

## **Environmental Factors Affect Nutrient Requirements for Goats**

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Goats are an environmentally adaptive specie of livestock, extremely opportunistic and afford the small limited resource landowner(s) an alternative enterprise. The goat provides food security, high quality protein (for human consumption), biological land enhancement and many “value-added” products to increase revenue generated on a holistically sustainable rural farm.

The herbivore, through browsing and grazing, affects the plant specie grazed, plant part selected, quality of vegetation grazed, frequency of plants grazed, and degree of vegetation removal. Plant growth requirements are sunlight and the ability of the soil to provide moisture, support, protection and nutrients. The water cycle, driven by solar energy, affects vegetation more than any other single environmental factor. There is a continuum between soil, plant(s), animal(s) and the atmosphere.

In Tennessee, the major soil mineral deficiencies have been identified as copper, magnesium and zinc (Gill 2004). Unless a high quality, loose, free choice mineral is provided, side effects can manifest as reproductive failure (copper) and foot rot (zinc).

Environmental factors that affect vegetation distribution in relation to pasturelands management are topography, slope, precipitation, wind erosion and soil mineral content. Brush, forb and pasture management is based on the physiology of the plants; biodiversity of plant species in a community is vital (Dabaan 1997 and Taylor 2003).

Genetic heritability of foraging is important in browse, forb and pasture operations. The goal is to improve herd performance; therefore the economical production traits of goats and their ability to adapt to environmental stress is crucial. Environmental stress can be heat/cold, weather (precipitation/humidity), nutrient density and quality of feed on offer, predation, traveling distance, topography, etc. Stress can represent major economic losses with a decrease in reproductive performance of both the male and female, inability to maintain a moderate body condition score, decrease in growth rate, increased incidences of internal parasitism and a suppressed immune system. Several factors affecting the degree of stress on the animals are breed, physiological state, age, sex of goats, social dominance and fight/flight distance.

The major response of goats to heat stress is evaporation; ruminants also try to maintain thermoneutral regulation through respiration. This increased respiration rate decreases feed intake and rumination time. Metabolism rate is altered as ruminant do

store heat, therefore they will seek shade. Their endocrine system is affected as is the electrolyte balance of sodium / potassium.

(McDowell 1985) states that the major effects of thermal stress are: feed consumption, environment by forage quality interrelationships, digestion and metabolism and requirements of specific nutrients. Feed intake is decreased as temperature and humidity increases. This helps maintain body heat balance by minimizing heat generation from ruminal fermentation. But, essential nutrients are consumed and metabolized in smaller quantities. It may be necessary to offer a nutrient dense supplement at this time because forages are maturing, increasing in cell wall content and decreasing in digestibility. Energy and protein utilization are decreased, sodium/potassium/calcium/magnesium/chloride are lost due to skin secretions and vitamin A appears to be the vitamin depleted rapidly during thermal stress.

Heat stress delays puberty in both males and females, lowers semen quality and conception rates, adversely affects fetal growth, affects birth weight and weaning weights (Bearden and Fuquay 1997, Eloy 2004) and causes abortions (Pugh 2002). Body condition is lost as appetite is suppressed during heat stress. Changes that can be made in management to minimize the loss of body condition are: provide natural or artificial shade, a high quality forage diet and cool, fresh water on offer. Water consumption increases as ambient temperature rises.

Stress management is critical to improving the profitability of the farm. Minimizing stress enhances the immune system to achieve profitable health. These management practices can include the physical handling of the stock, well constructed working facilities, animal welfare, an understanding of animal behavior (Wells 2006, Peischel 2003) and practices to avoid nutritional deficiencies (Hart 2006).

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