

# EMERGING ISSUES FOR ALFALFA AND OTHER FORAGES IN THE GREAT BASIN

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## ABSTRACT

Factors affecting forage production, quality, marketing, and utilization include urbanization; availability of crop production resources; approaches to environmental stewardship; and other social and economic forces. Two factors of particular interest are 1) availability of pesticides for use in alfalfa and other forage crops; and 2) new laboratory procedures for predicting forage nutritional value, and changing targets for optimum protein levels and composition in alfalfa hay.

**Key Words: alfalfa, forage, hay quality, pesticides, laboratory analysis, fiber digestibility**

Hay is one of the dominant agricultural production sectors in the Great Basin region. In Utah, alfalfa and other hay production had a value of \$234,752,000 in the 2002 reporting period, and in Nevada the corresponding value was \$147,697,000 in the 2001 period. While alfalfa is the most common hay crop in the region, perennial and cereal hay grasses are widely-used in mixtures and rotations with alfalfa. These are used where environmental conditions are unsuitable for alfalfa production, for certain feeding applications including horses and non-lactating dairy cows, and for extension of alfalfa stand life via interseeding. Factors affecting the production, management, nutritional value, marketing, and utilization of alfalfa and other forages play a critical role in the agricultural economy of the region. Factors that impact forage enterprises in many of the western states present challenges and opportunities and may be grouped broadly as:

### *1. Changing land-use patterns due to population growth and urbanization.*

- A. Loss of agricultural infrastructure, including suppliers, equipment fabrication and repair facilities and technicians, professional consultants and services, and marketing outlets, as landscapes and economies shift from rural agricultural to suburban and urban.
- B. Difficulties of managing agricultural land parcels interspersed with residential and commercial developments served by roads with increasing traffic volume and speed.
- C. Neighborhood objections to noise, dust, smoke, odor, spray drift, manure spillage, and slow-moving and wide machinery traffic associated with traditional farming practices.

### *2. Availability of water, new crop genetics, and other production resources.*

- A. Water issues related to recurring drought, salinity and other contaminants, public scrutiny and cost-effectiveness of water development projects, and increasing demands for limited water supplies by non-agricultural sectors.

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- B. Availability and cost-effectiveness of seed of genetically-modified crops, pesticides, and fertilizers, and limited research and development of pesticides for minor-use crops.
- C. Management of invasive and noxious weeds spreading from recreational properties on which weed populations and management may not be priority concerns.
- D. Availability of qualified labor, custom operators, and technical assistance.

### ***3. Management and environmental stewardship of cropping and livestock systems.***

- A. Management of crops, weeds, soils, irrigation, livestock, feeding, and manure to prevent degradation of surface and ground water quality by nutrients, pesticides, and pathogens and to protect and enhance watershed function.
- B. Implementation of improved irrigation technology, nutrient budgeting, and irrigation scheduling for improved crop production efficiency and feed composition.
- C. Incorporation of wildlife habitat and endangered species management objectives into planning and management of agricultural systems.

### ***4. Social and economic forces.***

- A. Low profitability of many traditional commodity-based enterprises and decreasing proportion of young agricultural producers.
- B. Opportunities for value-added and niche-marketed products and services as alternatives to production of generic commodities (e.g., weed-free, organic, low-K, non-GMO, and convenience-packaged hay products).
- C. Economic viability of alternative forages for rotation with alfalfa.
- D. Federal, state, and county regulations constraining and directing the size, nature, and operation of agricultural systems; and increasing public scrutiny of agricultural operations and societal expectations of producer accountability with respect to environmental stewardship, fair employment practices, and food safety.
- E. Increasing costs of cultural energy and transportation inputs including fuels and electricity.
- F. Inspection, quarantine, and product requirements of expanding dairy, horse, and export hay markets.
- G. Redefinition of land-grant university program directions and reduced university research and extension support of traditional agricultural production.

Differing combinations of these factors impact hay and forage enterprises in the region. In the remainder of this paper we focus on two particular trends that affect the viability of present approaches to hay management, quality, marketing, and utilization. These are 1) decreasing availability of pesticides for use in alfalfa hay and other forage crops; and 2) availability of new commercial laboratory procedures for predicting forage nutritional value in dairy cattle rations, and changing targets for optimum protein levels and composition in alfalfa hay.

### ***Pesticide Issues***

Societal concerns and environmental pressures within the United States have forced chemical companies to follow more stringent guidelines when developing and labeling products that are used in agricultural Integrated Pest Management (IPM). Costs associated with data gathering for

the development of tolerances for labeling purposes may not be offset by the amount of product ultimately being sold. Thus, pesticides used in the past on alfalfa and minor-use crops such as cool-season grass forages and hays are beginning to disappear from the IPM chemical war chest. In addition, the removal of an array of organophosphate products is adding to the dilemma of not having effective treatment options for some forage pests. Frustration on the part of growers increases as the proven products that they have historically relied upon disappear and are replaced by unknown products or are not replaced at all. Without chemical control products to employ with other IPM tools the risk of negative impacts on quality and quantity increases.

In Nevada, agricultural forage production occurs in scattered, isolated, oases surrounded by public lands. These agricultural production valleys are for the most part at high altitudes with short growing seasons. Input production costs, as well as distances to marketing centers and product use, put increased pressures on hay enterprise profitability. In order to remain in business the production of quality high-value hay is essential. This is further supported by the fact that the majority of these forage products is exported to niche or high-value markets. Therefore, the producers view any influence that has a negative impact on forage quality or quantity as enemy number one.

For example, in the spring of 2002 Nevada producers, in conjunction with Cooperative Extension and the Nevada Department of Agriculture, were designing survey trials for western flower thrips when they discovered Banks grass mite. Although mites have been found in limited numbers on an infrequent basis, widespread large-scale impacts had not been documented. This outbreak began to have severe impacts on cool-season grass hay production. Economic impacts of \$3,000,000 were estimated and verified. Although emergency measures were taken to limit further seasonal impacts, it was apparent that only short-term contact-type pesticides were labeled for use on cool-season grass hay products. Without miticides, ovicides, and systemics labeled for use on the minor crops, producers were forced to use chemicals that impacted the target and non-target species more frequently. Quality and quantities went down, input cost from control was three to four times that of traditional levels, and farm profits were severely impacted.

To be proactive concerning the use of chemicals as part of an IPM approach, producers are evaluating a number of potential opportunities. The first is to evaluate and possibly establish a hay association that can help with funding and coordinating needed research. Another possibility is to become a sub-chapter of an existing functional organization in an adjoining state. A second approach is to become more involved with the National IR-4 program and the opportunities it offers to minor-use crops. Lastly, we need to develop better communication methods with the US EPA so that growers understand which products and labels will be changing so that adjustments in management can be made.

### ***New directions in forage testing and targets for hay quality***

Since the detergent fiber analysis system was developed by P.J. Van Soest in the late 1960's, commercial forage testing laboratories and nutritionists have relied largely on forage fiber fractions (acid detergent fiber; ADF, and neutral detergent fiber; NDF) and empirical equations to estimate the energy value of forages for ration formulation and prediction of livestock performance. These equations are simply mathematical expressions of relationships between

concentrations of 1) ADF in the forage dry matter and corresponding forage digestibility as determined by *in vivo* (live animal digestion trials) or *in vitro* (laboratory test tubes or flasks with rumen fluid) methods; and 2) NDF in the forage dry matter and corresponding daily forage dry matter intake by livestock. Although the ADF procedure was not developed for use as a predictor of digestibility, expressions of forage energy levels (e.g., total digestible nutrients; TDN, and net energy for lactation;  $NE_L$ ) provided by laboratories during the past two decades have typically been predicted from ADF concentration in the forage. The Relative Feed Value (RFV) approach incorporates predictions of intake and digestibility from NDF and ADF into an index of daily digestible dry matter intake relative to full-bloom alfalfa hay, for which RFV=100.

While evidence supports a continuing role of NDF as a predictor of intake, relationships between ADF levels and forage digestibility have ranged from strong to weak and depend on forage species, growing environment, and other factors that regulate digestibility of forage fiber. Until recently, wide variation in fiber digestibility among forage samples has essentially been ignored in routine forage testing. Some commercial forage testing laboratories now offer fiber digestibility analyses based on lignin determination and use of *in vitro* rumen fluid methods and near-infrared reflectance (NIRS) instruments calibrated to predict fiber digestibility.

Interest in cost-effective, commercial analysis of fiber digestibility has increased dramatically since release of the National Research Council 2001 revision of Nutrient Requirements of Dairy Cattle. This publication presents a summative approach to prediction of feed energy values that requires estimates of fiber digestibility. Other new indices of forage quality, including Relative Forage Quality (RFQ) and MILK2000, also rely on estimates of fiber digestibility for prediction of forage energy levels for livestock performance, ranking of forages in field trials, or establishment of market values. To the extent that nutritionists and hay buyers focus on the 2001 Dairy NRC approach to feed energy evaluation, there will be economic incentives for forage producers to be familiar with and use new and emerging forage testing procedures that rely on fiber digestibility.

Another emerging concern that will impact hay production and marketing is that of the high rumen degradability of alfalfa protein and resulting excretion of urinary nitrogen into the environment and difficulty of balancing rations for sufficient levels of rumen undegradable protein. Efforts to minimize N release from livestock that are consuming crude protein beyond their daily requirements, and to better balance dietary levels of degradable and undegradable protein, will likely lead to new targets for optimum protein levels and composition in alfalfa hay.

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