

The importance of understanding principles of behavior that can be applied to improve animal health and ecological integrity in modern agriculture

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As agriculturalists we work directly with nature to harvest light and energy from the sun. Life itself is both our tool and the basis of our trade. Without it we have nothing to offer the world.

The greatest problems and the greatest opportunities in agriculture are the direct result of the fact that life changes. Market shifts, fluctuating exchange rates, new regulations, variations in the environment, even global climate changes directly affect our businesses and our livelihoods on a constant basis. How we respond to change determines how we will succeed as individuals, small businesses, an industry, and a culture.

Responding effectively to a dynamic world requires deep understanding of the principles and process that cause the system to behave as it does. When we know why things happen and how organisms act and interact, we can far more efficiently adapt to new and ever changing circumstances while optimizing production, quality of life, and profits without sacrificing long-term value or ecological integrity. By nature we all seek to enhance our own lives. Because we work intimately with nature to do so, it is essential that we understand how the systems we work with behave.

For example, all creatures behave in response to consequences. Past experiences and expectations cause animals and humans to act in a variety of ways intended to enhance their welfare. Often, young organisms learn how to behave through interaction with adults. Although social conditioning affects the decision to engage in many behaviors, individual experiences can often over-ride even powerful cultural cues. As a result, diet and habitat selection behaviors of animals are far more plastic and malleable than typically thought. Moreover, the impact of these animals on the environment is equally alterable. Just as animals do not “need” to behave exactly as their parents did, we are not limited to the behaviors and management systems used by our predecessors.

Historically we have attempted to use command and control tactics to alter landscapes to suit specific plants and animals. However, increasing evidence suggests that low-cost management of ever changing landscapes may be most profitably achieved using suites of locally adapted flora and fauna. This shift in thinking allows producers to move away from prescriptive “fossil fuel and fence” approaches to organically oriented behavior-based approaches utilizing dietary training, virtual fencing, and other such behavior-based economical solutions. Most importantly, we begin to see the production system as a living process and ourselves as an influential part of the system rather than a heavy handed dictator imposing rigid, unwise, and unhealthy rules upon it from the outside. Over time, slight differences in trajectory can result in drastically different outcomes. Sometimes the cost of creating change in stable systems or restoring degraded systems can be prohibitively expensive. However, under different circumstances or using a different approach creative solutions can drastically diminish treatment costs and even generate revenue.

Physical and biological complexity inherent in healthy ecosystems increases productivity, resiliency, and long-term sustainability. Biodiversity not only reduces risk of wildfire, disease, and other disasters it enables individual creatures of all types to better express specific preferences for unique combinations of nutrients and micro-climates. Choice and the ability to choose is essential in reducing stress and promoting optimal animal welfare and performance.

Dietary welfare is complicated because nutritional value is continually defined and redefined by individuals, whose needs are unique and dynamic. Thus, any feeding system that forces animals to eat monotonous diets can reduce “wellness.” The dietary challenges herbivores face are complex. Plants vary in nutrients and all plants contain toxins. Concentrations of nutrients and toxins differ by site and through time - across years, seasons, and even within days.

Similarly, the needs of individuals change from day to day and from meal to meal. Aversions occur even when a food is nutritionally adequate because satiety and surfeit are on a continuum. Thus, cyclic patterns of intake of different foods are due to eating any food too often or in too large an amount, and the less adequate a food is relative to an animal’s needs, the greater and more persistent the aversion. Gastrointestinal consequences from ingesting a variety of foods, especially those with “toxins” or other aversive components, depends dramatically on the contexts of animal condition, and the presence or absence of complimentary chemicals contributed by other foods. Additionally, even the timing and sequence of consumption can profoundly alter the perceived value and nutritional utility of a food.

Animals differ markedly from one another. Even within a “uniform” herd, up to half of the animals may have significantly different dietary preferences due to unique needs for nutrients and abilities to cope with toxins. Thus, no diet is equally valuable to all of the unique individuals within a group. No one diet can consistently meet the needs of any group or individual. Choice clearly influences performance on rangelands, pastures, and in confinement.

In the end, improving production and performance in agricultural systems requires understanding the subtle ways living systems behave, from soils and microbes to plants and herbivores. This talk provides specific examples from wildlife and domestic animals that illustrate how this approach has been used to improve ecosystem health, increase profits, and make life easier for farmers, ranchers, and landowners.