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SINCE

SET PRODUCTION BENCHMARKS FOR SHEEP AND GOAT PRODUCTION

SHEEP AND GOAT PRODUCERS SHOULD SET PRODUCTION BENCHMARKS TO HELP THEM ACHIEVE GOALS FOR THEIR OPERATION. THIS WILL HELP THEM TO IMPROVE PERFORMANCE WITHIN THEIR FLOCK OR HERD.

No matter what type of business you work with, those who are successful will set goals and evaluate them on a regular basis. For a sheep or goat operation, producers can set production benchmarks to improve performance that could lead to more profitability. These production goals could focus on only one year, or they could focus on reaching goals five or ten years down the road.

Producers should start by evaluating the production characteristics that are most important to their operation. Then, use the results of the evaluation to assess how to improve performance. Production benchmarks often focus on basic production or performance, reproduction, health, nutrition, marketing or finances. A few examples might be lambing or kidding percentage, weaning weight, ewe or doe production, loin eye size, fat depth, or even resistance to internal parasites.

As producers think about these production benchmarks, there are two things to consider: where you are now and where you want to go. Production benchmarks should be specific to individual operations and should balance the type of animals produced with the resources available on the farm. Producers most often should focus on optimum production rather than maximum production.

One production goal set by the American Sheep Industry is for sheep producers to increase lamb production through increased lambing percentage. The National Agricultural Statistics Service (NASS) reported the 2023 national lambing percentage at 103%. Increasing this would allow the United States to produce more lambs while maintaining the current flock inventory. This can be accomplished through selecting for twinning and by better managing nutrition. If we make a comparison of lambing percentages on a 100-ewe flock, we see very quickly how this can affect the operation's profitability. Assume that lambs will bring an average of \$150 per head at weaning. For a flock lambing at 150% this would mean an income of \$22,500 if all the lambs are sold. If the flock is lambing at 175%, this will bring the income up to \$26,250. Production costs and management practices are essentially the same, except for possibly a few extra dollars spent to flush the females during the breeding season. In this example, the producer increases income by \$3,750 simply by making selection decisions based on performance traits and better managing nutrition, particularly with flushing.

Resources available on the farm should help producers decide what goal to set for lambing or kidding percentage. Higher percentages require additional feed resources to support milk production as well as additional labor to manage females at lambing and kidding time.

Conception rates can be critical for any livestock enterprise. Lambs and kids should preferably be born within two heat cycles, or 34 days for lambs and 42 days for kids. This should produce a more uniform group of lambs or kids because they are closer to the same age and they should weigh more because they were born earlier in the lambing or kidding season. Ideally, most females would become pregnant in that first heat cycle. If conception rates during the first heat cycle are less than expected, set a higher first conception rate and look at options to reach this goal.

Another critical reproduction benchmark is lamb or kid mortality. Nutrition and management practices both play a major role in lamb and kid survivability. Nationally, producers experienced mortality rates around 6.5%, according to NASS. A good goal would be to reduce this to 5%.

Technology allows producers to make some production decisions using ultrasound to measure loin muscle depth and fat thickness. Although producers can make judgments on loin eye size visually by looking at the width of the top of a sheep, the only accurate way to assess loin muscle size is by measuring that animal's loin muscle. This can be accomplished using ultrasound or by taking carcass measurements. By using these measurements, producers can select for increased muscling and thus can increase the value of lambs. In general, a 1 square inch increase in loin eye increases carcass value by about \$10.

Internal parasites challenge many sheep and goat producers each year. In order to improve parasite resistance producers should keep records of animals that received anthelmintic treatments. Those animals that

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SKU - 308875



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require deworming most often can be culled from the flock or herd. Or producers can run fecal egg counts on individual sheep and goats. The National Sheep Improvement Program, which develops estimated breeding values (EBVs) for both sheep and meat goats, helps producers identify animals with the genetic ability to resist parasite infections through fecal egg counts. Culling animals that require deworming more often and selecting for animals with negative EBVs for fecal egg counts can help producers reach a benchmark for a decreased need to treat animals with anthelmintics.

Production benchmarking is a tool to help producers analyze their flock or herd and help them set goals to improve performance. Benchmarks can vary greatly from one flock or herd to another and so must be designed for each individual operation's situation.

Penn State Extension

MAXIMIZE REVENUE OPPORTUNITY FROM CULL EWES AND DOES

WHEN TO MAKE SHEEP AND GOAT CULLING DECISIONS

There are two key times of year to evaluate culling sheep and goats, especially females, from your herd or flock – after weaning and before breeding. After weaning, assess potential cull ewes and does for productivity and profitability in terms of the number of lambs or kids weaned and the cumulative weaning weight.

Around 45-60 days before breeding season, evaluate how potential cull ewes or does held up during the grazing season. Did any require greater maintenance in terms of parasites, worms or other health challenges? Did they have feet and leg issues? Body condition can be a factor for culling, but under-conditioned ewes and does that are otherwise sound and productive still have time to get back into condition with nutritional support before breeding.

For spring lambing or kidding, late gestation is a good time to review animal records and earmark females that have decreased in productivity over the past few years so you can keep an eye on them.

VOLUNTARY AND INVOLUNTARY CULLING FACTORS

Many factors influence decisions around culling goats and sheep, and you can group these factors into two categories – voluntary and involuntary culling. Involuntary culling of sheep and goats is associated with factors that negatively impact the bottom line regardless of market conditions. Involuntary culling factors are typically associated with reproductive issues (not breeding back) and severe health challenges. Most other factors are considered voluntary culling – factors preventing females from being highly productive but may be overlooked if the profit margins are high in a given market.

As such, voluntary culling factors include:

- Feet and legs
- Assisted or unassisted lambing/kidding
- Mothering ability
- Udder quality
- Number of lambs or kids weaned
- Cumulative weaning weight of lambs or kids
- Body condition
- Age
- Teeth

Producers often ask me at what age to cull ewes or does. The answer depends on the animal. Is she weaning a cumulative lamb or kid weight that ranks in the top half of the flock or herd? Has she remained hardy in terms of feet and legs and udder quality? Age alone isn't a reason to cull if an animal is productive and weaning an adequate weight of lambs or kids. However, if an older ewe or doe is routinely under-conditioned and has reduced fertility or milk production, it may be time to move her down the road.

EVALUATING MARKET OPPORTUNITY

Once you've decided which animals to cull, consider if you should cull immediately or keep them in the flock for a time to maximize market opportunities. The decision is twofold:

1. What are the expected feed costs to add weight to cull animals before marketing?
2. Will the expected return on investment outweigh any additional input costs?

Deciding when to cull ewes or does is about comparing the opportunity cost of time on feed and market opportunity. You don't have a crystal ball to know what market prices will be, but you can look at seasonality of historical cull ewe prices to make an informed decision.

Also consider the environmental conditions and time of year. For example, it might not make sense to devote extra feed resources to cull ewes and does when experiencing drought conditions. The availability of stored forage and grazing resources can greatly influence expected feed costs for cull ewes and does.

FEEDING CULL EWES AND DOES

If you decide to feed out females before marketing, I recommend treating them like incoming feedlot animals and, at a minimum, getting them up to date on vaccinations and deworming. Then, work them up to a feedlot-style diet for 60-90 days before marketing to maximize weight gain. However, be sure to evaluate for broken-mouthed ewes or does prior to initiation of the feeding program as the diet may need to be constructed to ensure they can be truly efficient on grain-focused ration.

Roughage is still essential in the diet, but to maximize efficiency, it's important to feed a higher level of energy to cull ewes and does than replacement females or females remaining in the breeding program. Determining how much to feed cull ewes and does will depend on current grain prices and what forage resources you have available. Self-fed products with a high fat level can also be a great option to supplement forages and help quickly add weight to cull ewes and does.

Re-asses cull ewes and does about 30 days after they've been on feed. If they haven't gained weight, consider marketing them to focus resources on females that are responding to added time on feed. Finding just the right balance of feed investment and marketing opportunity can help you capitalize on cull ewes and does and bring additional revenue back to your business.

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MINERALS AND VITAMINS FOR SHEEP

Proper animal nutrition means giving the animals the proper amount of all nutrients necessary for optimum production. This involves knowledge of the nutrients themselves, factors that affect the requirements of animals, and the feeds used to deliver those nutrients. Cost is always a consideration for profit-motivated producers. This interplay of factors can become very intricate, but it need not be.

For the ewe flock, proper nutrition involves giving animals all the good quality forage they want, and supplementing that with nutrients that may be deficient. So the basics of animal nutrition are good forage management, such as proper fertilization, a mixture of grasses and legumes, maintaining forage at a nutritious stage of growth, and providing forage in adequate quantities. Let's focus on the supplementation side of this issue.

Supplements are just that – sources of nutrition that are given to animals in addition to their basic ration, with the intent of increasing the intake of that critical nutrient. Thus, we can't properly supplement without knowing the requirements of animals, or without knowing the amount of nutrition provided by the basal ration.

In Table 1 are shown the various minerals and vitamins of concern, levels found in good forage, and the requirements for these nutrients by various classes of sheep. The requirements are based upon the Nutrient Requirements of Sheep, Sixth Edition (1985), and the forage values based upon pasture samples taken in southwest Virginia over the last several years.

Table 1. Minerals and Vitamins in Forage and Required by Sheep				
Nutrient	Good Forage	Class of Sheep and Their Requirements (in diet Dry Matter)		
		Mature Ewe		Young Lamb
		Early Pregnancy	Nursing Twins	Fast Gain
Calcium, %	.45	.25	.4	.55
Phosphorous, %	.40	.2	.3	.25
Potassium, %	2.0	.5	.8	.6
Magnesium, %	.25	.12	.18	.12
Sulfur, %	.25	.15	.25	.15
Sodium, %	.0005	.10	.15	.10
Iron, PPM	100	40	40	40
Copper, PPM	8	10	10	10
Manganese, PPM	70	40	40	40
Zinc, PPM	30	30	30	30
Selenium, PPM	.15	.3	.3	.3
Vit A, IU/lb DM	50,000	1000	1200	500
Vit D, IU/lb DM	500	100	100	100
Vit E, IU/lb DM	10	7	7	7

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MACROMINERALS

There are many minerals that are required in the diet of sheep. Macrominerals are required in larger amounts, with that requirement expressed as a % of the diet or as grams per head per day. In table 1, above, they are shown on the first 6 rows of the table. Some of these are already in sufficient quantity in forages, so supplementation is not needed. Others are never in adequate amounts, so must always be in a supplement. Finally, there are those that are marginal, meaning amount in the forage and amount needed are close to each other, thus supplementation is sometimes needed, and sometimes not.

- Adequate Potassium
- Deficient Sodium (when combined with Chlorine, makes salt)
- Marginal Calcium, Magnesium, Phosphorous, Sulfur

Calcium is often in adequate amounts in forages, and legumes have higher levels than do grasses. Grains and grain crop silages have very low levels of Calcium. Phosphorous is just the opposite. It is high in grains and low in forages, often because soils are low in phosphorous fertility levels. Because Phosphorous is important to reproduction and growth, it is often included in minerals for the ewe flock year around. Magnesium is often low in lush forage growing in early spring or when spring-like conditions occur. A deficiency of Magnesium causes grass tetany, a problem in cows that rarely occurs with ewes.

MICROMINERALS

Minerals needed in very small quantities are called microminerals, or trace minerals. The requirement by animals for these minerals is expressed in milligrams per head per day or in parts per million. Just as with the Macrominerals, some are adequate, others are deficient, and several are marginal.

- Adequate Manganese, Iron
- Deficient Selenium
- Marginal Zinc, Copper

Iron is often added to minerals (iron oxide or ferric oxide on the tag), even though the required amount is included in the forage that is consumed in the basal diet. The reason it is added is to give minerals the typical reddish-brown color. However, iron can interfere with the uptake of other minerals that are not in large amounts, such as zinc. Thus, it is recommended that iron not be included/added to complete minerals for ruminants.

Zinc, Copper, and Selenium are all important in many physiological functions, including the immune response and disease-fighting ability. Our soils are often deficient in Selenium, making forage grown on those soils also deficient. Consequently, it is strongly recommended to include Selenium in mineral mixtures for sheep of all ages.

The Food and Drug Administration (FDA) oversees Selenium (Se) in livestock feeds, since it is a cancer-causing element at high levels. They have established rules for inclusion of supplemental Se, and expressed those in 3 different ways. Those rules, indicating maximum levels of Se for sheep, are:

- 0.3 Parts per Million (PPM) in the total diet
- 0.7 mg per head per day
- 90 PPM in a free-choice mineral mixture

Because Se is not stored in the body for very long, frequent intake or dosing of Se is critical. A good sheep mineral needs to be available at all times that contains at least 50 or 60 PPM of Se. Assume Se is not included in a mineral product. If it is included, the amount must be stated on the label of the product. It often is stated as a percent. To convert % to PPM, move the decimal 4 places to the right. Thus, a product with 60 PPM would be stated to include 0.006% Se.

Copper (Cu) can be toxic to sheep. Although there is an important function of Cu in the body, and thus it is a required mineral, excess amounts are concentrated in the liver rather than being excreted. Over time, this excess of Cu can destroy liver tissue, resulting in death of the animal. Our soils, and thus the forages grown on them, contain Cu levels that are close to the animals' requirements. Consequently, sheep minerals for the mid-Atlantic region should not have any Cu added to them. **Note – These levels are too low for cattle and goats, thus properly formulated minerals for these species always have Cu added to them. Mineral mixtures formulated for cattle and for sheep can be toxic to sheep if used for a long time.

VITAMINS

Sheep, with their ruminant digestive system, can make vitamins from the raw materials consumed in their diet. They do this very well with all of the B-Vitamins; thus these are not any concern with sheep. Vitamins A and E are made from compounds found in green forage. Vitamin A can be stored in the liver for 2 or 3 months after sheep have been eating green forage for several months. Consequently, when eating fresh pasture or well-made hay no supplemental vitamins are needed.

However, when sheep are eating forage that is old, weathered, mature, or otherwise low in Vitamin A precursor, then this Vitamin should be added to the mineral mixture. Other feeds that will result in inadequate Vitamin A levels are corn silage, corn stalks, and straw.

Vitamin D is made from exposure to sunshine. For sheep housed indoors for more than 2 to 4 weeks, such as lambs being finished in confinement, Vitamin D should be included in the diet.

Most commercial minerals for sheep designed for free-choice feeding will contain added Vitamins A, D, and E. When making a total mixed ration, vitamin premixes can be added to the formulation if a free-choice mineral is not going to be fed.

INTAKE OF MINERAL

Sheep do not eat the same amount of mineral throughout the year. They have a craving for salt and consume a complete mineral to get salt. Some ingredients, such as dicalcium phosphate and especially magnesium oxide, are not very palatable; thus intake may be lower when these ingredients are included.

Often grain products or artificial flavor enhancers are added to mineral mixes to encourage higher intake.

Intake is higher when consuming lush fresh forage, such as in the early spring. During the dry summer months intake is lower, this is also the case when sheep are eating hay. If a water source is nearby intake is higher than when water is a great distance away. In addition to nearby water, intake is higher if mineral feeders are located in shady areas or along paths frequently traveled by sheep.

Producers should monitor intake periodically. Put out a known amount of mineral and keep track of the number of days a group of sheep takes to consume it. Divide by the number of head to calculate the intake per head per day. This should be an average of ½ to 2 ounces per day.

COMPOSITION OF MINERALS (FEED TAG INFORMATION)

By law the tag on a mineral product must contain certain information. It must contain guarantees of various minerals included in the product. The minimum information to be stated is:

- Minimum and Maximum Calcium
- Minimum Phosphorous
- Minimum and Maximum Salt
- Minimum and Maximum Copper (if added, or if it exceeds 20 PPM)
- Minimum Selenium
- Minimum Vitamin A

Information about other minerals included may be displayed on the label. A list of ingredients will be displayed. If a product contains a feed additive, it will say "Medicated" on the label, and the FDA-approved purpose for that additive will be stated.

FORM OF MINERAL SUPPLEMENT

Minerals and salt products are available in loose, granular form and in block form. Because blocks are hard enough to shed rainwater, it is sometimes difficult for sheep to get enough mineral from licking them. In addition, sheep have broken their teeth on blocks. Finally, few if any complete minerals are in block form. Loose minerals must be put in a covered feeder of some type to keep rain out so they don't cake and become hard. Loose mineral mixes are the recommended form of mineral for sheep.

TYPES OF MINERAL SUPPLEMENTS

Sheep producers with forage-based feeding programs normally provide minerals in a self-feeder to their animals. They normally do not mix minerals with other feeds that are fed each day, as is the case with pigs, poultry, dairy, and beef feedlots. There are several types of free-choice mineral mixtures available to sheep. These are:

White Salt

The only minerals this contains are Sodium and Chlorine. This is not an adequate mineral supplement. Often contains Iodine, and is therefore called Iodized Salt.

Trace Mineral Salt (TMS)

TMS is White Salt with added Trace Minerals. No macrominerals are included. Often colored red from the Iron compounds added. Unless specifically stated, TMS contains no added Selenium, although there are some TMS products that do. TMS with added Selenium is considered to be the minimum acceptable mineral supplement for sheep, and only then sheep consuming high quality pasture.

Complete Mineral

A mixture containing salt, the macrominerals Calcium and Phosphorous, and trace minerals. May or may not have added Selenium. May have added Magnesium, but perhaps not enough to prevent grass tetany. Often the ratio of Calcium to Phosphorous is in the product name, such as 2:1 or 4:1. Because Phosphorous is the needed item and Calcium is normally adequate, a lower ratio is more appropriate for forage-based feeding programs. A higher ratio just dilutes the Phosphorous with Calcium-containing ingredients.

LAMBS FED A HIGH-GRAIN DIET

The rapidly growing lamb fed a high grain diet can experience many nutritionally related problems. One of these is called

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urinary calculi, a blockage of the urinary tract caused by “stones” that develop. An unsupplemented high grain ration contains an excess of Phosphorous and negligible amounts of Calcium. The requirement (table 1) is for Calcium in higher amounts than Phosphorous. This reversal of Ca:P ratio results in a change in the pH of the urine and the development of mineral-based precipitates in the urinary tract. One solution to this problem is to use ammonium chloride in the ration. This changes the pH of the urine back towards normal, thus preventing the precipitates from forming. However, the Ca:P imbalance still persists. This is best fixed by feeding the lamb a mineral supplement that provides lots of Ca and little or no P. Ground limestone (feed grade) added to a complete ration at the rate of 1% of the mixture is recommended. In this way the diet will contain the recommended Ca:P ratio of at least 2:1, even though the actual amounts of both Ca and P will greatly exceed the animal’s requirements for these minerals. Many lamb feeders use added limestone plus ammonium chloride in the same feed.

SUMMARY

High quality forages consisting of mixtures of grasses and legumes provide the basis for good sheep nutrition in the mid-Atlantic region. These forages also provide many of the needed minerals and vitamins for sheep. However, several minerals will likely be deficient, thus mineral supplements must be offered. These supplements should be in loose form, fed in a feeder to keep out the weather. Free-choice minerals for sheep must contain added Selenium, and should not have any Copper added to them. The basic ingredient is salt.

Mineral supplementation need not be complicated or expensive. Intake of minerals by sheep needs to be monitored to ensure that amounts adequate to meet the needs are consumed. Excessive intake is costly and does not result in higher production. By focusing on forage production and quality first, then providing minerals that are likely to be deficient, producers can cost effectively meet the mineral needs of their sheep.

Please note the above recommendations are specific for sheep. Sheep and goats have substantially different requirements for some mineral, copper in particular (goats require more copper than sheep). Therefore, a “one size fits all” strategy for mineral supplementation of sheep and goats is not recommended.

Virginia Cooperative Extension

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