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Deer Nutrition - Part 1 Energize Your Deer Management

by David G. Hewitt

Poor nutrition can derail an otherwise well-planned deer management program; thus managers seek to provide high quality food. However, understanding and managing deer nutrition is complex because the quality of food can be defined in many ways and deer nutrient requirements vary seasonally and with a deer's sex and age. To foster better understanding of deer nutrition, the CKWRI Deer Associates eNews will host a multi-part series on white-tailed deer nutrition, beginning with energy.

What is energy?

Energy is a difficult concept to describe. From a nutritional standpoint, energy is the potential to do work. Energy is made available when organic compounds are "burned" metabolically in the body. The total amount of energy in a food, called gross energy, is measured by actually burning a sample completely and measuring the heat produced. Energy can be measured in calories, or more commonly kilocalories (kcal = 1,000 calories). The composition of food determines its gross energy content. For example, minerals have 0 kcal/gram, carbohydrates have 4.5 kcal/g, and fats have 9 kcal/g of gross energy.



Forages like berries, acorns, forbs, and new, succulent browse leaves have high digestible energy because they have low fiber. Acorns and seeds may also have high energy because they contain fats and oils, which are high energy sources.

What makes a high energy food?

Carbohydrates and fats are the two primary sources of energy for deer. Fats are high in gross energy and are generally highly digestible; thus fats are an excellent source of energy. However, fats are not common in deer forage and are difficult to incorporate into pelleted supplements. Acorns and whole cottonseed are examples deer foods that may be high in fat and thus are good energy sources.

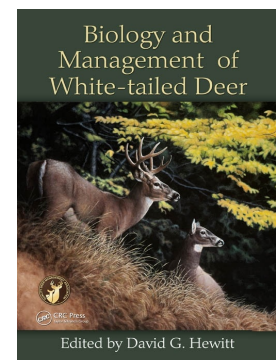
Carbohydrates may be highly digestible (think starch in corn) or poorly digestible (e.g. cellulose in mature grass). Poorly digested carbohydrates are considered fiber and thus the best indication of how much gross energy can be used by deer is the amount of fiber; the more fiber, the lower the digestible energy. Digestible energy is energy useful to the deer.

Excellent deer forages and poor quality forages often have the same gross energy. Such forages differ because of differences in the amount of gross energy digested. Thus, mature grass and corn have similar gross energy, but corn may have twice as much digestible energy.

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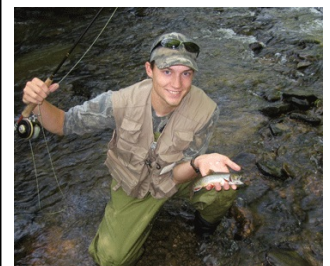
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Diets of free-ranging deer eating only forage may have less than 2 kcal/g digestible energy during dry seasons or in poor range conditions. During exceptionally good conditions, deer may consume diets containing 3 kcal/g. Most pelleted diets have 2.8 – 3.5 kcal/g digestible energy and therefore are good energy supplements.

What are implications of low energy intake?

- Low energy intake during autumn precludes bucks from acquiring fat needed during the rut. Entering the rut in poor condition could result in higher mortality rates (see the [March 2010 Deer Associates e-newsletter](#)).
- Energy intake immediately before and during the rut influences whether does ovulate, when they enter estrous, and potentially affects litter size. The effect of energy intake is dramatic for young does, which will not breed if on a low energy diet, but will breed if eating a high energy diet.
- Because body growth is energy expensive, low energy diets result in low growth rates and small bodied deer.
- Maintenance of body temperature in both hot and cold conditions requires energy. Poor energy intake may increase mortality during extreme weather.
- Low energy intake results in a cascade of metabolic changes that can affect a deer for the rest of its life and may have generational impacts. As discussed by Randy DeYoung in the [April 2010 Deer Associates e-newsletter](#), poor quality diets early in life can stunt deer and can cause a female's offspring to also be small, even if raised on a high quality diet. Because most nutritional regulation in an animal is tied to energy status, it is likely that energy intake is a primary factor causing these long term effects.
- Starvation occurs when an animal consumes less energy than necessary to meet its requirements and depletes its energy reserves. Starvation is the most severe consequence of low energy intake, but is uncommon in adult deer in South Texas.

Energy vs. Protein – Which nutrient is more limiting?

Energy has a step-child status in most people's minds when considering the nutritional quality of forage or feed. Usually the only information provided about deer forage or food is the protein content. Adequate protein is essential for maintenance, reproduction, and growth; however several lines of research suggest that energy is more limiting than protein for deer.

- In the 1980s, CKWRI scientists quantified the quality of deer diets monthly for an entire year near Kingsville. They found deer always consumed more than maintenance concentrations of protein and consumed sufficient protein for production during all but 2 months. Energy was insufficient for maintenance during 3 months and barely met maintenance requirements in a fourth month. The shocking part was that the months in which energy was most limiting were May–August, when fawns are being produced and antlers are growing.
- In a similar study conducted near Carrizo Springs, former CKWRI graduate students Ryan Darr, Luke Garver, and Kent Williamson plotted protein and energy intake of deer seasonally and also showed that energy is more often limiting than protein (see [Inside Deer Research Fall 2009](#)).
- Verme and Ozoga measured body growth of captive deer fawns fed diets differing in energy and protein. They concluded that diets differing modestly in energy content (3.0 vs. 2.7 kcals/g) had much bigger influence on body growth, metabolic state, and body fat than diets differing considerably in protein (16.2 vs. 6.6%).
- Abler and colleagues offered captive deer fawns diets varying in protein and energy content. Nearly 80% of fawns on diets with 3.1 kcals/g ovulated whereas none of the fawns fed a diet with 2.5/g kcals ovulated. Dietary protein of 9.6 vs. 18.2% had no effect on ovulation rates.

How do I know if deer are getting adequate energy?

There are 3 primary measures of energy status in deer that can be readily applied by managers:

- 1) Fat. Despite bad connotations for human health, fat represents good nutritional conditions for deer because body fat accumulates to the extent deer eat more energy than necessary for maintenance. Fat around a deer's organs and under its skin can be assessed at the skinning shed when processing harvested animals. There are 2 caveats when interpreting body fat:
 - fat stores vary seasonally. Deer are typically fattest during autumn and lose fat throughout the winter, even with unlimited access to high quality food.
 - female deer may be in poor condition during autumn, not because of low energy intake, but because they successfully raised fawns. Providing milk for fawns requires tremendous amounts of energy. Some of that energy comes from the doe's fat reserves and thus successful does may be in poor condition around the time of weaning.
- 2) Body condition. You can detect large differences in energy status visually by assessing deer body condition as described in the photos below.
- 3) Fawn body weight during autumn. Female deer invest large amounts of energy in fawns through lactation and fawns require high energy food to continue growing after they are weaned. For this reason, large fawns indicate a deer population has ample energy. Small fawns suggest energy needs for production are only just being met.



Deer body condition is a good indicator of energy status. The doe on the left has been using her fat and muscle for energy. The doe on the right has been eating more energy than she requires and has stored the extra energy as fat, giving her a plump, rounded appearance.

Implications for Deer Management

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Energy matters for nearly all aspects of white-tailed deer biology but few managers consider energy when addressing their deer herd's nutrition. Forbs, succulent browse, and mast generally have high amounts of digestible energy because they have low fiber concentration; management for these forages will increase energy intake. Actions that reduce deer energy expenditure may also be beneficial, such as reducing the distance deer must travel to obtain resources, providing cover to reduce thermoregulation costs, and reducing frequent disturbance during times of energy shortage. The positive response of deer to supplemental feed in southern Texas occurs largely because the supplement has higher digestible energy than forage, especially during drought or when range conditions are otherwise poor. Finally, actions that promote forage intake can also increase energy intake; factors influencing forage intake will be covered later in this nutrition series.

Next month - Protein - Building Blocks for Everything Deer

The next installment in the CKWRI Deer Associate eNew's nutrition series will be a description of protein's role in deer ecology and management.

Research referenced in this article

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