Determine basic nutrient needs of animals on smaller operations

We humans read food packaging labels when we want to better understand what goes into our bodies and the nutritional value.

Livestock, left to their own devices, will go for the "ice cream and potato chips" or simply end up eating the "cardboard" of their livestock-feed-world. They rely on us to make sure their needs are met.

We'll look at some basic livestock nutrition needs, how physiology can affect the type of feed needed, and how to provide livestock with balanced rations.

Different species, different needs, different capabilities

All animals have a need for protein, energy, water, dry matter (fiber), minerals, and trace nutrients; however, these basic nutrient needs vary by species – see the chart. This chart is based on middle-aged, at-ease animals of each species – these animals are not growing, lactating, breeding, finishing, or fighting environmental stress. All these factors can change nutritional needs.

Species	Dry matter intake / % body weight	Protein % of diet	Energy MCAL (megacalorie)	Water Gal./day
Goats 90 lbs	5%	11%	3 Mcal	.75 – 1.5 gal.
Sheep 120 lbs	2.5%	7-10%	5 Mcal	1-2 gal.
Alpaca 300 lbs	3%	5-7%	4 Mcal	3-4 gal.
Cattle 1,200 lbs	2.8%	8-12%	18 - 21 Mcal	8-12 gal.
Swine 200 lbs	3%	13-15%	10-12 Mcal	3-5 gal.
Horses 1,300 lbs	2.5-3%	8-10%	40 Mcal	8-14 gal.

These figures are based on research, but a feeding regimen should be based on the specifics of your animals, feed analyses, and environment. Each species has specific micronutrient requirements and are vulnerable to different toxins.

What type of feed should I use?

The types of feed animals use to get the nutrients they need also varies with their physiologies, especially their digestive tracts. Ruminants such as cattle, sheep, and goats and pseudo-ruminants such as alpaca and llama, are multi-compartment digestive tract animals that use internal bacteria to break down materials less digestible to simple-stomached animals such as swine and horses.

Some animals, such as goats, alpacas and llamas, have mouth physiology to allow browsing and peeling tough twigs and brush. Others, such as cattle, actually use their tongues to "pull" grass into their mouths in a non-selective manner. Horses and sheep have incisors at the front of their mouths enabling them to crop plants very close to the ground. Swine, which are omnivores, have tusks and grinding teeth. Swine draw nutrients from plants, insects, and meat.

Using Pearson Square

Sometimes, feed supplies during our long and hard winters run low or there just simply isn't enough nutrients in the available feed. That sometimes means supplying a totally different feed to livestock, but more often than not, it means providing a supplement. This means livestock are provided two feeds. There is a great tool called the Pearson Square to help understand how much to feed of each of our two feeds. We will work with a Pearson Square to develop a balanced ration for a middle-aged animal not experiencing

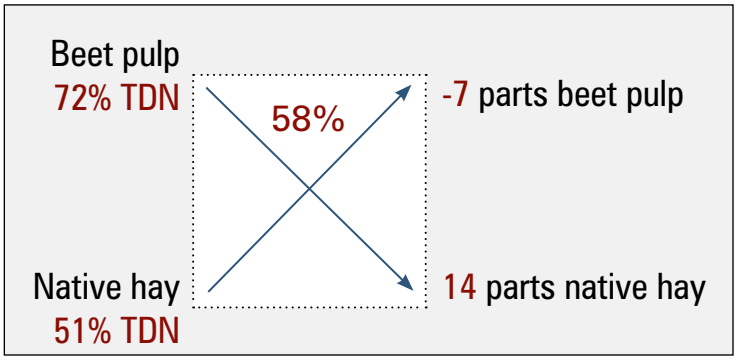
any environmental stress. Balancing a ratio will change as the physiological and environmental demands, such as lactating, breeding, or extreme cold temperatures, vary among animals.

The Pearson Square is a square with a number in the middle. That number represents the nutritional requirement for an animal for a specific nutrient. The "goal" center number will change depending on what part of the life cycle the animal is experiencing. The number can be found on feed labels for bagged feed or there are various tables available online for feedstuffs/feed composition (see the Barnyards & Backyards website http://bit.ly/barnyardtreasure for "Forages, Pasture and Grazing" then under "Feeding hay" for various online resources). The producer could be wanting to balance for crude protein, TDN (total digestible nutrients), which relates to animals' energy, amino acids, vitamins, or minerals.

There are three rules to make a Pearson Square work.

1. The number in the middle of the square must numerically always be in-between the two numbers on the left side. The left side numbers are the nutrient content (for the goal nutrient) of the feeds mixed.
2. Subtract in a diagonal through the center of the square.
3. Ignore negative numbers that may be generated on the right side. The numeric value is the biggest concern.

In the following example, our cattle need 58% TDN. Use the Pearson Square to determine the appropriate mix to meet a beef cattle's TDN requirement, meaning what mix will give her the energy she needs. A producer definitely wants her to have good energy if she is in her final period of gestation or lactating. We have access to beet pulp and native hay for feed.



Example Pearson Square solving for what mixture of feeds to give animal when meeting TDN requirements.

We know the TDN of beet pulp and native hay (72% and 51% respectively) and list them on the left hand side. We know we want 58% TDN, so we put that in the center of the square. We subtract diagonally through the square to get the numbers on the right hand side of the square (51-58=-7; 72-58=14). Rule 3, from above, tells us we can disregard the negative and make that number positive. Add the 7 and the 14 to find the total "parts" of feed to get 21 parts.

Pulp%= (7/21)*100= 33.33%

Hay%= (14/21)*100= 66.67%

The example above suggests the feed needs to be made up of approximately 33 percent beet pulp and approximately 67 percent native hay to meet the animal's TDN nutrient requirements. For a more in-depth look at Pearson Squares check out this bulletin, *Formulating Rations with the Pearson Square*, from CSU Extension bit.ly/pearsonsquare. After learning how to calculate a basic ration, the real world complexities to rations can be added (lactation, breeding, finishing, growing, and environmental stresses). Contact your local extension office for more help with these complex issues.

Learning how to provide the feed needed to meet your animal's nutrient requirements is important not only to keep them well fed but can also help avoid certain feed-related health problems. An example is high protein alfalfa hay fed to horses can cause laminitis or "founder" in small horses unable to process the high protein content. In addition, an only-alfalfa diet can cause stunted development in young horses and osteoporosis in older horses, since the phosphorus-rich alfalfa pulls calcium out of the dietary tract.

For help tackling subjects described in this article, write down the size, age, production phase, health status, and weather conditions of your animals and contact a University of Wyoming Extension educator to assist with a site-specific, nutrient planning process.

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