used successfully in a backgrounding program. Steers cost less to feed than heifers and are valued higher when finished for slaughter. Bulls are not usually desirable for a backgrounding program because of their behavior and disposition. Therefore, most backgrounders castrate bulls upon arrival. Castrating bulls at this stage can drastically reduce gains and can be a significant cost to the backgrounder. That is the reason why, in the Arkansas Livestock Auction survey, bulls were discounted to the price of

steers. Heifers have a lower value than steers, generally \$9 to \$11 per cwt.

Weight – Value differences that exist between different weights of feeder steers and heifers are determined by the prevailing costs of growing cattle. The cost of gain is much less in a lighter calf than in a heavier calf. Lighter calves (<600 pounds) generally gain more cost effectively on forages than heavier calves (>700 pounds). Therefore, the lighter feeder calves are more desirable for a backgrounding program.

Muscle – Muscle thickness is related to muscle-to-bone ratio at a given degree of fatness-to-carcass yield grade. USDA developed a standard muscle scoring system (USDA, 2000). The scoring system is 1, 2, 3 and 4. Muscle score 1 cattle are thrifty and moderately thick throughout. They are moderately thick and full in the forearm and gaskin, showing a rounded appearance through the back and loin with moderate width between the legs, both front and rear. Muscle score 2 cattle show a high proportion of beef breeding, are thrifty and tend to be slightly thick throughout. They tend to be slightly thick and full in the forearm and gaskin, showing a rounded appearance through the back and loin with slight width between the legs, both front and rear.

Muscle score 3 cattle express a forearm and gaskin that are thin, and the back and loin have a sunken appearance. The legs are set close together, both front and rear. Muscle score 4 cattle are thrifty but have less thickness than the minimum requirements specified for the No. 3 grade. Muscle score 1 calves are the most desirable for a backgrounding program. Heavier-muscled calves oftentimes will have higher average daily gains than lighter-muscled calves (No. 2, 3 and 4).

Frame – Frame scores are determined based on the revised U.S. Standards for Grades of Feeder Cattle (USDA, 2000). According to the standards, frame size is related to the weight at which, under normal feeding and management practices, an animal will produce a carcass that will grade USDA Choice. USDA large-framed steers and heifers are expected to weigh over 1,250 and 1,150 pounds, respectively, to grade USDA Choice. USDA medium-framed steers and heifers are expected to weigh 1,100 to 1,250 and 1,000 to 1,150 pounds, respectively, to grade USDA Choice, and USDA small-framed steers

and heifers are expected to weigh less than 1,100 and 1,000 pounds, respectively. Large-framed animals require a longer time in the feedlot to reach a given grade and will weigh more than a small-framed animal would weigh at the same grade.

In the Arkansas Livestock Auction Survey, USDA small-framed feeder cattle sold with severe discounts, over \$22.00 per cwt. compared to large- and medium-framed feeder cattle. The selling prices between large- and medium-framed feeder cattle were not different, making them equally desirable for a backgrounding program.

Breed – It has often been stated that there is as much variation within a breed as there is across breeds. This statement is certainly true. Therefore, it becomes very difficult to recommend to backgrounders that one breed type fits all needs and environments. When designing a backgrounding program, it becomes extremely important to identify the breed type(s) that will perform the best in the given environment.

In the Arkansas Livestock Auction Survey, 23 breeds or breed combinations were analyzed. Livestock market reporters evaluated each feeder calf and determined its breed or breed type based on frame score, muscle thickness, color, breed characteristics and body structure. Breed or breed combinations were based on common industry perception rather than actually knowing the breed composition. Generally speaking, a crossbred animal (i.e., English x Continental) that expresses growth potential with hybrid vigor is desirable for backgrounding programs.

Condition – Cattle and calves may vary greatly in condition or flesh. Calves that are overconditioned have usually been on a high plane of pre-weaned nutrition (creep feeding, etc.). Subsequent to weaning, the level of nutrition may decrease and the overconditioned feeder cattle may actually lose weight for a period, thus affecting performance in the backgrounding phase. Calf buyers will not pay for that weight and time loss, thus there are large discounts seen with fleshy and fat feeder calves sold at weaning. Therefore, thin or average conditioned feeder calves are more desirable going into a backgrounding program.

Shrink – Fill and tissue shrink are the two kinds of shrink that occur during the transport and marketing of cattle. Cattle held off of feed

and water overnight experience fill shrink, which is the loss of rumen fill, manure and urine. This type of shrink is recovered in a short period of time after feed and water intake return to normal. Tissue shrink is a decrease in the weight of the carcass and other body tissues. This type of shrink is primarily the result of extra-cellular and intra-cellular fluid loss. Tissue shrink is generally associated with long periods without feed and water. Cattle on lush green grass will shrink more than if they were consuming a less digestible, dried grass or hay.

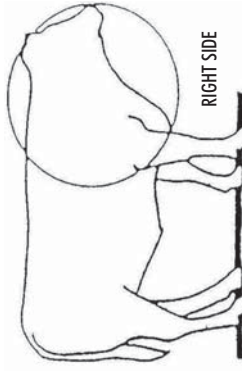
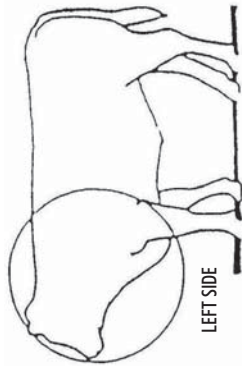
Summary

Before starting a backgrounding program, evaluate available resources, forage production potential, labor requirements and costs of all other inputs, as well as estimated purchase costs, selling price and weight of cattle. A thorough, accurate economic analysis (budget) should help you arrive at an estimated net return. Once involved in a backgrounding program, follow all recommended management practices to lower the cost of animal gains. This means using all recommended practices that return more than \$1 for each \$1 invested.

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Addendum 1



CALF PROCESSING RECORD GROUP RECORD

Owner: _____

Date: _____

Number of animals: _____ Sex: Steers _____ Bulls _____ Heifers _____ Eartag Numbers Used: _____

Use procedure number to identify injection site in circles on animal above.

	Date	Treatment	Product	Company	Lot #	Expiration	Dose	Route of Admin	Booster Date	Processor Initials
1		Clostridial (black leg +)								
2		Tetanus								
3		Brucella							N/A	
4		Coccidiostat							N/A	
5		Implant								
6		IBR/PI3/BVD/BRSV								
7		Mannheimia/Past.								
8		H. somnus								
9		Internal parasites							N/A	
10		External parasites							N/A	
11		Antibiotics								
12		Medicated feed								
13										
14										

Castration method: _____

Date: _____

Brand: _____

Date: _____

Location: _____

Dehorn: _____

Date: _____

Description/Comments: _____

Signed: _____

Date: _____

Addendum 2

TREATMENT RECORD

PEN _____

DATE	TAG #	CIS	TEMP	WEIGHT	MEDICATION	DOSAGE		REMARKS

SYMPTOMS		Clinical Illness Score (CIS)	Description	Clinical Appearance
		1	Slightly ill	Mild depression, gaunt +/- ocular/nasal discharge
		2	Moderately ill	Ocular/nasal discharge, gaunt, lags behind other animals in the group, coughing, labored breathing, moderate depression, +/- rough hair coat, weight loss
		3	Severely ill	Severe depression, labored breathing, purulent ocular/nasal discharge, not responsive to human approach
		4	Moribund	Near death

Modified from BRD clinical assessment score criteria provided by Elanco Animal Health.

Addendum 3

BACKGROUNDING BUDGET

Description:

Number of calves

Average weight when started

Month started

Estimated month to sell

Daily gain expected

Weight when sold

Estimated Cash Expenses and Profits:

1. Purchase cost

Number of steers _____ × _____ price/hd

Number of heifers _____ × _____ price/hd

Number of bulls _____ × _____ price/hd

2. Feed

3. Hay (purchase price or value grown hay could be sold for)

4. Labor

5. Salt, minerals, etc.

6. Pasture charge (Fertilizer + seed + equipment rental or depreciation + fuel + fencing repairs OR value permanent pasture could be rented for + fertilizer, etc.)

7. Veterinarian, drugs and implants

8. Death loss

9. Buying, selling and transportation charge

10. Insurance

11. Interest on borrowed money for cattle and feed

12. Total cash costs (Lines 1 through 11)

13. Cost per head (Line 12 divided by number of head)

14. Break-even price (Line 13 divided by average selling weight per head)

15. Selling price/cwt _____ × _____ average weight

16. Estimated profits per head (Line 15 minus Line 13) for labor needed, facilities, principal payments and risk

17. Total estimated profits from backgrounding (Line 16 times number of calves sold)

Addendum 4

COMMON CALCULATIONS IN BACKGROUNDING DECISIONS

Average Daily Gain (may be calculated for individuals or groups)

$$\frac{(\text{Ending weight} - \text{Beginning weight})}{\text{Number of days between weigh dates}}$$

Example: A set of 75 calves weighed 58,500 pounds on March 14. The calves were purchased on October 15 of the previous year and weighed 36,000 pounds. The number of days between the two dates is 150. The average daily gain for the group is 150 pounds per day and the per calf average daily gain is $150/75 = 2$ pounds per day.

Total Feed Conversion

$$\frac{\text{Total feed disappearance during the feeding period}}{\text{Total weight gained during the feeding period}}$$

Example: A set of 75 calves were fed hay in ring feeders and 6 pounds per day of a commodity feed blend. The hay weighed 750 pounds per bale with an estimated waste of 12 percent. A total of 168 bales were offered. Total feed consumed was $(168 \times 750 \times 0.88) + (6 \times 75 \times 150) = 178,380$. Total weight gain was $58,500 - 36,000 = 22,500$. Total feed conversion was $178,380/22,500 = 7.9$ pounds feed per pound of gain.

Partial Feed Conversion

$$\frac{\text{Total feed disappearance of specific ingredient during the feeding period}}{\text{Total weight gained during the feeding period}}$$

Example: Total commodity feed disappearance was 67,500 pounds. The partial feed conversion for the commodity feed was $67,500/22,500 = 3$ pounds of feed per pound of gain (the use of partial feed conversion can be misleading.)

Supplementation Response Feed Conversion

$$\frac{\text{Total supplement disappearance during the feeding period}}{\text{Total weight gained} - \text{Weight gain of nonsupplemental group}^*}$$

*Weight gain of nonsupplemented group may be projected from historical records or basal diet quality without the supplement if a nonsupplemented group is not available for comparison.

Example: A set of 75 calves were fed 67,500 pounds of commodity blend over 150 days in addition to hay. The hay was 10 percent protein and 60 percent TDN. Without supplement the calves were expected to gain 1.3 pounds per day. The supplemental feed conversion was $67,500 \text{ pounds of feed} / ((75 \times 2 \text{ pounds per day} \times 150) - (75 \times 1.3 \text{ pounds per day} \times 150)) = 8.6$ pounds of supplement per pound of additional weight gain. The 2 pounds per day gain in the denominator came from the average daily gain calculation above.

Breakeven Cost of Gain

$$\frac{\left(\text{Expected sale price: } \left(\text{weight} \times \frac{\$}{\text{lb}} \right) - \text{Purchase price: } \left(\text{weight} \times \frac{\$}{\text{lb}} \right) \right)}{(\text{Expected ending weight} - \text{Purchase weight})}$$

Example: 75 calves were purchased in October weighing 480 pounds at a price of \$220 per cwt or \$2.20 per pound. They will be sold in March weighing 780 pounds at an anticipated price of \$180 per cwt or \$1.80 per pound. The amount of weight gain per calf between October and March is 780 pounds – 480 pounds = 300 pounds. The breakeven cost of gain is $((780 \times 1.80) - (480 \times 2.20))/300 = \1.16 . If cost of gain is kept below this price, the enterprise was profitable.

Addendum 4 (cont.)

Breakeven Sell Price

$$\frac{\text{Purchase price: } \left(\text{weight} \times \frac{\$}{\text{lb}} \right) + \text{Total cost of gain: } \left(\frac{\$}{\text{lb of gain}} \times \text{total weight gain} \right)}{\text{Expected sell weight}}$$

Example: Calves can be purchased in October weighing 480 pounds valued at \$2.20 per pound. The anticipated cost of gain based on previous feeding rates, feed conversion, health and other costs is \$1.16 per pound of gain. The calves will be sold in the spring weighing approximately 780 pounds; therefore, the expected weight gain is 300 pounds. The breakeven sell price in the spring is $((480 \times 2.20) + (300 \times 1.16))/780 = \1.80 per pound or \$180 per cwt.

Morbidity (Sickness) Rate

$$\frac{\text{Number of calves within a group that were treated for illness}}{\text{Total number of calves within the group}} \times 100$$

Example: 75 calves were purchased, and among the 75, 40 were pulled and treated for symptoms of respiratory disease. The morbidity rate was 53 percent.

Mortality Rate or Death Loss

$$\frac{\text{Number of calves within a group that died}}{\text{Total number of calves within the group}} \times 100$$

Example: 75 calves were purchased, 40 were pulled and treated for symptoms of respiratory disease, and two of the treated calves later died. The mortality rate was 2.7 percent.

Death Loss Budget Item Per Head Sold

The death loss budget line item is usually calculated as the purchase price and veterinary medical expense incurred for each calf that died. In general, feed and other costs are not included because death loss usually occurs during the receiving period and individual feed intake is not known.

$$\frac{(\text{Number of calves that died} \times \text{per calf purchase price}) + (\text{Number of calves that died} \times \text{per calf medication cost})}{\text{Number of calves marketed}}$$

Example: 75 calves were purchased weighing 480 pounds for \$2.20 per pound. Two calves died during the receiving period. The combined cost of vaccinating and treating the two calves for symptoms of respiratory disease was \$45.00. The total death loss per head sold was $\$2,157/73 = \29.55 per head.

Feeder Futures Basis

$$\text{Price received at a particular market location} - \text{Feeder futures price}$$

Example: Calves marketed in March weighing 750 pounds in Arkansas received \$140/cwt and the nearby feeder futures during the month of March was \$150 per cwt. The basis for 750-pound calves in March was -\$10 per cwt.

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