Future Economic Development Potential of Agriculture in White Pine and Lincoln Counties

PRESENTATION TO THE OFFICE OF THE NEVADA STATE ENGINEER

Prepared for

SOUTHERN NEVADA WATER AUTHORITY

Prepared by

URI,
Utility Resources, Inc.

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Future Economic Development Potential of Agriculture in White Pine and Lincoln Counties

Submitted to:
Jason King, P.E., State Engineer
State of Nevada
Department of Conservation & Natural Resources
Division of Water Resources
901 S. Stewart Street, Suite 2002
Carson City, Nevada 89701

Pertaining to:
Groundwater Applications 54003 through 54021 in
Spring Valley
and
Groundwater Applications 53987 through 53992 in
Cave, Dry Lake, and Delamar Valleys

June 2011

Prepared by:
URI, Utility Resources, Inc.
1500 Liberty Street SE
Salem, Oregon 97302

Dennis E. Peseau, Ph.D., President, URI — Date 6/22/11

George Carter, Vice President, URI — Date 6/22/11

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ACRONYMS

AUM	Animal Unit Month
CE	Conservation Easement
CVR	Cave Valley Ranch, LLC
NSE	Nevada State Engineer
SNWA	Southern Nevada Water Authority
UNR	University of Nevada, Reno
USDA	U.S. Department of Agriculture

ABBREVIATIONS

BC	Before Christ
Bil	billion
cwt	hundred weight
ft	foot
lb	pound

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EXECUTIVE SUMMARY

This report analyzes the future development potential of agriculture in Nevada's White Pine and Lincoln Counties. For purposes of this investigation and how it pertains to the Southern Nevada Water Authority (SNWA) water applications for consideration by the Nevada State Engineer (NSE), the particular emphasis here is on the Basins of Origin—Spring, Cave, Dry Lake, and Delamar Valleys (collectively "Valleys of Interest").

The report considers the agricultural outlook from a number of perspectives: international, national and the western United States. The report also applies certain mathematical statistical tools to discern any trends in agricultural activities in these Basins of Origin. From a practical standpoint however, efforts to correlate and then extrapolate broader national and international economic and spatial factors that ordinarily influence agricultural markets are largely irrelevant to this distant and remote region of eastern Nevada.[1]

The markets, fertile soils, moderate climates and abundant lands that have made numerous other areas of global agricultural endeavors economically attractive to the growing corporate conglomerates around the world do not and will not exist in White Pine and Lincoln Counties. These agricultural attributes simply are not available and do not exist in these counties, particularly in the Basins of Origin. In fact, very little formal analysis or scrutiny is required to observe and conclude that the long-term outlook for agriculture in these basins is rather bleak. Moreover, due to the limited availability of private lands and grazing opportunities on public lands, growth in either livestock or alfalfa and hay operations is highly unlikely in this remote area. This report is being submitted to assist the NSE in considering whether granting the SNWA applications 54003 through 54021, inclusive, in Spring Valley; and applications 53987 through 53992, inclusive, in Cave, Dry Lake, and Delamar Valleys, and will result in an undue limit on future growth and development in the Basins of Origin pursuant to Nevada Revised Statutes 533.370.

1. This opinion is based on several sources examined and identified throughout this report (see Section 11.0, References).

The primary agricultural activities in White Pine and Lincoln counties are the growing of alfalfa, the raising of cattle and, to a lesser degree, the raising of sheep. This report focuses on these activities as they pertain to Spring, Cave, Dry Lake, and Delamar Valleys. As agriculture is among the most competitive of all businesses, and whose products are sometimes traded as commodities with liquid and efficient markets, the discussion begins with a brief look at commodities internationally, nationally and then to the more relevant markets here in the western United States.

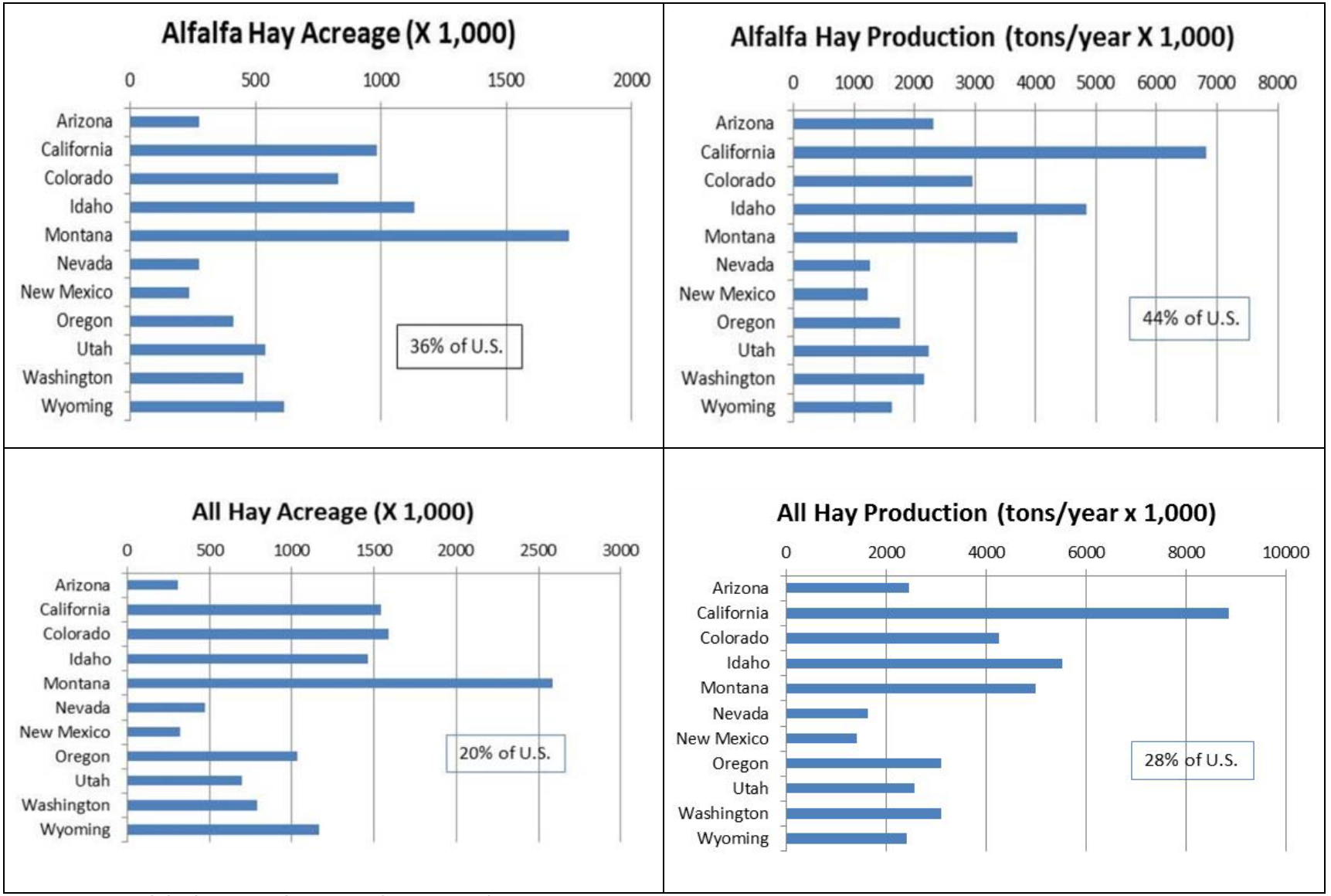
1.0 ALFALFA PRODUCTION WORLDWIDE

Alfalfa is the most important legume grown throughout the world. Its history can be traced back as early as 1400 BC in the Middle East. Ancient alfalfa production dates back more than 1500 years for medicinal uses in numerous Asian cultures. Today alfalfa is a primary feed for dairy cattle, although this nutritious perennial is an important feed for beef cattle, horses, sheep and other animals as well.

Principal growing regions include the United States, Canada, South America, Europe, Asia, Australia, the Middle East and South Africa. Total alfalfa production worldwide is estimated to be approximately 450 million tons. The United States is the world's largest producer, with annual yields of approximately 70 million tons (USDA Statistics, 2010).

2.0 ALFALFA HAY PRODUCTION IN THE WESTERN UNITED STATES

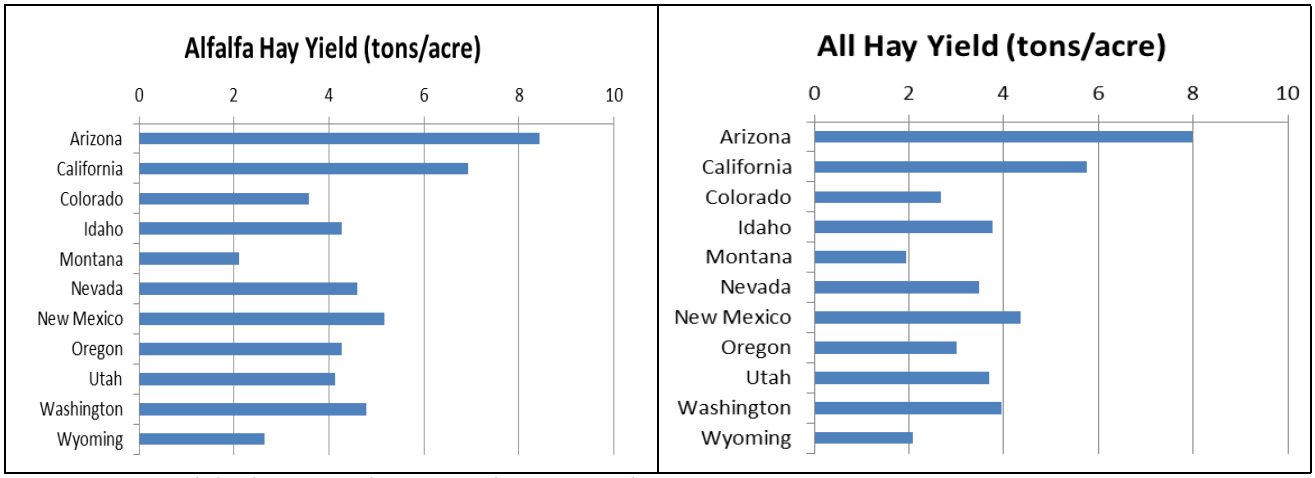
California, South Dakota and Idaho are typically leaders in alfalfa hay production for the United States (USDA Statistics, various years). The economics of growing alfalfa in the United States tend to be regionally sensitive, as access to markets other than local are often cost prohibitive because of transportation costs. This report focuses first on the western United States as the West is its own regional alfalfa market, both in the context of alfalfa resale, and for supplemental livestock feed. The states of South Dakota and Wisconsin, while major alfalfa growers, are not players in the western United States due to their proximity to the western United States. This is one reason the U.S. Department of Agriculture (USDA) tracks alfalfa production and compiles data on this product separately for the 11 western United States states of Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon Utah, Washington and Wyoming. Although the interstate production of alfalfa varies greatly among these 11 states, the aggregate tonnage of about 31 million tons per year comprises about 44 percent of total United States production. The charts in Figure 1 indicate the representative state-by-state annual alfalfa tonnage for the 11 western state group.



Source: USDA Statistics (2008-2010, last accessed May 25, 2011)

Figure 1
Annual Alfalfa Tonnage for the 11 Western State Group

The states of California, Colorado, Idaho and Montana dominate the 11 western states as measured both by acreages of alfalfa planted and annual tonnage produced. The charts in Figure 2 show Arizona and California to have by far the greatest yields per acre among the western states. Most of the Arizona and California alfalfa acreages are in areas that generate seven to ten cuttings per year, which explains the disproportionately higher yields of over seven tons per acre, as compared with the remaining nine western states having average yields of approximately 3.5 to 4 tons per acre.



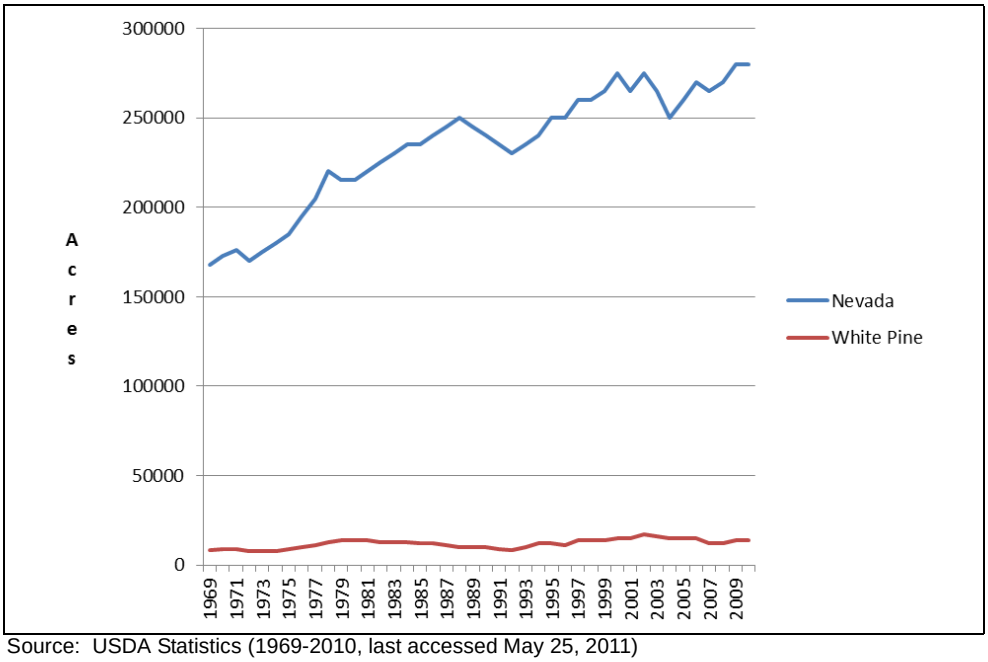
Source: USDA Statistics (2008-2010, last accessed May 25, 2011)

Figure 2
Alfalfa Hay Yield

Despite the disparate production levels and yields across the 11 western states, alfalfa growing remains an important crop in each state's agricultural economy. In these 11 states, alfalfa and other forage crops are ranked prominently as either the top or second ranking crop in all 11 states. In Nevada, alfalfa growing ranks first in terms of acreage planted, ranks first as a cash crop in the state and ranks second in terms of cash receipts for all agricultural commodities.

3.0 CURRENT OUTLOOK FOR ALFALFA IN NEVADA AND WHITE PINE COUNTY

Nevada's alfalfa acreage has averaged roughly 268,600 acres for the years 2000-2010 with no discernible trend either up or down. Alfalfa hay production in Nevada over the same period has averaged about 1.23 million tons per year. Significant factors contributing to this chronic lack of growth in alfalfa acreage include limited suitable fertile soils, availability of water for irrigation and relatively constant grazing allotments. Over a longer period, 1969-2010 (the longest time period for which NASS has alfalfa data for Nevada) there has been consistent growth in both alfalfa hay acreage and production. Figures 3 and 4 show the alfalfa hay acreage and production for Nevada from 1969 through 2010.[1]

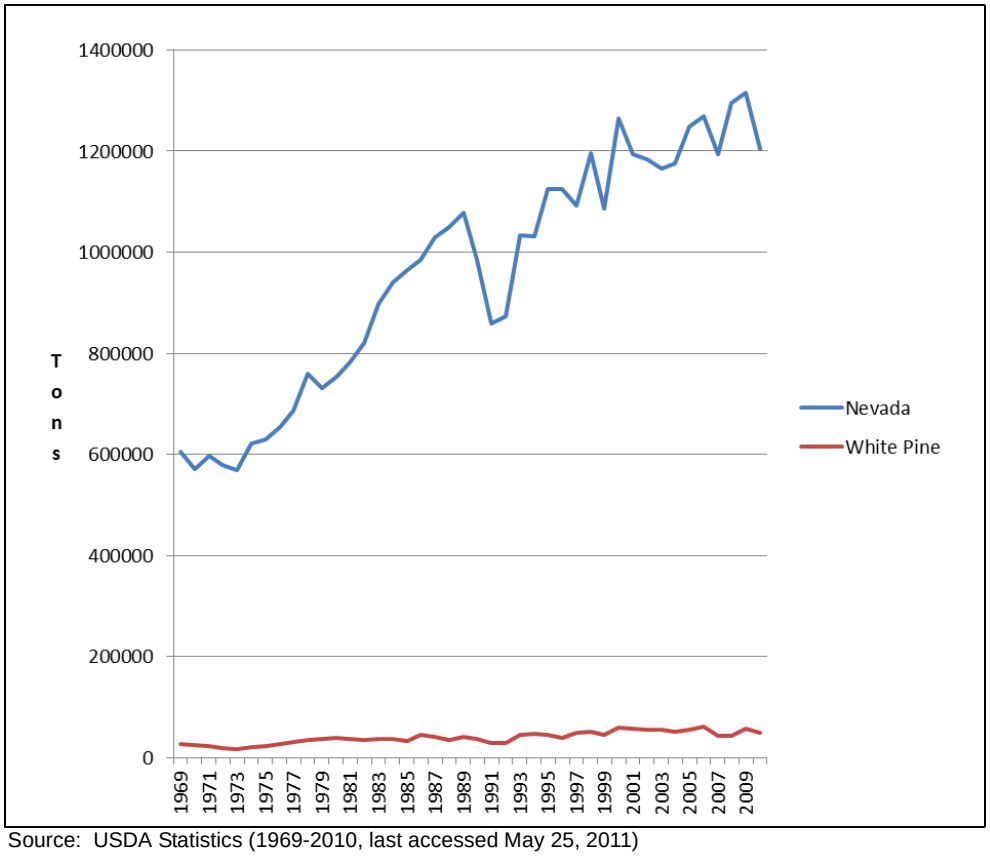


Source: USDA Statistics (1969-2010, last accessed May 25, 2011)

Figure 3
Nevada and White Pine County (Alfalfa Acreage Harvested 1969-2010)

Over the same 1969-2010 period, alfalfa acreage in White Pine County has also grown, but growth has been much more variable. Acreage grew from 1969 through 1980, but then declined from then until the early 1990s. From the early 90's until 2002 there was another period of growth with acreage peaking in 2002. Since then, alfalfa acreage in White Pine County has fallen.

1. White Pine and Lincoln Counties have been addressed separately in this report. The analysis for Lincoln County begins in Section 7.0 this report.

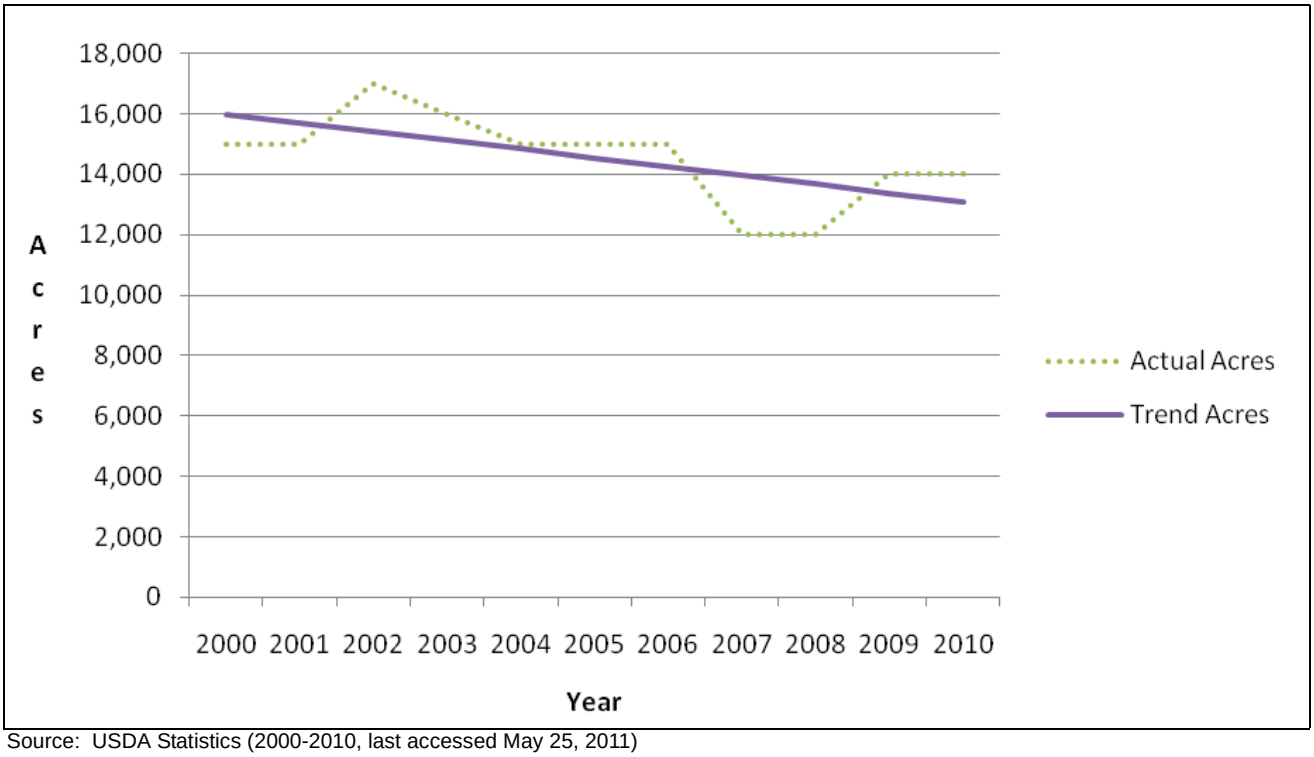


Source: USDA Statistics (1969-2010, last accessed May 25, 2011)

Figure 4
Nevada and White Pine County (Alfalfa Hay Production in Tons 1969-2010)

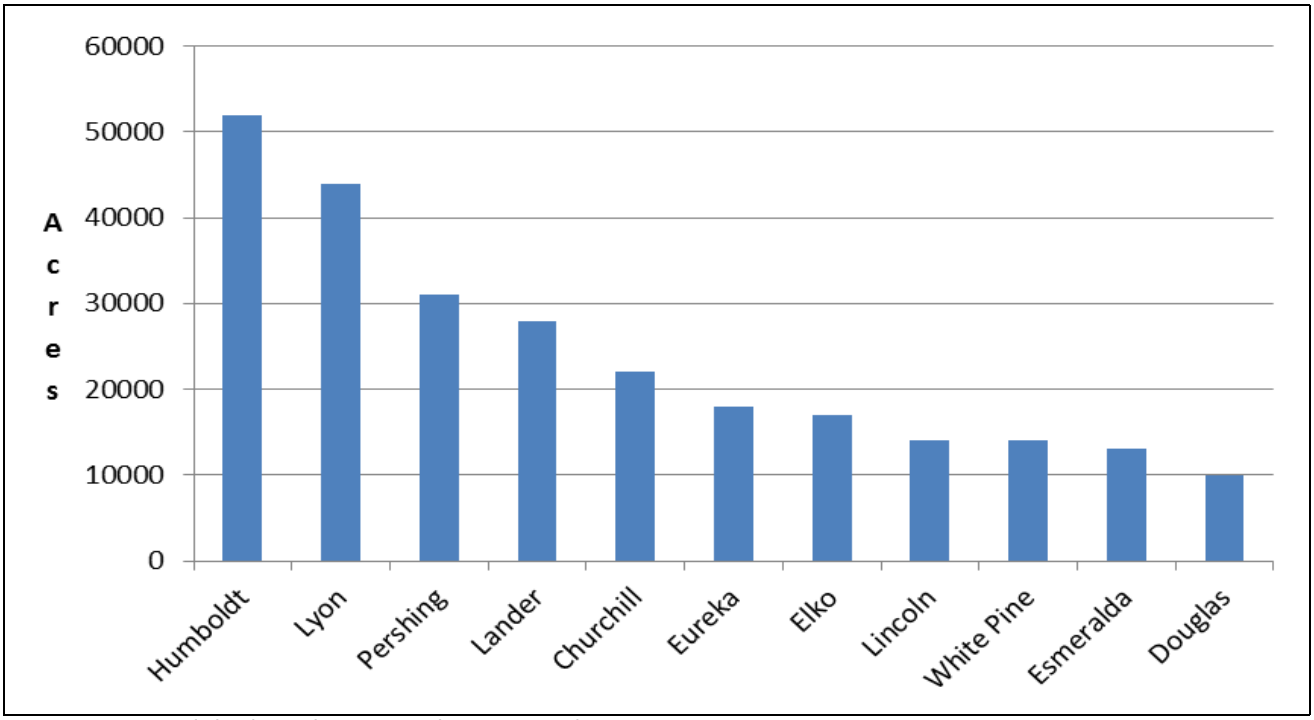
Over the more recent 2000-2010 period, alfalfa acreage in White Pine County has averaged 14,545 acres with a generally downward trend. Figure 5 shows White Pine County alfalfa acreage from 2000 to 2010, along with a best fit trend line over the same period to show the downward trend.

Over the 2000-2010 period, production in White Pine County has averaged 53,455 tons per year, or about 4.4 percent of Nevada's total alfalfa hay production. Humboldt, Lyon, Pershing and Lander counties led Nevada counties in harvested alfalfa acreage and production in 2010. Alfalfa acreage in those counties ranged from 28,000 to 52,000 acres or more than two to three times the acreage in White Pine County. Similarly, alfalfa hay production in those counties ranged from 117,000 tons to 224,000 tons, or almost 2.5 to 4 times White Pine County's production. In 2010, alfalfa hay yields in Nevada were 4.3 tons per acre, ranging from 5.45 tons per acre in Esmerelda County down to 3.05 tons per acre in Elko County. Yield in White Pine County was 3.5 tons per acre, second lowest of all counties in Nevada. Figures 6 through 8 show 2010 alfalfa hay acreage harvested, production in tons and yields in all Nevada Counties.



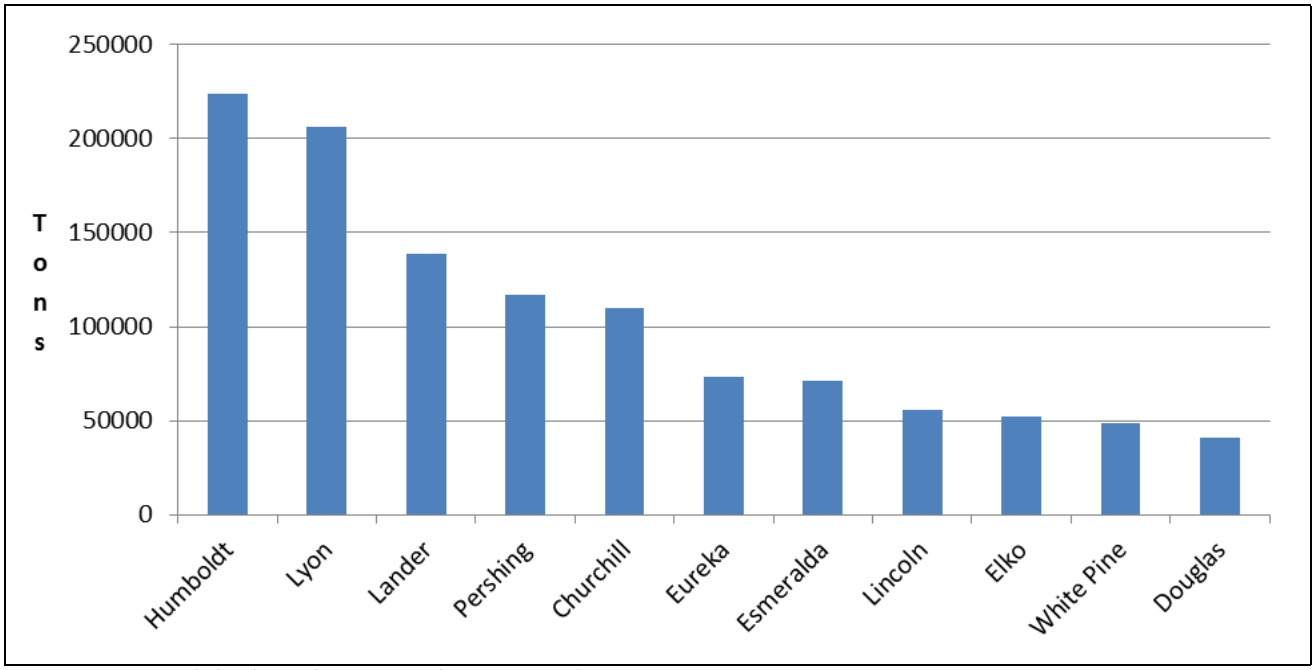
Source: USDA Statistics (2000-2010, last accessed May 25, 2011)

Figure 5
White Pine County Alfalfa Acreage



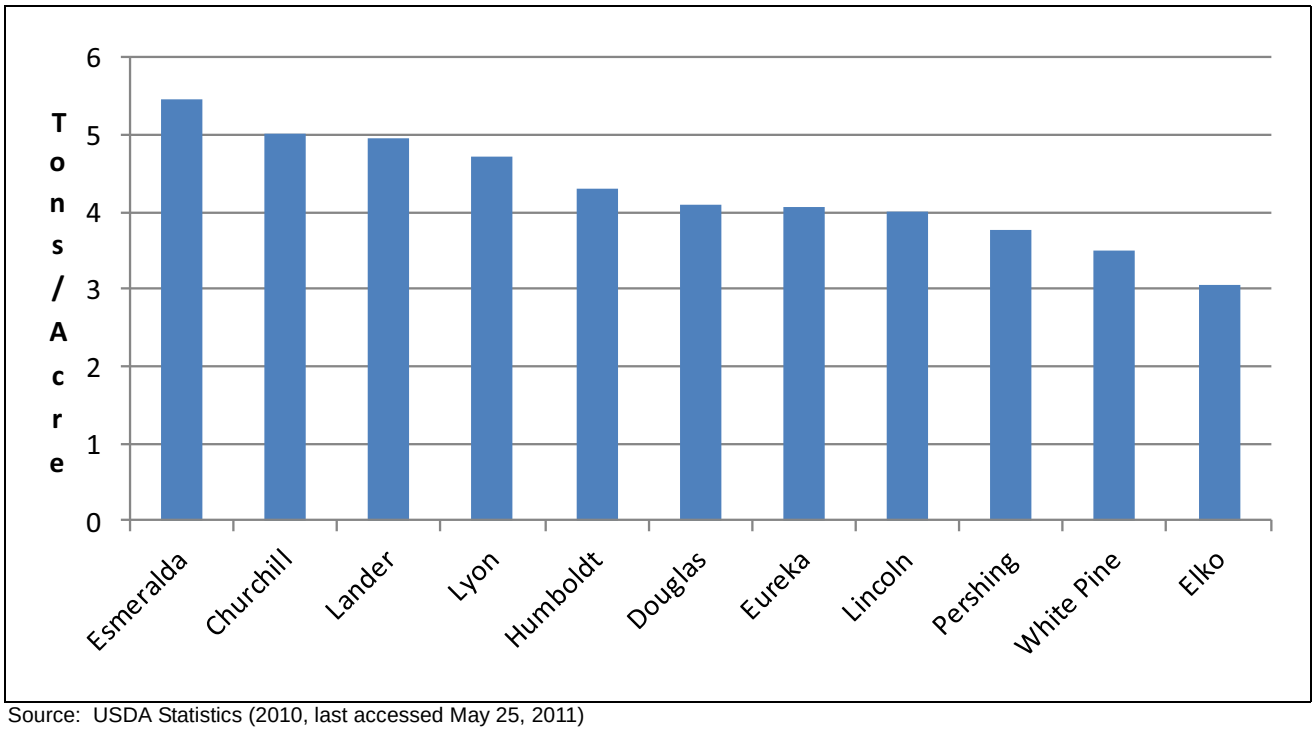
Source: USDA Statistics (2010, last accessed May 25, 2011)

Figure 6
2010 Nevada County Alfalfa Acres



Source: USDA Statistics (2010, last accessed May 25, 2011)

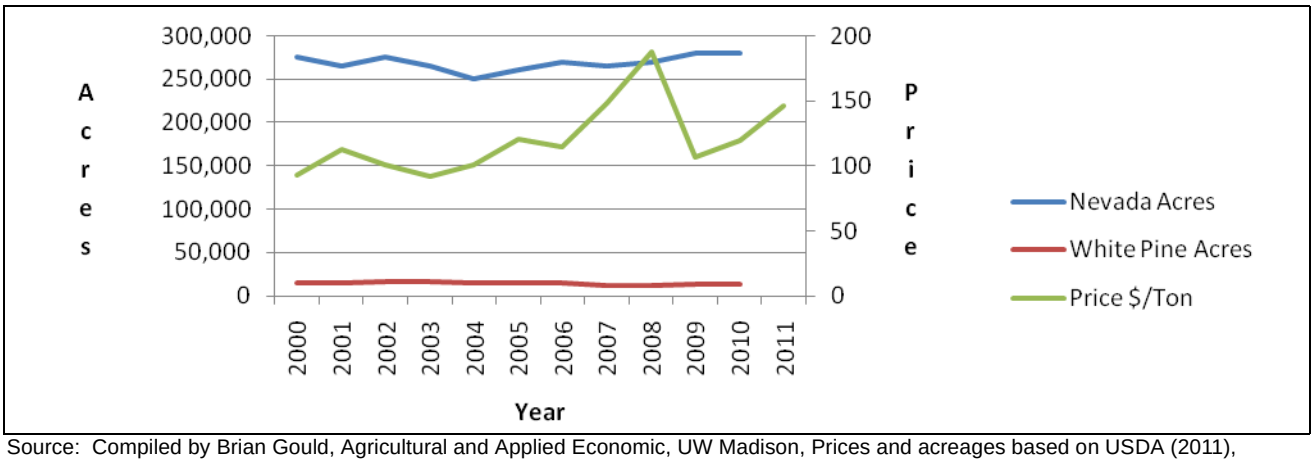
Figure 7
2010 Nevada County Alfalfa Production



Source: USDA Statistics (2010, last accessed May 25, 2011)

Figure 8
2010 Nevada County Alfalfa Yields

In addition to the factors discussed above, the single most important factor for the lack of any discernible upward trend in Nevada alfalfa production, however, is the overall economics associated with the growing of alfalfa. The economics of alfalfa production is analyzed in greater detail in another section of this report. Some conclusions regarding the lack of growth in this agricultural commodity can be deduced from Figure 9 below.



Source: Compiled by Brian Gould, Agricultural and Applied Economic, UW Madison, Prices and acreages based on USDA (2011), National Agricultural Statistics Services

Figure 9
Alfalfa Harvested and Price

For most of the 2000-2010 period, alfalfa prices have ranged between $91.50 and $125, with a one year spike of $188 per ton in Nevada. For some of the more productive alfalfa growing regions, primarily in northern Nevada, these prices have been at or above breakeven levels for profitability, as reflected in the chart's slightly positive-sloping line for statewide alfalfa prices. This time trend of Nevada alfalfa prices is generally correlated with the contemporaneous prices in the other 10 western states. One useful observation confirming the expectation of a continuation of the lack of any significant growth trend in Nevada alfalfa production is the lack of any positive increase in Nevada planted acreage or production in response to the unique and unusual alfalfa price spike in 2007-2008. Several factors, discussed in the following pages, may account for this lack of production response:

- New investment in irrigation pivots for new land put into alfalfa production is not economic even at higher prices:
- The contraction of dairy markets beginning in 2007 and the associated dampening effect on alfalfa demand in the western United States.
- Limited grazing allotment expansion and associated lack of demand for alfalfa for supplemental grazing feed.
- Marginal soil fertility and/or water for additional alfalfa plantings.
- An acknowledgement of the superior yields and access to markets of several other western states.
- A relatively flat production of and markets for local calves and lambs.

4.0 ECONOMICS OF ALFALFA INVESTMENT IN NEVADA AND WHITE PINE COUNTY

The viability of any investment undertaking is determined by the overall economics of the endeavor. This is especially true for agricultural commodities, including alfalfa, since these products tend to be traded as commodities, and are among the most competitively traded of all goods and services. This section of the report considers the economics of alfalfa production in Nevada and White Pine County. Although White Pine County is not one of the more productive alfalfa producing counties in Nevada, as measure by yield per acre, representative economics can be ascertained from the generalized production data available from state and federal agencies.

Investment in any new alfalfa stands requires significant upfront capital costs as well as significant operating costs once the new plant and equipment are in place. In determining the economics and rates of return on investment from alfalfa, the economist and/or investor must focus on the "marginal" or new costs of the investment. Historical and current average investment and operating costs may be of some use, but investment returns are gauged and measured in terms of profitability levels of the new venture under consideration.

4.1 Establishment Costs of New Alfalfa Stands

The analysis here is based upon a study prepared by the University of Nevada, Reno (UNR) Cooperative Extension on the costs to establish and produce 500 acres of alfalfa in Humboldt County titled, "Humboldt County Alfalfa Hay Establishment, Production Costs and Returns 2004" (Curtis et al., Humboldt, 2004). This study was selected for comparison because it was the most recent study of alfalfa production prepared by the University based on an area relatively close to White Pine County and focused solely on alfalfa production utilizing center pivot irrigation. A comparable UNR study does not exist for White Pine County. As discussed in the study, the alfalfa is to be irrigated by center pivot irrigation, much like alfalfa that could be produced in Spring Valley. Other studies on alfalfa hay production done by the University are based on wheel line and flood irrigation which involve tradeoffs of capital and operating (labor) costs, or are based on joint production of both alfalfa hay and grass hay, and are not studied here because of the predominance of sprinkler irrigation in the basins of origin. Center pivot irrigation advantages over flood irrigation include the ability to tolerate more varied terrain and the ability to be more precisely managed resulting in potentially greater efficiency in water use and higher yields. Studies in California indicate that even though center pivot and wheel line irrigation has similar costs, the higher capital costs of center pivot irrigation is more than offset by reduced operating costs. The investment necessary to establish this 500 acre alfalfa hay includes the costs for ground preparation and planting, as well as the investment necessary to grow and produce the alfalfa. The total investment as shown in the study is assumed to be approximately $1.7 million, or almost $3,500 per acre (Curtis et al., Humboldt, 2004, pg. 7). The investment covers

the center pivot system, drilling of wells, pumps, pipe and miscellaneous fittings, power, ground preparation, seed and planting.

4.2 Operating Costs of Alfalfa.

The operating costs associated with growing alfalfa can vary considerably with various farming practices and regions within Nevada. For example, the costs of pest management, weed control and fertilizer application may vary from northern, eastern and southern Nevada. Basin by basin and county by county production and operating cost data may not apply specifically to White Pine County, but should provide some insight into the economics of growing alfalfa in the Basins of Origin. As shown in the UNR study Humboldt County (Curtis et al., Humboldt, 2004 p. 6), these operating costs are estimated to be $380.30 per acre. Also, as shown in Table 2 of the UNR Study, the assumed yield for alfalfa is 5.5 tons per acre. This is considerably higher than historical yields in White Pine County for the last several years, which have ranged from 3.2 tons per acre to 4.1 tons per acre. Total cash overhead costs in the study account for an additional cost of $40.90 per acre and noncash overhead, or capital recovery cost not including any return on capital, amount to $142.94 per acre. Adding the three components of cost results in a total cost per acre to produces alfalfa of $564.15. If, for example, the yield was 5.5 tons per acre and the price for alfalfa sold was $98.00 per ton, as assumed in the study, the net return per acre would be $98.00 × 5.5 - $564.15 = ($25.15). In other words, the grower would realize a negative return on his investment.

4.3 Alfalfa Breakeven Analysis

In order to assess the economics of alfalfa production in and around White Pine County, initial establishment costs, which include long-lived plant and equipment, must be annualized. The annual capital recovery costs associated with the establishment costs and the annual operating costs to produce alfalfa are largely fixed on a per acre basis.

The primarily fixed nature of these costs makes the actual economics of producing alfalfa very dependant on the price of alfalfa and the actual yield. Table 1 provides a matrix of the net return per acre for alfalfa prices, varying from $85 per ton to $205 per ton, and yields varying from 3 tons per acre to 6 tons per acre. The costs for producing alfalfa are assumed to be those discussed above and developed in the UNR study for Humboldt County (Curtis et al., Humboldt, 2004). Using the information on costs developed in the UNR study for Humboldt County, Table 1 was generated to plot the potential net returns per ton of alfalfa grown as a function of the price per ton and alfalfa yields. For example, at a yield of 3.5 tons/acre, the net price received for sales of alfalfa on this 120 acre stand must be at least $165 per ton to realize a minimal profit. At a yield of 6 tons/acre, the breakeven alfalfa price begins at approximately $95 per ton.

The normal average yields for alfalfa production in White Pine County range from 3.2 to 4.1 tons per acre according to the USDA National Agricultural Statistics Service for years from 2000 through 2009 (USDA, National Agricultural Statistics Service, 2000-2010). Pursuant to Table 1, alfalfa prices must consistently range between $145-$195 per ton to maintain breakeven points at these yields per acre. According to the USDA, alfalfa prices in Nevada have averaged approximately $120/ton over the last 10 years. In only two years, 2007 and 2008, have alfalfa prices reached

Table 1
Net Returns per Acre above Total Costs for Alfalfa Hay

Price	Yield Tons/Acre						
$/ton	3	3.5	4	4.5	5	5.5	6
$85.00	($309.14)	($266.64)	($224.14)	($181.64)	($139.14)	($96.64)	($54.14)
$95.00	($279.14)	($231.64)	($184.14)	($136.64)	($89.14)	($41.64)	$5.86
$105.00	($249.14)	($196.64)	($144.14)	($91.64)	($39.14)	$13.36	$65.86
$115.00	($219.14)	($161.64)	($104.14)	($46.64)	$10.86	$68.36	$125.86
$125.00	($189.14)	($126.64)	($64.14)	($1.64)	$60.86	$123.36	$185.86
$135.00	($159.14)	($91.64)	($24.14)	$43.36	$110.86	$178.36	$245.86
$145.00	($129.14)	($56.64)	$15.86	$88.36	$160.86	$233.36	$305.86
$155.00	($99.14)	($21.64)	$55.86	$133.36	$210.86	$288.36	$365.86
$165.00	($69.14)	$13.36	$95.86	$178.36	$260.86	$343.36	$425.86
$175.00	($39.14)	$48.36	$135.86	$223.36	$310.86	$398.36	$485.86
$185.00	($9.14)	$83.36	$175.86	$268.36	$360.86	$453.36	$545.86
$195.00	$20.86	$118.36	$215.86	$313.36	$410.86	$508.36	$605.86
$205.00	$50.86	$153.36	$255.86	$358.36	$460.86	$563.36	$665.86

Source: Table matrix generated from the cost estimates in the UNR studies for alfalfa and cow-calf operations.

breakeven levels. Also, it should be noted that the UNR study for Humboldt County (Curtis et al., Humboldt, 2004) assumes that capital recovery costs do not include any return on capital, only return of capital. Consequently, the net returns per acre in the breakeven table represent the return on capital. To earn at least a 5 percent return on the approximately $1.7 million investment, the net return per acre would need to be $170 per acre. With 4.0 tons per acre yield, the price of alfalfa would need to be $185 to realize a net return of $170 per acre, or 5 percent return on capital. Even at the highest yield realized in White Pine County over the last 15 years, 4.1 tons/acre, prices would need to be above $180 to even earn a minimal 5 percent return on capital. Certainly any sophisticated investor would be very reluctant to commit capital to such a venture. This lack of profitability is evidence that production of alfalfa in White Pine County may be used extensively for supplemental feed for local more profitable livestock operations. Taken in conjunction with local complimentary livestock operations, the marginal economics of alfalfa production may be enhanced somewhat.

In sum, the breakeven analysis described in Table 1 demonstrates the unfavorable economic circumstances for establishing new alfalfa stands in White Pine County, and for that matter, nearby counties in eastern Nevada. Given the inability to overcome the clear productivity and cost disadvantages in this area, the outlook for expansion of alfalfa hay production is dismal. The remoteness of White Pine County compared with more major alfalfa growing regions in the western United States decreases the competitiveness of the county's alfalfa sales to market. Alfalfa is typically priced in the field, requiring the buyer to assume transportation costs. Buyers adjust field prices downward accordingly. Given this, and the lack of sustainable alfalfa prices in the county, it is understandable why alfalfa production in White Pine County has not increased in the last decade.

4.4 Western Dairy Industry as a Source of Demand for Nevada-Produced Alfalfa

A major user of alfalfa worldwide is the dairy industry. This industry is also important for White Pine County. Alfalfa prices in Nevada, like other states in the western United States, are significantly influenced by the health of the dairy industry. Alfalfa price fluctuations, from the very gradual increases over the last decade, to the 2007-2008 price spike, and the precipitous fall thereafter, track United States and international dairy product price trends. The dairy industry was thought to be in a steady upward trend of prices until the 2008 international recession greatly reduced demand for, and prices of dairy products. This recession reverberated throughout the dairy industry and resulted in dairy prices that were far below those necessary to break even.

Stronger global demand in 2010 and less production has begun to support price forecasts closer to breakeven levels[2], but no significant price rise is anticipated. This can be seen from the USDA Agricultural Projections to the year 2020 shown below in Table 2, which was published in February 2011.

As a consequence of flat, below breakeven prices, demand from the dairy industry is not expected to cause upward pressure on regional alfalfa prices throughout the forecast period 2010-2020 (USDA Agricultural Projections to 2020, February 2011). As a result of the heavy financial losses sustained in many sectors of agriculture, and particularly in the U.S. dairy industry in the last few years, the dairy industry has experienced a significant credit crunch with its banking institutions. This credit crunch has contributed both to reduced demand for alfalfa, and a dampening of near and longer term growth rates in the industry. Despite the present financial circumstances, many forecasters are predicting a steady but gradual rise in the domestic demand for U.S. dairy products through 2020. The issue for the dairy industry, however, is not so much a lack of forecast demand, but rather the open-ended question of whether the current high feed grain prices of such commodities as corn, soybean meal and other grain feed will moderate to allow some measure of profitability to return to the production of dairy products in the United States.

Ultimately it is the long-term outlook for the dairy industry prices that determines its potential influence on demand for alfalfa. In this regard, the recent 2010-2020 USDA forecast is informative (USDA Agricultural Projections to 2020, February 2011). Table 2 summarizes the USDA annual projections of a number of components relevant to the United States dairy industry.

The last line of the Table 2 lists the “all-milk” prices, projected to increase from $16.40 cwt in 2011 to $18.70 cwt in 2020. Similar to the trends of many agricultural prices, the all-milk prices in real terms, that is, adjusted for general inflation, are actually decreasing over the period 2011-2020. As a result, the dairy industry in the United States and in Nevada and White Pine County in particular, are not expected to contribute to any growth in demand for alfalfa.

2. Some sources, such as Hay and Forage Grower, suggest that an all-milk price of over $16/cwt would begin to relieve financial distress in the industry. Prices throughout 2011 are expected to be at or slightly below this level. January 1, 2010 and February 23, 2010, Hay and Forage Grower, and USDA Dairy Forecast published November 30, 2010.

Table 2
Dairy Long-Term Projections

Item	Units	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Milk Production and Marketings													
Number of cows	Thousand	9,201	9,115	9,130	9,095	9,070	9,045	9,025	9,005	8,990	8,970	8,955	8,940
Milk per cow	Pounds	20,576	21,160	21,425	21,780	22,180	22,600	22,990	23,425	23,735	24,105	24,480	24,950
Milk production	Bil. lbs.	189.3	192.8	195.6	198.1	201.2	204.4	207.5	210.9	213.4	216.2	219.2	223.1
Farm use	Bil. lbs.	1.0	1.0	1.0	1.0	1.0	0.9	0.9	0.9	0.9	0.8	0.8	0.8
Marketings	Bil. lbs.	188.3	191.9	194.6	197.1	200.2	203.5	206.6	210.0	212.5	215.4	218.4	222.3
Supply and Use, Milkfat Basis													
Beginning commercial stocks	Bil. lbs.	10.1	11.3	10.1	10.6	10.9	11.1	11.1	10.9	10.5	10.0	9.6	9.3
Marketings	Bil. lbs.	188.3	191.9	194.6	197.1	200.2	203.5	206.6	210.0	212.5	215.4	218.4	222.3
Imports	Bil. lbs.	5.6	4.6	4.1	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.1	5.2
Commercial supply	Bil. lbs.	204.0	207.8	208.9	212.0	215.5	219.1	222.3	225.6	227.8	230.3	233.1	236.8
Domestic commercial use[a]	Bil. lbs.	187.3	189.7	192.1	194.9	197.6	200.4	203.3	206.6	208.8	211.1	213.7	216.9
Commercial exports	Bil. lbs.	4.5	7.7	6.2	6.2	6.8	7.6	8.1	8.5	9.0	9.6	10.1	10.8
Ending commercial stocks	Bil. lbs.	11.3	10.1	10.6	10.9	11.1	11.1	10.9	10.5	10.0	9.6	9.3	9.1
Total utilization	Bil. lbs.	203.1	207.5	208.9	212.0	215.5	219.1	222.3	225.6	227.8	230.3	233.1	236.8
CCT net removals[b]	Bil. lbs.	0.7	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Supply and Use, Skim Solids Basis													
Beginning commercial stocks	Bil. lbs.	10.9	11.3	11.8	11.5	11.1	10.9	10.7	10.6	10.5	10.5	10.5	10.6
Marketings	Bil. lbs.	188.3	191.9	194.6	197.1	200.2	203.5	206.6	210.0	212.5	215.4	218.4	222.3
Imports	Bil. lbs.	5.5	5.1	4.9	5.1	5.3	5.5	5.7	5.9	6.1	6.4	6.6	6.9
Commercial supply	Bil. lbs.	204.7	208.2	211.3	213.7	216.6	219.9	223.0	226.5	229.1	232.3	235.5	239.8
Domestic commercial use[a]	Bil. lbs.	168.6	167.0	170.3	172.5	174.8	177.5	180.3	183.3	185.5	188.0	190.5	193.8
Commercial exports	Bil. lbs.	22.4	29.8	29.5	30.1	30.9	31.7	32.1	32.7	33.1	33.8	34.4	35.3
Ending commercial stocks	Bil. lbs.	11.3	11.8	11.5	11.1	10.9	10.7	10.6	10.5	10.5	10.5	10.6	10.7
Total utilization	Bil. lbs.	202.3	208.6	211.3	213.7	216.6	219.9	223.0	226.5	229.1	232.3	235.5	239.8
CCT net removals[b]	Bil. lbs.	2.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prices													
All milk	$/cwt	12.83	16.35	16.40	16.95	17.10	17.30	17.45	17.70	17.90	18.20	18.50	18.70

Dairy projections were completed in November 2010.
CCC is the Commodity Credit Corporation, U.S. Department of Agriculture.
Totals may not add due to rounding.
[a]Domestic commercial use is adjusted for the Barter Program.
[b]Includes products exported under the Dairy Export Incentive Program.

In the long term, the dairy industry can be expected to grow at modest levels, corresponding to population growth and an increasing ability of developing nations to produce and purchase more nutritional dairy products. However, as transportation costs of feed for dairy cattle are relatively high, international markets distant from United States will themselves grow increasing levels of alfalfa and other feed crops.

5.0 LIVESTOCK PRODUCTION IN NEVADA AND THE DEMAND FOR ALFALFA

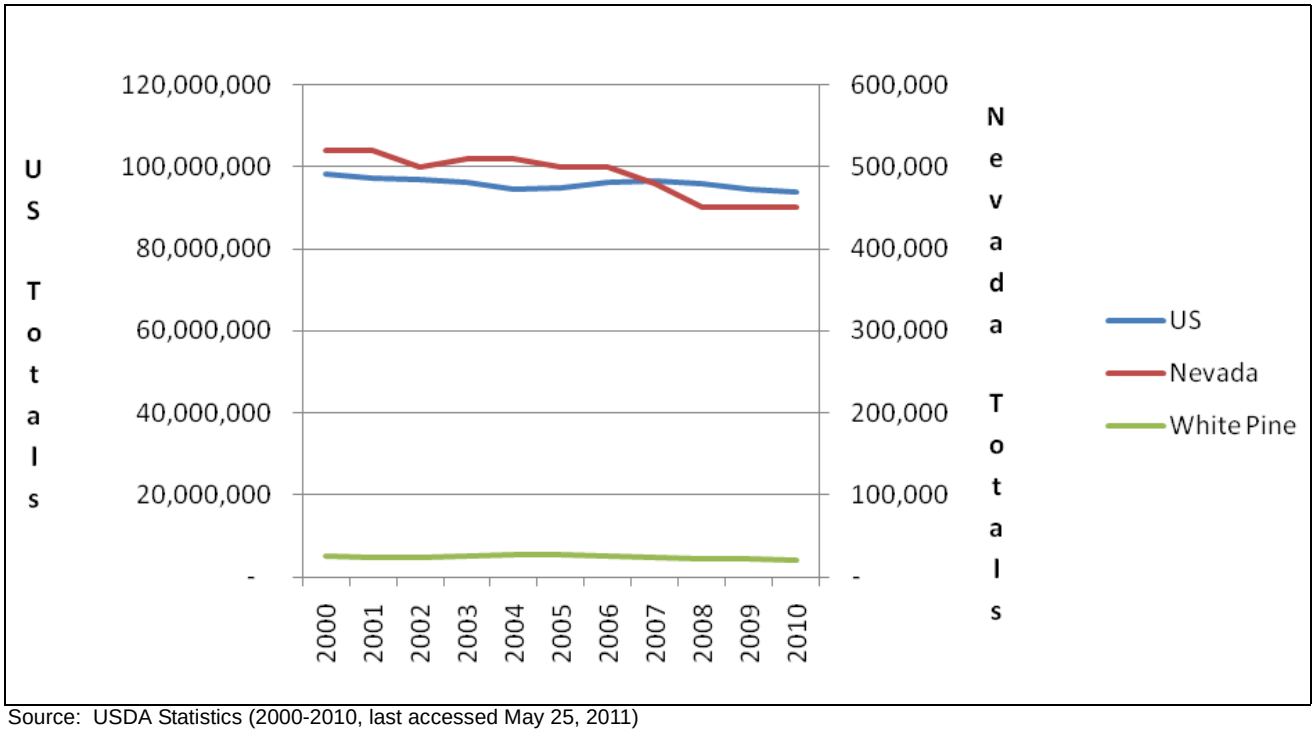
The discussion of the economics of alfalfa production above evaluates alfalfa sales primarily as a function of its value as hay on the open market. In addition to alfalfa hay sales, alfalfa in Nevada is raised also to augment local range livestock grazing. This is especially true of White Pine County.

Range livestock production is Nevada's top agricultural activity. According to the Nevada Department of Agriculture, the value of annual cattle and calves production is approximately 50 percent higher than Nevada's second ranked agricultural commodity, alfalfa and other hay.[3] Nevada's cattle industry is primarily one of "cow-calf" operations, meaning that the industry here is one of breeding cows and raising resulting steers and heifers for resale into higher grade hay feed and eventual feedlots for slaughter. The industry is made possible by the availability of grazing allotments issued by the Bureau of Land Management. At present, there are roughly 1,138,000 AUMS utilized in Nevada (USDI, BLM Public Land Statistics 1971-2008).

Due to a rather complex interaction of grazing availability and beef and alfalfa prices, foreign competition and consumer preferences over the last decade, the cattle and calf industry throughout the United States and particularly in Nevada and White Pine County, has experienced a slight downward trend. Figures 10 and 11 below show this trend.

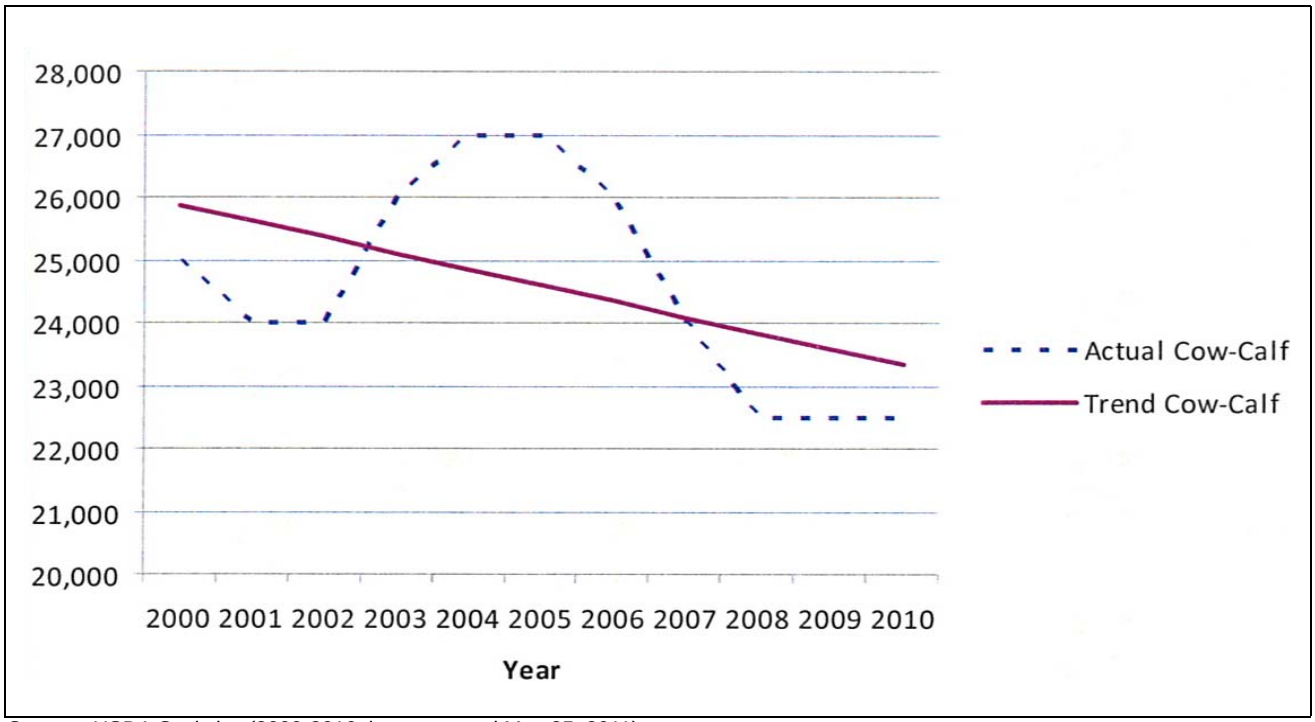
While the cow-calf operations in Nevada and White Pine County continue to be an important component of the regional economy, the industry does not appear to be poised for growth of any sort. To the extent that cow-calf operations support alfalfa production, this industry is not likely to contribute to an increase in the demand for alfalfa. The following section examines briefly the economics of Nevada's cow-calf industry as a function of alfalfa prices.

3. Based on the Nevada Department of Agriculture ranking in 2007, the top five agricultural commodities were cattle and calves, hay, dairy products, onions, and potatoes.



Source: USDA Statistics (2000-2010, last accessed May 25, 2011)

Figure 10
Cow Calf Inventory



Source: USDA Statistics (2000-2010, last accessed May 25, 2011).

Figure 11
White Pine County Cow-Calf Inventory

6.0 ECONOMICS OF NEVADA'S COW-CALF PRODUCTION AND ALFALFA PRICES

As a result of the fact that livestock grazing in Nevada must be supplemented with considerable quantities of high quality feed, primarily alfalfa, alfalfa prices are a key determinant of cow-calf economics. While the availability of economical federal allotments of grazing land in much of Nevada is likely the cornerstone of the industry's viability, range grasses are low in nutritional value and must be bolstered by high quality alfalfa and other hay forage, especially during the winter grazing period (December-March). Due to this costly supplemental feeding, this feeding can be of short duration only. Alfalfa has one of the highest feed values of forages due to its high levels of protein, energy, vitamins and minerals. Due to its higher relative price, alfalfa can generally be expected to comprise nearly 45 percent of the total operating costs of a cow-calf enterprise. As a result, alfalfa prices are the key factor in the profitability, or lack of profitability, in this livestock industry.

A study prepared by the UNR Cooperative Extension titled, "White Pine County Cow-Calf Production Costs & Returns, 2004", (Curtis et al., White Pine 2004), examined the economics of raising beef cattle in White Pine County. The study (Table 1) shows total operating costs of $436.26 per cow for a 500 cow operation. As also shown in the study at Table 1, the costs for alfalfa hay as a supplemental feed are $196.00 per cow, or 45 percent of total operating cost. Total overhead and capital recovery cost are an additional $97.72 per cow. Based on these numbers, at a price of $1.28/cwt for steers, this operation would realize net returns of $43.71 per cow. As shown in Table 2 of the study (Curtis et al., White Pine, 2004), total investment to undertake this cow-calf operation, not including any land cost, is $504,000, or $1,008 per cow. The net return or $43.71 per cow produces a return on investment of 4.34 percent. However, it is also very apparent from the study that the economics will be very dependent on the actual price of calves sold and the price of alfalfa. For example, Table 1 in the study assumed a price for alfalfa as a supplemental feed of $70.00 per ton, far below actual alfalfa prices of the last three years.

To gauge the economic health of the cow-calf industry in White Pine County, an analysis was undertaken to estimate the net returns available in the raising of these livestock as a function of the price of calves and the price per ton of alfalfa. Using the information on costs developed in the UNR study for White Pine County, Table 3 was generated to plot the potential net returns per cow as a function of the price per calf ($ per cwt) and alfalfa prices.

Table 3
Net Returns per Cow above Cost for a Cow-Calf Operation

Calf Price	Alfalfa Cost $/Ton								
$/cwt	$85	$100	$115	$130	$145	$160	$175	$190	$205
$110	($82.36)	($124.36)	($166.36)	($208.36)	($250.36)	($292.36)	($334.36)	($376.36)	($418.36)
$115	($52.56)	($94.56)	($136.56)	($178.56)	($220.56)	($262.56)	($304.56)	($346.56)	($388.56)
$120	($22.76)	($64.76)	($106.76)	($148.76)	($190.76)	($232.76)	($274.76)	($316.76)	($358.76)
$125	$7.04	($34.96)	($76.96)	($118.96)	($160.96)	($202.96)	($244.96)	($286.96)	($328.96)
$130	$36.85	($5.15)	($47.15)	($89.15)	($131.15)	($173.15)	($215.15)	($257.15)	($299.15)
$135	$66.65	24.65	($17.35)	($59.35)	($101.35)	($143.35)	($185.35)	($227.35)	($269.35)
$140	$96.45	$54.45	$12.45	($29.55)	($71.55)	($113.55)	($155.55)	($197.55)	($239.55)
$145	$126.25	$84.25	$42.25	$0.25	($41.75)	($83.75)	($125.75)	($167.75)	($209.75)

Source: Table matrix generated from the cost estimates in the UNR studies for alfalfa and cow-calf operations.

For example, at a market price of $125 per hundred pounds of calf weight, and a purchase price of $85 per ton of quality alfalfa, the venture stands to realize a net return of $7.04 per cow. Even a casual look at Table 3 indicates the very marginal economics of the cow-calf industry in White Pine County. Positive returns are realized only for very low alfalfa costs and very high calf prices.

The conclusions from the analysis pertain to the outlook for both the cow-calf and alfalfa industries. As in many regions in Nevada and the United States, the gradual decline of cow-calf operations and flat alfalfa production in White Pine County are indicative of marginal economics. Neither the sale price of calves has been consistently above breakeven levels, nor has the price of alfalfa been consistently low enough to allow profit levels to foster major new investment in the cow-calf industry in Nevada and in the United States. Cow-calf production can be expected to be cyclical, as in many agricultural endeavors, with no discernible trend toward expansion.

7.0 JOINT ALFALFA COW-CALF ECONOMICS

While alfalfa alone or cattle production alone may not offer significant opportunities for profit in White Pine County, it is possible that alfalfa production in conjunction with a cow-calf operation may enhance profit given the grazing potential existing on private and nearby public lands. The addition of a cow-calf operation to an alfalfa operation can be viewed as an alternative vehicle for marketing alfalfa production. Rather than selling alfalfa directly, some of the alfalfa production can be withheld and fed to cattle that are then sold, with resulting net revenues enhancing profit from direct sales of remaining alfalfa. However, examination of the Humboldt County and White Pine County UNR Extension studies of alfalfa and cow-calf costs and returns would suggest that combining operations is not beneficial. Withholding 1,400 tons of alfalfa from the 500 acre alfalfa operation and using it for supplemental feed in the 500 cow-calf operation results in a net return to the alfalfa operation of $85.61 per ton. That is more than $12.00 per ton less than selling the alfalfa directly for $98.00 per ton as is assumed in the UNR study (Curtis, et al., 2004, Humboldt County). In addition, additional capital investment is necessary to acquire or set up the cow-calf operation. The operation is better off selling alfalfa directly rather than marketing it through the alternative vehicle of cattle sales. Of course, this relies on the implicit assumption that no cost savings from joint operations are realized.

If sufficient cost savings can be realized from joint operations, marketing alfalfa via cattle sales could still enhance the economics of production of alfalfa. Examination of the investment and costs in these two studies indicates some potential for savings from joint operations. Removal of the costs of equipment that may be duplicative, substitution of hired labor for owner/operator labor that is less expensive and removal of duplicative overhead expense results in a 22 percent reduction in non-feed related costs for the cow-calf operation. The net value of alfalfa withheld from direct sale and used in the cow-calf operation results in a net return of almost $112 per ton, which is almost $14.00 per ton more than alfalfa sold directly in the study. Of course, additional investment is necessary to realize this enhanced return. While the addition of the cow-calf operation and resulting joint operating savings improved returns, the net return for the alfalfa operation still is only about $6,500, which would produce a rate of return on investment of approximately 0.3 percent annually on the over $2.0 million capital investment to establish the joint operation. Although the slight positive return is more than the negative return of the alfalfa only operation, it is hardly sufficient to induce any additional investment in alfalfa, or joint alfalfa/cow-calf operations in White Pine County, given the assumptions in the UNR studies and the potential cost savings from joint operations.

7.1 Breakeven Analysis of Joint Operations

As with both the alfalfa and cow-calf operations, economics on joint operations are highly dependent on alfalfa yields, alfalfa prices and cattle prices. Given the high degree of variability in all three, especially alfalfa prices and cattle prices, economic results can vary dramatically. The following tables were generated to calculate the returns per acre for a joint alfalfa/cow-calf operation based on

the costs in the UNR studies and the potential savings from joint operations discussed above given various prices for alfalfa and calves. Tables 4 through 6 show the returns for alfalfa yields of 3.5, 4.5 and 5.5 tons per acre.

Table 4
Net Returns per acre above Cost for a Joint Alfalfa/Cow-Calf Operation for Alfalfa Yield of 3.5 Tons/Acre

Calf Price	Alfalfa Price $/Ton								
$/cwt	$85	$100	$115	$130	$145	$160	$175	$190	$205
$110	($276.17)	($265.67)	($255.17)	($244.67)	($234.17)	($223.67)	($213.17)	($202.67)	($192.17)
$115	($246.37)	($235.87)	($225.37)	($214.87)	($204.37)	($193.87)	($183.37)	($172.87)	($162.37)
$120	($216.57)	($206.07)	($195.57)	($185.07)	($174.57)	($164.07)	($153.57)	($143.07)	($132.57)
$125	($186.76)	($176.26)	($165.75)	($155.26)	($144.76)	($134.26)	($123.76)	($113.26)	($102.76)
$130	($156.96)	($146.46)	($135.96)	($125.46)	($114.96)	($104.46)	($93.96)	($83.46)	($72.96)
$135	($127.16)	($116.66)	($106.16)	($95.66)	($85.16)	($74.66)	($64.16)	($53.66)	($43.16)
$140	($97.36)	($86.86)	($76.36)	($65.86)	($55.36)	($44.86)	($34.36)	($23.86)	($13.36)
$145	($67.55)	($57.05)	($46.55)	($36.05)	($25.55)	($15.05)	($4.55)	$5.95	$16.45

Source: Table matrix generated from the cost estimates in the UNR studies for alfalfa and cow-calf operations.

Table 5
Net Returns per acre above Cost for a Joint Alfalfa/Cow-Calf Operation for Alfalfa Yield of 4.5 Tons/Acre

Calf Price	Alfalfa Price $/Ton								
$/cwt	$85	$100	$115	$130	$145	$160	$175	$190	$205
$110	($191.17)	($165.67)	($140.17)	($114.67)	($89.17)	($63.67)	($38.17)	($12.67)	$12.83
$115	($161.37)	($135.87)	($110.37)	($84.87)	($59.37)	($33.87)	($8.37)	$17.13	$42.63
$120	($131.57)	($106.07)	($80.57)	($55.07)	($29.57)	($4.07)	$21.43	$46.93	$72.43
$125	($101.76)	($76.26)	($50.76)	($25.26)	$0.24	$25.74	$51.24	$76.74	$102.24
$130	($71.96)	($46.46)	($20.96)	$4.54	$30.04	$55.54	$81.04	$106.54	$132.04
$135	($42.16)	($16.66)	$8.84	$34.34	$59.84	$85.34	$110.84	$136.34	$161.84
$140	($12.36)	$13.14	$38.64	$64.14	$89.64	$115.14	$140.64	$166.14	$191.64
$145	$17.45	$42.95	$68.45	$93.95	$119.45	$144.95	$170.45	$195.95	$221.45

Source: Table matrix generated from the cost estimates in the UNR studies for alfalfa and cow-calf operations.

Table 6
Net Returns per acre above Cost for a Joint Alfalfa/Cow-Calf Operation for Alfalfa Yield of 5.5 Tons/Acre

Calf Price	Alfalfa Price $/Ton								
$/cwt	$85	$100	$115	$130	$145	$160	$175	$190	$205
$110	($106.17)	($65.67)	($25.17)	$15.33	$55.83	$96.33	$136.83	$177.33	$217.83
$115	($76.37)	($35.87)	$4.63	$45.13	$85.63	$126.13	$166.63	$207.13	$247.63
$120	($46.57)	($6.07)	$34.43	$74.93	$115.43	$155.93	$196.43	$236.93	$277.43
$125	($16.76)	$23.74	$64.24	$104.74	$145.24	$185.74	$226.24	$266.74	$307.24
$130	$13.04	$53.54	$94.04	$134.54	$175.04	$215.54	$256.04	$296.54	$337.04
$135	$42.84	$83.34	$123.84	$164.34	$204.84	$245.34	$285.84	$326.34	$366.84
$140	$72.64	$113.14	$153.64	$194.14	$234.64	$275.14	$315.64	$356.14	$396.64
$145	$102.45	$142.95	$183.45	$223.95	$264.45	$304.95	$345.45	$385.95	$426.45

Source: Table matrix generated from the cost estimates in the UNR studies for alfalfa and cow-calf operations.

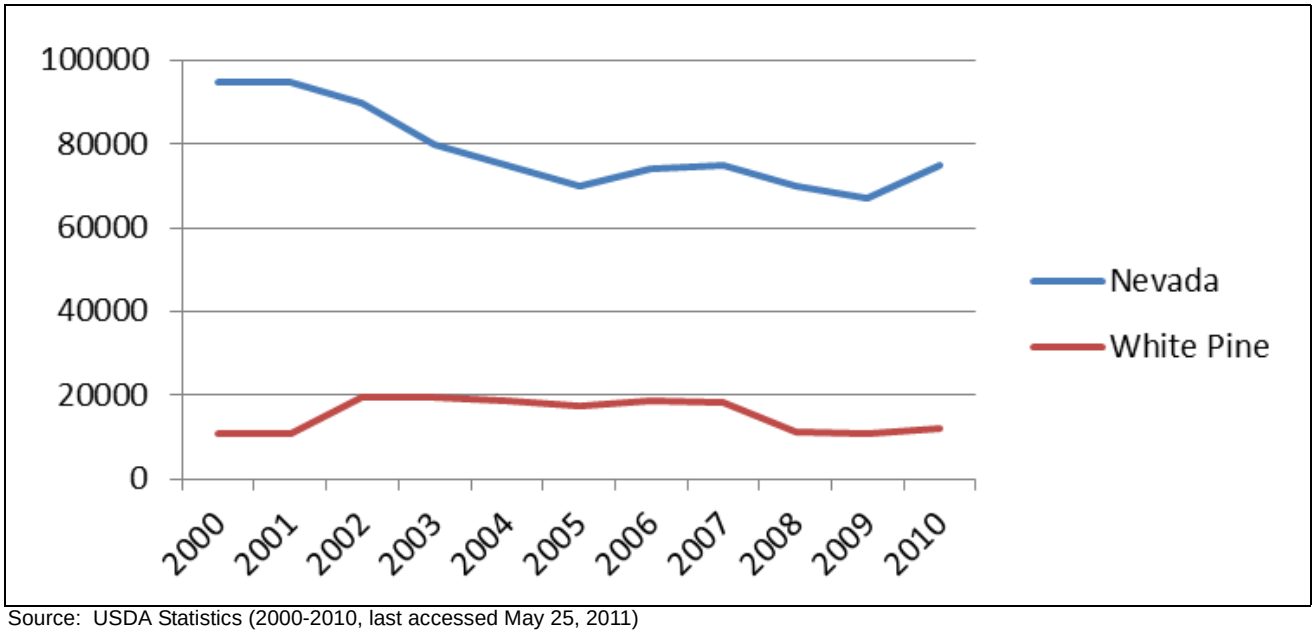
As is evident, in Table 4 with alfalfa yields at 3.5 tons per acre, a joint alfalfa, cow-calf operation is economic only at the highest combinations of alfalfa prices and calf prices. In Table 5 with alfalfa yields at 4.5 tons per acre, the operation becomes profitable when alfalfa prices reach the $115-$130 dollars per ton and calf prices reach $135-$140 per cwt range. It is notable that at the highest price combination in the table, alfalfa at $205 per ton and calves at $145 per cwt, the net return is only $221 per acre for an investment of approximately $2.05 million. That results in a rate of return on investment of 5.4 percent. An investor could earn a similar rate of return by investing in long or intermediate term Treasury Notes with virtually no risk at all compared to investing in an alfalfa/ cow-calf operation with highly variable returns and highly variable product prices. It is also important to note that alfalfa yields in White Pine County have not exceeded 4.1 tons per acre in the last 10 years.

The final Table 6 shows returns at an alfalfa yield of 5.5 tons per acre. As discussed above, for the last ten years, alfalfa yields have ranged between 3.2 and 4.1 tons per acre in White Pine County. Thus, achieving a yield of 5.5 tons per acre would appear highly unlikely. Even with an extremely high yield, the highest alfalfa and calf price combination only produces a net return of $426 per acre, or a 10.4 percent return on investment. Returns on S&P 500 stocks have averaged higher rates of return over the last 85 years, but are much more liquid and would seem to be less risky than investment in an agricultural operation.

Like the breakeven tables for an alfalfa operation alone and a cow-calf operation alone, the breakeven tables for a joint alfalfa/cow-calf operation show very low or negative returns over a wide range of price and yield outcomes. Even in the few price yield outcomes that produce a positive return, the returns are equal to or less than common alternative investments with far less risk and far more liquidity. The results seem highly unlikely to induce any significant investments in alfalfa, cow-calf or joint alfalfa/cow calf operations in White Pine County in the foreseeable future.

8.0 SHEEP AND LAMB ACTIVITY IN NEVADA AND WHITE PINE COUNTY

While the sheep and lamb inventories in Nevada in recent years have been relatively minor compared with the State's cow-calf inventories, sheep and lambs are more significant in White Pine County. The sheep-lamb industry has been relatively stable in part because of the "joint product" nature of the production of both meat and wool. These livestock are also useful in weed control in pastures and alfalfa stands. As depicted in Figure 12, the sheep inventory in Nevada and White Pine County has been essentially level over the past several years, and we have noted nothing that would cause a change to that trend.

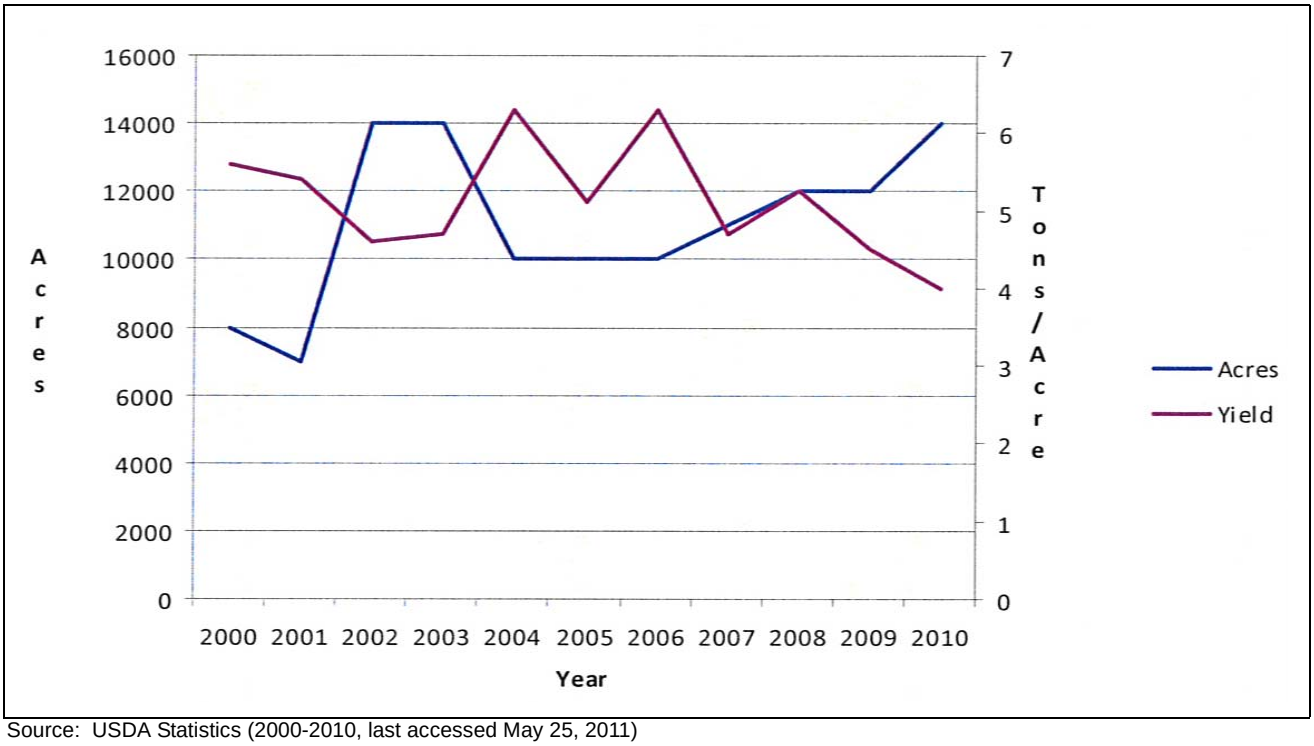


Source: USDA Statistics (2000-2010, last accessed May 25, 2011)

Figure 12
Sheep Inventory 2000-2010, Nevada and White Pine County

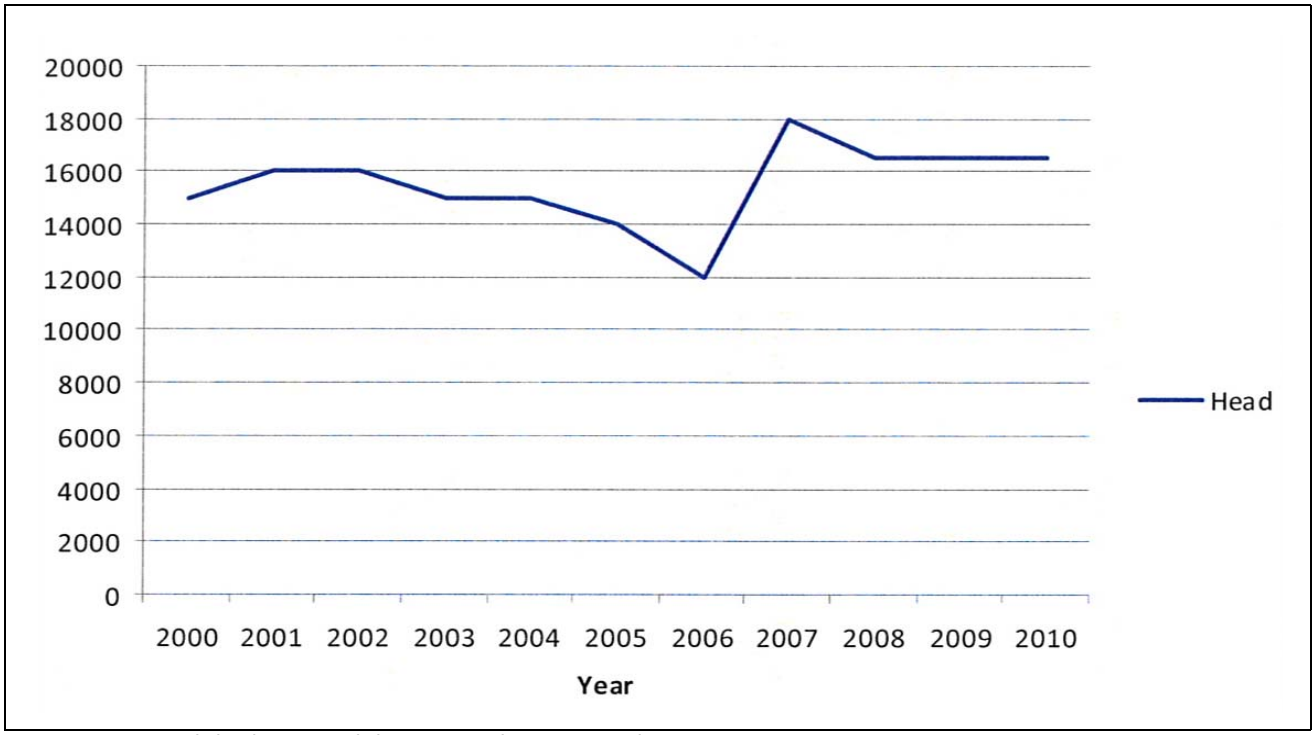
9.0 AGRICULTURAL OUTLOOK FOR LINCOLN COUNTY

Figures 13 and 14 for Lincoln County are for comparison with prior charts presented for White Pine County. While these agricultural operations are substantial, with the exception of Cave Valley, none of the Lincoln County Basins of Origin have any recognizable alfalfa or cattle production. Cave Valley is addressed in the basin-by basin discussion below.



Source: USDA Statistics (2000-2010, last accessed May 25, 2011)

Figure 13
Lincoln County Alfalfa (Acres and Yield)



Source: USDA Statistics (2000-2010), last accessed May 25, 2011)

Figure 14
Lincoln County Cow-Calf Inventory

9.1 Geographical and Ownership Issues of the Basins of Origin within Lincoln County

9.1.1 Dry Lake Valley

As discussed in the report, "Economic Development Potential in Spring, Cave, Dry Lake, and Delamar Valleys Hydrographic Basins," (Holmes, 2011) only a very small portion of Dry Lake Valley is privately held. The acreage is comprised of numerous small, oddly-shaped parcels which are nestled in the west slopes of the Bristol and Highland Ranges. The slope and minimal parcel sizes would limit any significant economic potential for raising alfalfa in Dry Lake Valley. Satellite inspections reveal that two very recent 65-acre hay irrigation circles have been planted. These small parcels are irrigated by diesel-generated electricity and make little economic sense. The potential for cattle operations would likewise be limited for the same reasons.

9.1.2 Delamar Valley

Approximately 1,400 acres of private land in Delamar Valley is located on the west slope of the Delamar Mountains and appear to have no potential for the economic raising of alfalfa or hay.

9.1.3 Cave Valley

The north-central portion of Cave Valley contains virtually all of the valley's approximately 6,014 acres of privately held land. Almost one-half of the private land is comprised of small irregularly-shaped parcels situated on the eastern slope of the Egan Range. Satellite photos reveal no apparent existing alfalfa operations and the topography and small size would appear to disqualify this area of Cave Valley (approximately one-half of all the privately held land) from any significant agricultural activities.

Cave Valley Ranch, LLC (CVR) at the northern end of the valley, is by far the largest private landowner, owning 3,280 acres in several parcels.

In December 2009, CVR and the SNWA agreed to create a Conservation Easement ("CE") applicable to 1,480 of the 3,280 acres owned by CVR. The purpose of the CE is to conserve and protect in perpetuity the natural habitat located on the CVR property. The CE grants SNWA the right to stop any practice or use of the CVR property that is inconsistent with the terms of the CE and that would violate the conservation values of the CE. While CVR may continue any existing ranching uses on the property, the CE prohibits new residential, commercial, or agricultural development on the land covered by the CE.

In addition, the elevations of the few remaining plots of CVR acreage not disqualified by the CE for potential pasture range from 6,400 ft to over 6,600 ft would restrict yields due to likely fewer cuttings and lower yields. These factors place this CVR land at a competitive economic disadvantage with neighboring Spring Valley.

In summary, for these and all other reasons outlined in this report regarding the bleak outlook for agricultural expansion, the land at CVR not covered by the CE will not be converted to alfalfa production. The competitive disadvantages and the significant new infrastructure that would be required in Cave Valley in higher voltage transmission lines, road upgrades and intensive investment in new wells, pumps, pipelines and center and wheel line irrigation systems undoubtedly make alfalfa purchases from areas such as Spring Valley superior to production in Cave Valley.

10.0 CONCLUSION

This report has traced the historical, present and anticipated future prospects for development of new alfalfa, cattle and sheep activities in the four Basins of Origin. Each of these agricultural activities have been stagnant or nonexistent in these Basins for some time. Although the alfalfa, cattle and sheep operations that exist at the present may continue at current levels, the substantial costs of investment in new facilities and land in these areas and superior economic advantages throughout the western United States virtually preclude expansion of these operations on any significant level in the future. This report concludes that there is no reasonable expectation that these four Basins of Origin will experience any expansion in agriculture activities in the future.

Water has not, and will not be the limiting factor to any expansion of agricultural activities in these Basins. Rather, clear economic disadvantages for agriculture in this remote region make any expansion here highly unlikely. While existing alfalfa, cattle and sheep operations may continue or decline slowly, severe competitive constraints identified in this report will prohibit growth in agriculture here.

These conclusions are demonstrated on a number of levels. Visual inspection of the time trends in these activities, and underlying data point to the stagnation of agriculture in these Basins. The financial investment returns' analyses in the report, based on and extrapolated from regional university studies, confirm that new investment in agriculture in these Basins cannot be expected to provide any justifiable level of returns or profits given the investment risks and cost of money involved. These break even analyses and general outlook for agriculture as forecasted by government agricultural agencies reinforce and underscore these conclusions. For these reasons, the report concludes that no additional water in these Basins will be required for future growth of agriculture in Spring, Cave, Dry Lake and Delamar Valley Basins.

11.0 REFERENCES

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