The Grazingland Animal Nutrition Lab:
Monitoring the Nutritional Well-Being of Free-Ranging Animals with the NIRS/NUTBAL System
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Grazing animal performance is primarily determined by plane of nutrition. When sound management is applied, the nutritional needs of an animal using a particular forage resource can be met or exceeded. Circumstances such as drought, winter, or overstocking can cause forage quality or quantity to fall below critical thresholds for animal maintenance or economically sustainable production. When these situations occur, supplemental feed is required.

Purchased supplemental feed is often the greatest input cost associated with producing a unit of milk, meat or fiber. Determining what to feed, when to start, how much and for how long are some of the critical choices a livestock producer faces. While farmers routinely apply soil amendments after receiving a detailed chemical analysis, livestock producers often rely strictly on experience and estimation to make nutritional management decisions.

Diet quality of grazing animals is difficult to determine. Mistakes are costly. Even with a high level of expertise, making these decisions in the midst of erratic weather and market conditions is a difficult task. Accurate, timely, and cost-effective information on the nutritional status of grazing animals would be a great benefit to livestock and/or (Continued on next page)
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resource managers. The NIRS/NUTBAL system was designed to provide this information in a non-invasive and time-efficient manner.

Near infrared reflectance spectroscopy, or NIRS, is the diagnostic component of this system. Fresh fecal material is collected from a representative sample of the herd or flock in question and sent to the Grazingland Animal Nutrition (GAN) Lab. There, it is dried and ground to a uniform particle size. In the next step, light from the near infrared band is projected into the sample. Just as light in the visible spectrum is absorbed or reflected uniquely by distinct materials resulting in our perception of color, NIRS "sees" the wave lengths reflected and absorbed by the fecal sample. The nutritional makeup of the diet will result in a particular chemistry in the feces. Mathematical equations derived from comparing known diets and corresponding fecal samples are then applied to predict diet quality.

Values for crude protein and digestible organic matter (energy) obtained by NIRS are used in the Nutritional Balance Analyzer, or NUTBAL, software package. The user inputs such variables as breed type, reproductive state, and peak milk yield of a representative animal. Environmental conditions and performance goals are also included. These factors determine the nutritional requirements of that animal. NUTBAL then determines if the predicted diet is sufficient to meet these needs. If a deficiency is detected, the user can then choose feedstuffs and formulate a least-cost feeding program in NUTBAL to rectify the shortfall. Clients can either purchase and use NUTBAL themselves or request that GAN Lab run the analyses for them.

Producers in 44 states are involved in the NIRS/NUTBAL fecal monitoring system. They are either participating on their own or in cooperation with state extension agencies, feed companies or the NRCS. This system is also being applied in Canada, South America, and Africa. Most clients use the service to make nutritional management decisions for domestic livestock (cattle, sheep and goats), however, deer, bison and elk diets can also be predicted. Future plans are to expand the realm of fecal NIRS analysis to include other species, additional diet constituents, and improve the robustness of existing equations in specific situations.

Jeff Wellman reads fecal samples with the NIRS machine.