EMERGING ISSUES OF IMPORTANCE TO THE CALIFORNIA ALFLAFA INDUSTRY

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ABSTRACT

Alfalfa is currently the highest-acreage crop in California, and in 2001 one of the highest in income. However, alfalfa faces a number of emerging issues, which will likely have powerful influences on acreage, production methods, and economic return in the future. Without question, the most important of these is water quantity, availability, and price, with water transfers of various sorts being likely scenarios in the future. Water quality is a secondary, but important issue, with pesticide runoff of insecticides being the primary issue of concern. Biotechnology is likely to have an impact upon alfalfa in the next decade, beginning with roundup-ready alfalfa in 2004. The relentless expansion of Western dairying has provided a powerful market demand for California alfalfa, but urbanization, water restrictions, and competition with high value crops have always restricted acreage. Market share of alfalfa sold to dairies has declined significantly, which is a challenge for growers. Forage quality is a key aspect of the value of alfalfa, and techniques to measure quality are likely to change in the near future. Communication of economic and non-economic values of alfalfa to a non-ag public is likely to become more important as time goes on.

Keywords: Water, irrigation, water use efficiency, biotechnology, markets, future

INTRODUCTION

Occasionally, events have the effect of causing one to call into question one's tried and safe assumptions about life in general, our ways of doing business, and about the longer-term viability of our current activities. Such a reexamination of life's assumptions occurred nationally this past fall due to terrorism and war, and more locally in the Klamath Basin in California and Oregon earlier this year. In the latter case, farmers who had settled ranches generations ago, found themselves suddenly without water, effectively halting agriculture.

Prognostication—There's no future in it. Prediction is a high-risk business. Some of the most important world events of the past 15 years were not adequately predicted in the least. Consider the collapse of the Soviet Union, the invention of the internet, and the attack on the World Trade Center. Yet none would disagree about the profundity of their effects on world history. However, in retrospect, it is also clear that there were slowly developing forces at work that "of course!" created the groundwork for those events.

Understanding the limits of future-guessing, it is still perhaps useful to consider trends and influences that are currently at work, and are likely to be powerful influences as time goes on. If nothing else, it may be amusing to future readers. In this article, I discuss several emerging and

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important issues that may be important to the alfalfa and forage industry, possibly influencing future trends.

WATER QUANTITY

Without question, water (quantity, availability and price) is the 'Achilles heel' of alfalfa in California and many neighboring western states. To make this statement is not to say something that is very controversial—for water is a major limiting factor for ALL of western agriculture. Even those crops touted as 'high value' crops are not likely to compete very successfully for water with many types of urban or environmental uses of water, when the criteria are primarily economic or political. After all, a high rise office building in LA or Sacramento will almost always produce more money per acre foot of water used than bales of hay, loads of cotton, crates of oranges, or truckloads of grapes. Endangered species appear to have more 'feel-good' political appeal than fields of alfalfa, sugarbeets, rice or orchards.

A Question of Value. There is a significant and profound question of value here with regards to food production and allocation of water, and of urban growth and the environment. This is a discussion beyond the scope of this article, but suffice it to say that values are indeed the driving force—the value of endangered species, fisheries, natural rivers, use of water by cities compared with the environment or food production. The value of economic growth and expansion compared with rural landscapes, the value (and price) of locally-produced food compared with imported food. Farmers have raised questions about the broader values of agriculture for open spaces, food security, wildlife habitat, rural communities, and human nutrition. But it is clear that the 'value', price, and availability of water is determined by a mix of economic, political, perception, and legal factors, in addition to the vagarities of the weather. Throw into that mix: energy. If 2001 did nothing else, it convinced us of the strong relationship between energy and water.

Water and Alfalfa. Alfalfa has a particular problem with the issue of water for several reasons: First, the quantity of water required annually is large on an annual basis, ranging from less than 3 acre feet/year to over six in California, depending upon region. The statewide average use is likely between 4 and 5 acre feet/year on approximately 1 million acres. Secondly, alfalfa is a perennial, with little flexibility to quickly switch crops when water supplies are tight. Thirdly, economic returns for alfalfa are considered moderate compared with many specialty crops, limiting its viability when water becomes expensive.

Alfalfa has a positive story to tell. On the positive side, alfalfa is one of the more efficient of crops in terms of water-use (production of harvestable dry matter per unit of water—see Table 1). The fact that alfalfa is a perennial contributes to its high water-use efficiency, along with its high yield and Harvest Index (the whole crop is harvested, not just a portion). The major reason for the high seasonal water use of alfalfa is that it grows nearly the whole year and occupies large acreage! Most crops use water at a fairly similar rate, it is the crop growing season and acreage that differs significantly. Economically, although alfalfa returns are rarely stellar, alfalfa tends to be more reliable in its markets, providing a steady income throughout the year. Risks are also lower than many crops, and alfalfa is less tied to internationally-determined prices. Also, it contributes substantially in a multiplier effect through the dairy industry, currently the most

important agricultural enterprise in California. Additionally, irrigated alfalfa contributes significantly to wildlife habitat. Thus the story of water use in alfalfa is not as dismal as first it seems.

Current Water Wars. The most dramatic of recent California water wars was the shutting-down of alfalfa production and other agriculture in the Klamath Basin of Oregon and California early in 2001. This occurred after a severe drought and the allocation of water for the maintenance of lake levels for endangered species and fish habitat. Additionally, low water supplies in other intermountain regions limited production, causing some streams and wells to go dry, and limiting alfalfa production. This sudden and dramatic cutting off of water sent a shock wave through the Klamath Basin, but also through all of agriculture—for all growers recognized a pattern that could be repeated in other areas.

Table 1. Comparison of Applied Water Use Efficiencies of Several Crops Grown in the Sacramento Valley of California

Crop	Applied Water	Crop Economic Yield	WUEh
	(inches)	(lbs/acre)	(lbs/inch)
Alfalfa	42	12833	306
Corn Grain	35	9597	274
Wheat	19	4525	238
Sugarbeet	43	8005*	186
Rice	71	7774	109
Dry Bean	28	1753	63
Almonds	37	1134	31

NOTES: Applied water (irrigation water required to produce a crop) is median of range of values from California Water Plan Update, 1994, DWR, 1994. Crop Economic Yields are a 5 year mean (1996-2000) from County Agric. Commission Reports from 9 counties in the Sacramento Valley. *Sugarbeet economic yields are sucrose yields based upon 15% sucrose in the root. All other yields are in dry matter. WUEh is the Water Use Efficiency of the harvested product based upon applied water. Adapted from 'Alfalfa, Wildlife and the Environment, The importance and benefits of alfalfa in a technological age." 2001. See http://alfalfa.ucdavis.edu for details.

Water Transfers. What about the future? Was the Klamath situation the sudden but temporary misfortune of but a few growers? Or is it a representative pattern that will be repeated in the same place or elsewhere, perhaps with slightly different dynamics? Although the factors are so many as to defy predictability, many experts believe that water transfers of various sorts (environmental, regulatory, or voluntary purchases) are very likely to be a part of California's future, especially for alfalfa. In many areas feeling the crunch, alfalfa may be the major crop affected. Consider the following partial listing of water transfers and issues of various types that are pending or considered, from South to North, in California:

- Agreements to permanently transfer 200,000 acre feet per year from Imperial Irrigation District to San Diego in exchange for improvements in infrastructure. This is reportedly the largest rural to urban water exchange in US history.
- Environmental concerns about the health of the Salton Sea due to salt accumulation and excess water from irrigation drains
- Renewed commitment by California not to exceed its 4.4 million AF allocation from the Colorado River (CA has exceeded this amount every year).

- Near complete, long-term agreements to transfer 29% of the water from the Palo Verde Valley (Blythe) to Los Angeles during drought years.
- Adjudication of Mojave Desert groundwater use by alfalfa farmers in conflict with growing urban demands.
- Purchase of water from various districts in the Central Valley to restore San Joaquin Valley wetlands and wildlife refuges.
- CalFed proposals to fallow large acreages (200,000 acres) of farmland in the Bay Delta for restoration of habitat
- Limitations due to water availability, pumping costs, and agricultural drainage on the west side of the San Joaquin Valley.
- Transfers of water to meet the needs of southern cities from the Sacramento Valley water supplies.
- Maintenance of high reservoir levels, and purchase of agricultural water to meet California's energy needs—this impacts the entire West, not just California.
- Efforts to restore stream flows, lake levels, and meander of major rivers and tributaries, like the Sacramento and in various regions for aesthetic, recreational, and wildlife needs.
- Continued uncertainty of water availability in the Klamath Basin due to Endangered Species Act (key species are suckerfish and salmon) ruling to maintain lake levels and stream flows.
- Possible impact of California Endangered Species listing of Coho salmon in the Sacramento and Intermountain watersheds, impacting perhaps both pumping and surface water supplies.

Reading a list such as this of water issues may be enough to cause some alfalfa growers to curl up into a fetal position. However, the availability and cost of water has always been a patchwork in California, highly dependent upon where one is located, as well as weather patterns. Thus, one water district can suffer severe limitations, while other districts may have adequate supplies. Some of these water transfers will likely benefit individual growers, since they involve cash payments in exchange for fallowing fields or transferring water. Their impact upon rural communities and suppliers to growers may be more devastating, regardless of the direct impacts upon growers. Whatever the multiple causes, water transfers (economic, voluntary, regulatory or court-determined) are very likely to be a powerful force, sometimes impacting a region slowly an predictably, other times suddenly and unpredictably. What the future will bring is impossible to say, but with California alfalfa, water will likely be at the center of it.

WATER QUALITY

Although quantities, price and availability of water are a major determining factor for alfalfa acreage and economic viability, there are several water quality issues also currently facing alfalfa. Alfalfa, in general, has relatively minimal negative impact upon the environment—the pesticide intensity is low, and alfalfa canopies prevent the erosion of soil, a major source of contamination to rivers and streams. However, there are a few concerns:

The first of these is a concern by Water Quality boards about the presence of organophosphates (e.g. Chlorpyrophos or Lorsban, or diazanon) in surface waters in the San Joaquin Delta and in

other surface waters. Orchard crops and alfalfa have been implicated in these observations, orchards for the winter-dormant sprays and alfalfa primarily for the treatment of Alfalfa Weevil and the Egyptian Alfalfa Weevil, though also for summer worm control. There is some evidence that irrigation water can move these compounds off of alfalfa fields into the sloughs, streams, and rivers, after which they may impact the Bay Delta. Members of the California Alfalfa Workgroup and CAFA have been active in trying to address this issue through education and research. A second, of somewhat less concern, is the detected presence of herbicides used as winter-dormant sprays in alfalfa in a few wells in the northern San Joaquin Valley. Current evidence is that these may result from catch basins which allow percolation of water into groundwater zones, not through surface percolation. Both of these water quality issues are important to be addressed by the industry. The process of regulation is complex and dynamic. Although there are some technological issues to be resolve, many in the alfalfa industry feel that it is important that the industry addresses these important areas before they are regulated to do so.

CHANGING NATURE OF MARKETS, ALFALFA ACREAGE

Since the 1970s, alfalfa and other so called 'lower-value' field crops (wheat, sugarbeets, cotton) have been under pressure for acreage reductions due to supply and price of water, substitution by other crops, such as orchards or vineyards, and other pressures such as conversion of land to urban use. This has exerted a downwards pressure on alfalfa acreage. Pulling the other direction is the expansion of animal numbers in California, particularly high-producing dairy cows and horses. Thus, alfalfa acreage has remained about stable at around 1 million acres, pulled in one direction by loss of farmland and water, and in the other direction by increase in demand.

The ensuing years have also seen increased globalization of markets, and major dramatic changes in the nature of competition between growers in different parts of the world for the same markets for many crops. Alfalfa is actually better able to weather these storms in some respects, due to the fact that our primary market is large and right here in California. Additionally, there is a practical and economic limit to how far bulky forages (hay) can be shipped.

To be realistic, alfalfa has been loosing significant 'market share' in recent decades. While approximately 45 to 50 lbs of alfalfa per dairy cow per day was produced in the early 1970s, today, California produces about 20-25 lbs per dairy cow per day. (The amount actually consumed by each dairy cow is lower, but difficult to measure). However, there is a clear downward trend on the incorporation of alfalfa in dairy rations. While previously, dairies have relied almost exclusively upon alfalfa for their forage needs, now there is more reliance on small grains and corn silage as well as many commodities that have entered the market, often at very low prices. The reality of 'decreased market share' is an important emerging issue, and something that alfalfa producers should face. Forage quality measurement and understanding is at the crux of this issue, as the pressure to produce higher quality hay is likely to intensify in the future. What is it that alfalfa offers, other than "stuff that cows eat"? Alfalfa does have unique and important qualities, but alfalfa growers must be increasingly more sophisticated in their understanding of forage quality, to assure that alfalfa remains a critical part of dairy rations in the future.

FORAGE QUALITY

The methods and approaches to measuring forage quality are likely to undergo several important changes in the near future. It is telling that, in the recent (January, 2001) release of the NRDC guidelines for the 'Nutritional Requirements of Dairy Cows', there is increased emphasis on both actual measurements of quality (not book values), and combinations of measurements in so-called 'sumnative equations' to estimate energy. The old methods, using a fiber value (e.g. ADF or MCF) with an equation (like the California equation) to predict TDN are completely absent. . This should be cause for pause for an industry which has relied on those tests (ADF or MCF) for years. Although there are a range of philosophies and points of view about how to use summnative equations (see Peter Robinson's paper, this symposium), there are several points which will likely be key to important common ideas embraced by most nutritionists. Neutral Detergent Fiber (NDF) and an estimate of digestibility, such as NDF digestibility, are likely to be key common threads to hay testing in the future, although nutritionists may continue to argue about how to calculate TDN. The California Hay Testing Consortium made a recommendation several years ago that labs to learn how to perform NDF measurements and digestibility measurements, since it is likely that NDF may replace ADF over time. These changes have to be done carefully and slowly, since markets have to adjust to the changes in methods. How quickly alfalfa markets adapt to change in methods depends upon those in this audience.

BIOTECHNOLOGY

In the popular press, the late 1990s to current times has been termed the 'golden age of biology', since so many rapid advances have been made in genetics and biotechnology. These efforts will undoubtedly have an impact upon alfalfa. The most dramatic and immediate effect will be from Roundup-resistant alfalfa, which will enter the market likely in 2004. Roundup-Ready crops have swept through acreage of corn, soybean, and other crops in the Midwest USA during the late 1990s. Although the technology is still being evaluated for alfalfa, it is likely that interest will be high, and significant acreage may follow. Other advances in biotechnology, including improved quality lines, may be in the offing. Alfalfa will likely have to face the same types of perception issues as other crops have faced with regards to varieties altered through biotechnology.

PUBLIC PERCEPTION/INTERACTION WITH WILDLIFE/ENVIORNMENT

An important 'emerging issue' with alfalfa is the perception of the public as a whole. In an agricultural system where decisions are increasingly made by a non-agricultural public, it behooves farmers to help the public understand the importance of different crops, and how they contribute to their daily lives. This includes both the value of alfalfa nutritionally and economically, but also in terms of non-economic values such as wildlife habitat, open spaces, soil conservation, and aesthetic value. An ignorant public can easily dismiss a crop such as alfalfa, since few understand its value and importance. This has been one of the driving forces for the formation of the California Alfalfa & Forage Association, and efforts to produce posters and booklets which educate the public about alfalfa (see paper by Tom Ellis and Jim Kuhn, this symposium).