HAY INDUSTRY TRENDS: UNDERSTANDING ALFALFA AND DAIRY STATISTICS

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ABSTRACT

The 1999 production year was characterized by favorable weather patterns, but dismal market conditions for hay throughout most of California, as the market worked through large oversupplies from the previous year. Thresholds for high-quality categories were raised in 1999 due to grower's ability to produce better quality hay this year and the large supply. California remains the highest producer of alfalfa hay in the nation, and second largest producer of all categories of hay, in spite of lower acreage than many states. Meadow voles and new severe Cowpea aphid infestation were important pest issues throughout much of California in 1999. Long-term trends in alfalfa and dairy production show major structural changes from 1970-1999, which industry members should note. Corn silage and small grain forage acreage has increased substantially during this period, especially the past 10 years, when corn silage acreage has increase 87%. The production of alfalfa has declined from about 50 lbs/cow per day in 1970 to less than 28 lbs/cow/day in 1998, and is projected to be about 22 lbs/cow/day in 2010. It is projected that alfalfa production will be stable, in 2010 compared with 1998. Corn silage may be well over 500,000 acres if current trends continue. The dairy industry has continued to grow at a fast pace, driven partially by low-cost feeds and good demand in recent years, and this trends shows no sight of abating. Projection of current trends indicate that we should have nearly 2 million dairy cows, and CA dairy production should be over 40 billion lbs of milk in 2010. Relative efficiencies of dairy productivity are 55-60% greater and of alfalfa 25-30% greater than in 1970, and further improvements in efficiency are expected. Future demand for high quality forages is likely to be a more intense feature of markets to come, due to the increasing milk yields of California dairy cows. However, unforeseen large economic changes or water transfers could dramatically change this picture.

KEYWORDS: Acreage, Industry Trends, Economics, pests, dairy industry

INTRODUCTION

The purpose of this article is to review current market and growing conditions, and to examine longer-term market trends in relationship to the California alfalfa industry.

The California alfalfa industry has experienced a number of 'ups' and 'downs' during the past several years, from a stellar 1997 price performance, to the dreary wet spring of 1998 and the fine weather but low prices of 1999. 1997 was probably the best year ever for alfalfa in the state—prices were at record high levels in a sellers market and yields were good; the industry reached $1 Billion in total value, and attracted many first-time

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and previously-dormant growers to put in larger acreage. The higher acreage, coupled with a rapid fall in exports, increased supplies from other states, and record low commodity prices in 1998-99, created a 'yo-yo' effect, and very tough market conditions in 1998-99. The past two years' alfalfa crop will come nowhere near the $1 billion mark. The 1998-99 prices were generally dismal-the only consolation for growers being that some other crops fared worse. Oversupply in the lower-quality hay categories has been the hallmark of the past two years in particular.

1999 PRODUCTION YEAR

The 1999 Season had generally favorable weather patterns in most of California, favoring good yield levels and high quality. The cool, dry conditions caused the first two cuttings of the year in the Central Valley and Desert regions to be higher than usual in forage quality and this trend tended to continue through the summer, which was cooler than normal. Many growers have shortened significantly their cutting schedules in 1999 due to severe market pressures for high quality hay. Some growers stopped irrigating in the summer since the price of water and harvesting exceeded the value of the product, especially in deteriorated alfalfa stands. We had lower-than normal yields in the Intermountain areas where cool temperatures limited growth, but higher-than normal yields in the rest of the state. Average 1999 yields and quality in California should be higher than 1998, which was marred by wet, cold spring conditions that lowered yields and reduced forage quality.

Since there was a greater-than-normal supply of higher quality category hays in 1999, even the price for high quality was depressed from two years ago. The 'cutoff' threshold of what is considered quality was raised this year (changed from about 29 ADF to about 27 or lower to be considered 'dairy quality'). Labs reported a jump of about 1-2 points in the average quality of the samples received this year. Growers experienced intense market pressures to produce high quality hay or risk not selling their product, a result typical of these market conditions.

PEST SITUATION

In spite of generally favorable weather conditions, several pest issues plagued growers this year. In the winter of 1998-99, substantial alfalfa acreage in the upper San Joaquin and Sacramento Valleys were essentially denuded by large populations of meadow voles. According to Desley Whisson, UC Davis Vertebrate Pest Specialist, meadow vole populations cycle, reaching high levels such as these at approximately 7-year intervals. It is partially related to winter rainfall conditions (rains were lower and gentler than normal in 1998-99, presumably more comfortable for the voles). High-population levels can remain for a few years before they come back down, so growers should be prepared for another winter in 99-2000 with many unwanted guests feeding on their alfalfa fields. There are ongoing efforts to obtain Section 18 registration for zinc phosphide to help control meadow voles this coming winter and spring. This is currently in process in the federal EPA.

The high populations of the small black Cowpea Aphid (*Aphis craccivora* Koch.) surprised many growers in the Imperial Valley and High Desert of California in the spring of 1999. This aphid was always present in low numbers there, but populations somehow exploded in 1999. Many areas had whole plants covered with black aphids. Later severe infestations also affected many areas of the San Joaquin Valley and Sacramento Valley region. This aphid has likely never been observed at such high levels in California. The burst of the population was reminiscent of earlier outbreaks of aphid populations (eg. Blue and Spotted Alfalfa aphids), and the silverleaf whitefly populations in the Imperial Valley in the early 1990s which were (and continue to be) highly threatening to the alfalfa industry. These pests appeared to came suddenly, but then seemed to remain. It is not known whether this Cowpea Aphid is a close relative of the black aphid that is a severe problem in Argentina, Saudi Arabia, and China. It is also not yet clear whether this is a temporary, localized infestation, a new biotype, or whether it will become a more widespread, and permanent, feature of California's pest profile. Stay tuned.

ALFALFA PEST MANAGEMENT TASK FORCE

Members of the California Alfalfa Workgroup, in cooperation with the California Alfalfa & Forage Association, formed an Alfalfa Pest Management Task force in early 1999 to address several regulatory issues facing alfalfa and to provide a forum for discussion of pest issues. The two main areas of focus have been groundwater contamination issues (particularly winter-dormant weed control sprays), and surface-water contamination with insecticides. A 'Crop Profile' was developed by CAFA early in 1999 to help guide this process. The task force consists of Industry representatives, University Cooperative Extension Specialists and Farm Advisors, State of California Representatives, and Grower representatives. It is an 'Ad Hoc' forum for discussion and future action. Its main purpose is to approach emerging alfalfa pest management issues pertaining to regulation and the environment using a scientific approach, and to focus specifically on alfalfa. John Troiano of the Department of Pesticide Regulation will be giving a presentation in this symposium.

UNDERSTANDING ALFALFA STATISTICS

To steal a quote from somewhere, it has been said that there are liars, damned liars, and then there are statistics. Or perhaps, statistics don't lie, but liars use statistics. At the risk of being associated in some way with either statisticians or liars, it is instructive from time to time to examine trends in the alfalfa industry from the standpoint of long-and short term trends. Seth Hoyt, from the Ag Statistics Service in Sacramento, has a companion article to which examines in more detail the export and market situations (we would be eternally grateful if we were not associated with either of the above categories). Together, these provide an indication of where the industry is currently, and where it may be heading.

Hay Production Status. California remains the top producing alfalfa hay state in the nation, with production of over 7 million tons (Table 1.,USDA data—the total figure will

vary slightly by reporting agency). California has occupied this position for a number of years. It is interesting to note that there are 7 other states with larger alfalfa acreage, and the main reason that California's production is so high is the relatively higher yields experienced here vs. other states. It should also be noted that total alfalfa forage yields in several other states may actually be as high as California (as often pointed out by my colleagues from the Midwest). Some states, such as Wisconsin, Iowa and Minnesota, harvest a significant portion of their alfalfa as haylage (much of the first cutting), which artificially lowers their 'hay yields' and total production figures. If added together, the haylage + hay yields in those states may be higher than indicated on Table 1. Haylage is an insignificant portion of California's alfalfa acreage.

Table 1. Acreage, yield and production of Alfalfa Hay in the top ten US states, 1998. (USDA Data)

Rank	State	Acres (x1,000)	Yield	Production
1	California	980	7.2	7,056
2	South Dakota	2,300	2.3	5,290
3	Wisconsin	1,900	2.6	4,940
4	Minnesota	1,475	3.3	4,868
5	Idaho	1,020	4.4	4,488
6	Nebraska	1,300	3.3	4,225
7	Iowa	1,200	3.5	4,200
8	Montana	1,600	2.4	3,960
9	Kansas	900	4.0	3,600
10	Colorado	820	3.9	3,196
	United States	**23,673**	**3.35**	**79,242**

Note: These are for alfalfa hay only. Several states harvest a considerable portion of their alfalfa as haylage, primarily Wisconsin, Iowa, and Minnesota.

Leading California Alfalfa Counties. Imperial, Kern, Tulare, Merced, and Fresno, Counties were the 5 top leading alfalfa counties in California (Table 2). However, there are about a half-dozen other counties with acreage and production in the same acreage, and there are 15 counties in California with acreage over 30,000 acres). Alfalfa remains a ubiquitous crop in the State, and is important in every major agricultural zone in the state, with the exception of the Salinas Valley.

Total Forage Estimate. Total Forage production in California is worth more than 1.6 million acres, and is valued at more than 900 million/year (Table 3). It is interesting to see that other forages bring the total acreage up to over 1.6 million acreage (there is some discrepancy between different reporting agencies). This does not include irrigated pasture. Certainly, in the Central Valley of California, corn silage and grain hay and forage have taken on increasing importance in recent years. Sudangrass is significant primarily in the low desert region, and wild hays and miscellaneous hay makes up another large chunk of California's forage production.

Table 2. 1998 County Agriculture Commissioner Data on forage acreage, yield, and production.

(Data released in August, 1999--Obtained from National Ag Statistics Service: http://www.nass.usda.gov/ca/bul/agcom/indexcm.htm)

Counties	Acres	Yield (t/a)	Production (t)	Price ($/t)	Value ($)
Alameda	409	5.9	2,413	112	270,267
Amador	434	6	2,604	120	312,480
Butte	3,025	4.33	13,098	115	1,506,299
Colusa	9,440	6.57	62,021	104	6,450,163
Contra Costa	4,090	5.67	23,190	101	2,342,220
Fresno	*76,300*	*7.04*	*537,152*	*109*	*58,549,568*
Glenn	16,959	4.2	71,228	90	6,410,502
Imperial	*178,517*	*7.65*	*1,365,655*	*94*	*128,371,575*
Inyo	4,000	6	24,000	103	2,472,000
Kern	*120,000*	*6.98*	*837,600*	*96*	*80,409,600*
Kings	47,024	5.66	266,156	99	26,349,428
Lake	188	5.72	1,075	135	145,174
Lassen	32,000	4.8	153,600	95	14,592,000
Los Angeles	5,270	7.94	41,844	139	5,816,288
Madera	37,313	6.98	260,445	105	27,346,698
Merced	*77,479*	*6.8*	*526,857*	*124*	*65,330,293*
Modoc	30,000	4.5	135,000	95	12,825,000
Mono	7,000	5.74	40,180	103	4,138,540
Monterey	1,045	5.55	5,800	137	794,566
Plumas	4,400	3	13,200	95	1,254,000
Riverside	60,647	9.5	576,147	82	47,244,013
Sacramento	5,716	5.49	31,381	90	2,824,276
San Benito	1,500	3.11	4,665	120	559,800
San Bernardino	15,390	9.45	145,436	125	18,179,438
San Joaquin	63,800	6.1	389,180	120	46,701,600
San Luis Obispo	3,160	6.85	21,646	124	2,684,104
Santa Barbara	1,522	6.85	10,426	110	1,146,827
Santa Clara	875	9.5	8,313	195	1,620,938
Shasta	7,000	5.4	37,800	95	3,591,000
Sierra	1,000	2.6	2,600	95	247,000
Siskiyou	50,532	5.25	265,293	95	25,202,835
Solano	31,804	6.25	198,775	95	18,883,625
Stanislaus	40,844	6.74	275,289	125	34,411,070
Sutter	6,279	5.5	34,535	103	3,557,054
Tehama	4,700	5.5	25,850	95	2,455,750
Trinity	100	2.8	280	90	25,200
Tulare	*104,000*	*7.5*	*780,000*	*101*	*78,780,000*
Yolo	42,430	5.95	252,459	97	24,488,475
Yuba	705	5.2	3,666	96	351,936
Total Alfalfa	**1,096,897**	**6.0**	**7,446,856**	**108**	**758,641,599**

Table 3. Total Alfalfa and Other California Hay and Forages (Data Taken from County Agriculture Commissioner Estimates. Note that Greenchop and corn silage are high moisture yield estimates.

Category	Acres	Yield(t/a)	Production (t)	Price($/t)	Value
Alfalfa Hay	**1,096,897**	**6.0**	**7,446,856**	**108**	**758,641,599**
Grain Hay	223,089	2.6	498,720	68	39,676,800
Green Chop	11,715	23.5	397,352	25	9,920,100
Sudangrass	97,464	4.9	427,969	98	43,586,400
Wild Hay	38,212	2.1	77,460	69	5,418,500
Other Hay	208,312	2.9	595,589	78	46,260,100
Corn Silage	341,093	25.3	8,627,262	20	173,319,500
Total CA Forage	**1,675,689**				**903,503,499**

MEGA-TRENDS FROM THE 1970S –PROJECTING TO THE YEAR 2010

Alfalfa. Examination of the alfalfa industry from 1970 (about the time of the first Alfalfa Symposium was held in Fresno) to current times (latest data is 1998) is quite revealing (Figures 1-3). Total alfalfa hay production has been remarkably constant over this period (Figure 1). High supply periods were the 1998-99 (presumably the '99 data will also show this), late 1980s, and the early 1970s. Total alfalfa Acreage has declined about 15-20% over this period (Figure 2), down from a maximum of 1.2 million acres in the early 1970s. However, acreage was up about 8-10% from 1997 to current year, an indication of year-year fluctuations. At the time of the first California Alfalfa Symposium, alfalfa occupied 1 in 6 irrigated acres in the state (Verne Marble, CAS Proceedings, 1971), which is clearly not the case today. However, alfalfa growers have improved productivity per unit land area, so that average yields are nearer to 7 –7.5 tons/acre, compared with 5.5-6 tons/acre in the early 1970s (Figure 3). This steady increase in productivity has bee precipitated by improved irrigation and land leveling, better harvesting methods, better varieties and pest control in the 1990s vs. 1970.

Dairy. The CA Dairy industry continues to gallop along in 1999, as dairies reportedly experience golden times of profitability. The growth the California dairy industry from the 1970s through the 1990s is nothing short of phenomenal. The productivity levels will likely again jump substantially in 1999 vs. 1998, continuing a long-term growth phase, which has been steady since the early 1970s (Figure 4). Total milk production in 1998 was more than three times the production in 1970. This is CA's leading ag product, and is worth over $4 billion/year. The continuing growth is driven largely by record-low feed costs, and good to above-average milk prices and strong demand for processed milk products, especially cheese. California has historically had the lowest-cost production in

the US, making it an attractive investment for cheese makers and entrepreneurs, as well as by dairy families. Increased cow numbers are a major engine of growth; they are way up in recent years, nearing 1.5 million dairy cows in 1998-99 - Figure 5). Although some dairies are leaving the state, new ones are being built and older ones are expanding, some driven by relocation of the Chino (LA) milk shed to the Central Valley. Growth in total milk production has averaged about 4-5% per year over a long period of time, about half of which comes from increased cow numbers, half from increased productivity per cow. Figure 6 shows the increase in per-cow productivity. The average California cow produces about 20,000 lbs of milk per year in 1998, compared with about 12,500 in 1970, a 60% increase. Average herd size is now about 650 cows and 19% of CA dairies produce 50% of the milk, and 50% of the dairies produce 83% of the milk (California Dairy information Bulletin, October, 1999).

Hay and Dairy Relationships. It is clear that alfalfa hay growers have been quite efficient at increasing production as well as forage quality over the past 30 years, they have not matched the rate of growth from the dairy industry. California remains an alfalfa-deficit state in most years (see Seth Hoyt article). Figure 7 shows the amount of total hay produced per dairy cow in 1970 through 1998. We have gone from producing about 50 lbs/cow/day to about 28 lbs/cow/day (keep in mind that not all hay enters the dairy market, so the average amount of alfalfa in California rations is considerably less than this).

We must assume that this has meant a dramatic change in consumption per cow of alfalfa produced in the state. Much of the differences in consumption are due to 1) hay imported into California, 2) increased uses of corn silage, 3) Increased use of small grain hay and forage, and 4) Increased incorporation of various commodities in the dairy ration. These commodities range from cottonseed to beet pulp, tomato pumice and bakery wastes. If alfalfa were viewed as a single industry or company (eg. Like Ford or General Motors), the 'market share' of alfalfa has undoubtedly been substantially reduced during the last 30 years. Much of this is due to dramatic increases in the use of corn silage, especially during the past 10-12 years (Figure 8). Corn silage acreage has increased 87% in the past 10-11 years.

Relative Efficiency. If efficiency is measured as yield per unit land area (tons/acre), milk per unit animal (lbs/cow/year), and forage quality measured by the concentration of Total Digestible Nutrients (TDN, measured from fiber), then the changes in relative efficiency can be indexed as on Figure 9. Efficiencies in dairy production are about 60% greater than in 1970, whereas efficiencies in alfalfa production have improved about 25-30%. Both of these improvements in productivity are substantial and even dramatic. Forage quality has increased on the order of 2-3%, according to the average forage samples received by one lab. It should be noted that the gradual reduction in average consumption of alfalfa per animal has apparently occurred without an apparent penalty to the animal producer in terms of per-animal productivity.

Projecting into the Future. There is no doubt that prognostication is a dangerous business. However, if one makes the assumption that current conditions will prevail for

the next ten years similar to the past 20 years (a reasonable assumption), we can make projections based upon past trends. It is likely that total alfalfa productivity (tons/year) will be about the same as current levels.

Average alfalfa yields should increase to above 7.5 tons/acre (top yields in most areas are well above this—typically 12 tons or better, so this is completely possible), which will offset the generally downward trend of acreage (in spite of recent increases in acreage, the long-term trend is for lower acreage). Alfalfa acreage has downward pressure due to growers switching to higher-value crops, water availability and costs, and urbanization. However this trend may be highly dependent upon what happens with other 'agronomic' crops, especially cotton, tomato, and wheat and corn, several of which face severe international competition. Alfalfa acreage experiences an opposing upward pressure due to the strong and increasing demand for forages from the dairy sector (not to mention horses, which are a major growth area, but consume far less alfalfa). These two opposing forces seem to approximately cancel out, leaving acreage relatively constant. Since growers have increased efficiency to about balance declining acreage, total production is likely to be stable, with temporary yearly fluctuations due to the behavior of the markets and competitive crops.

Dairy production is likely to be above 40 billion lbs in 2010 (Figure 4), if the trends of the past 30 years are any guide of the future. This expected increase is driven by cow numbers above 1.8 million and average production per cow above 23,000 lbs/cow/year. This productivity level is near double the average 1970 cow. California alfalfa hay produced per dairy cow should be further reduced to about 20 lbs/cow/ day, and corn silage may be up nearer to the 500,000-750,000 acre mark (half to three-quarters that of the alfalfa acreage), depending upon whether you think that corn silage acreage is increasing at an increasing rate, or only linearly (Figure 8). The magical combination of low cost of production, excellent feeds including alfalfa, and strong demand and price that propelled California to be the nation's number one milk producing state appear to still very much at work. Many in the dairy industry expect this growth to continue.

CONCLUSIONS

Long-term production trends show major structural changes from the 1970s to current times. Alfalfa productivity per unit area has increase 25-30%, whereas dairy productivity per cow has increased more than 60%. Total alfalfa production has been fairly constant due to overall declines in total acreage, offset by increased yields. The 'market share' of alfalfa in California's dairy industry has declined substantially since the early 1970s. If the dairy industry continues to grow at current rates, we should expect close to 2 million dairy cows by 2010, with a concomitant strong domestic demand for all forages including alfalfa. However, alfalfa must find a place among a wide variety of feedstuffs now available to dairies. Future demand for high quality forages is likely to be a more intense feature of markets to come, due to the increasing milk yields of California dairy cows. Unanticipated major changes in economic trends or large water transfers could significantly alter this picture, however.

Figure 1. TOTAL CALIFORNIA ALFALFA HAY PRODUCTION, 1970-1998
(Trend projected to 2010)

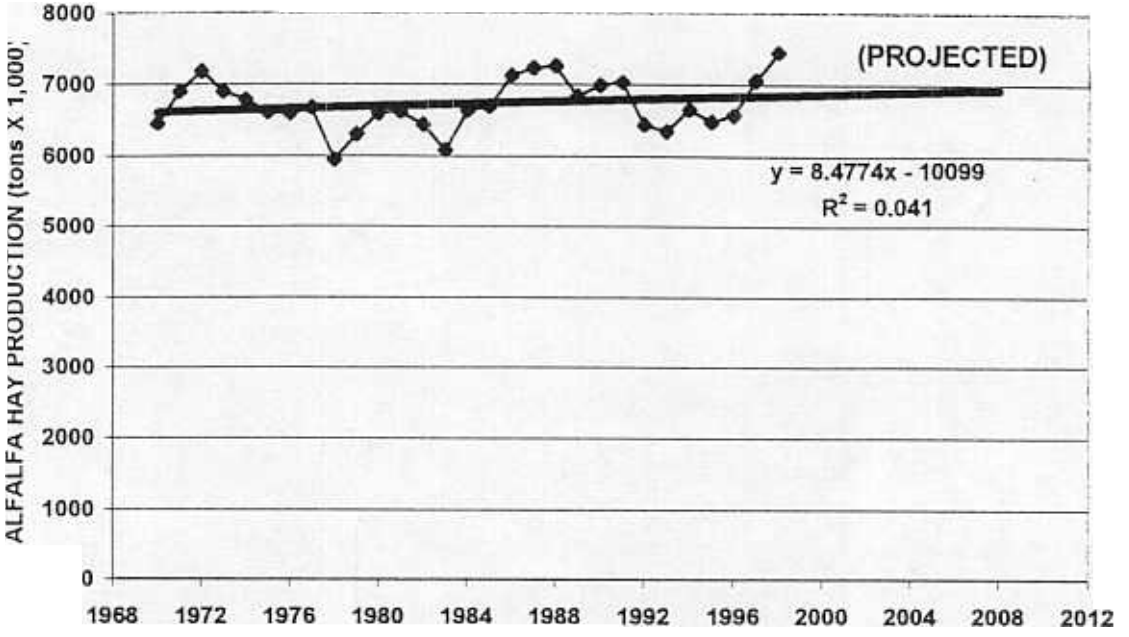

Figure 2. CHANGES IN ALFALFA YIELD, 1970-1998

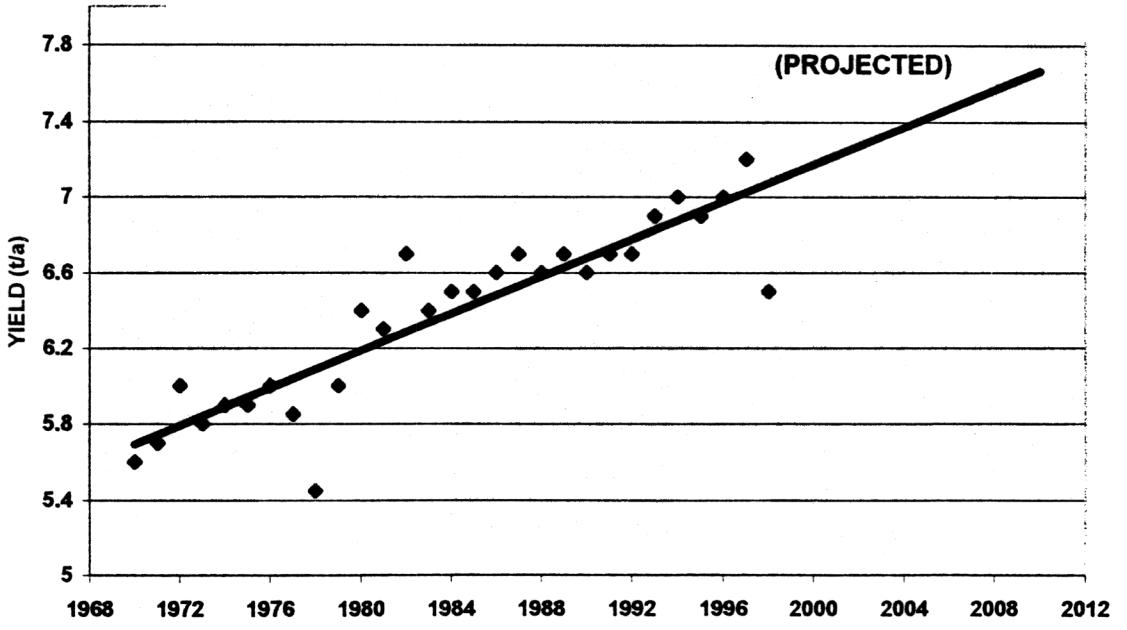

Figure 3. ACREAGE OF ALFALFA, 1970-1998

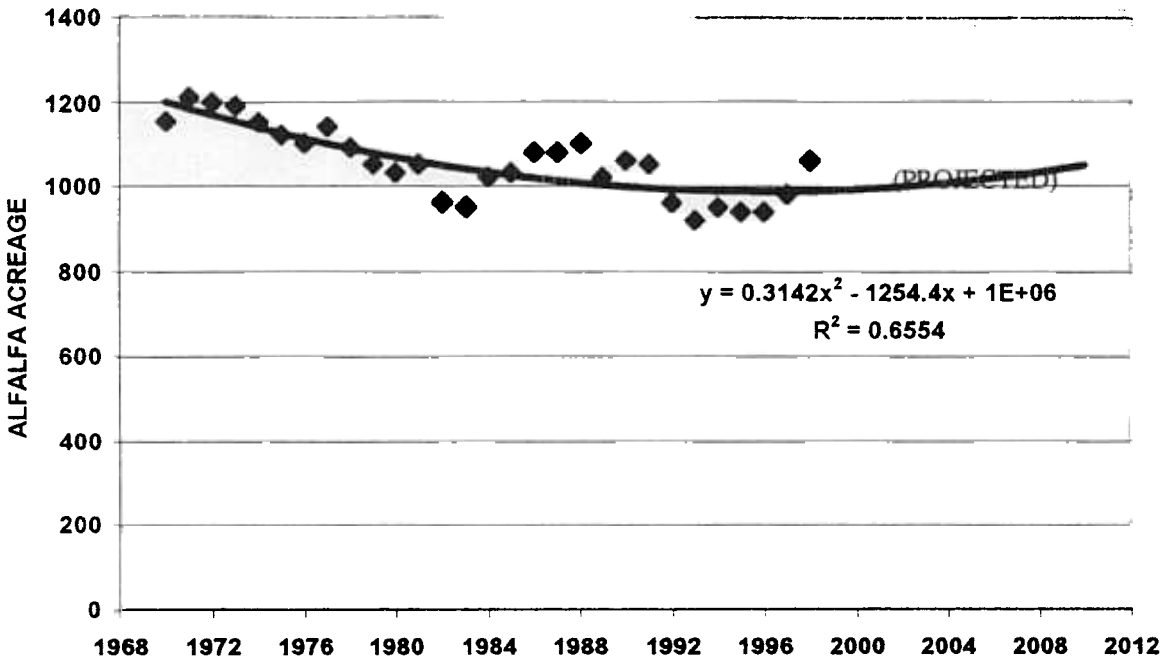

Figure 4. TOTAL CALIFORNIA MILK PRODUCTION
(Trend Projected to 2010)

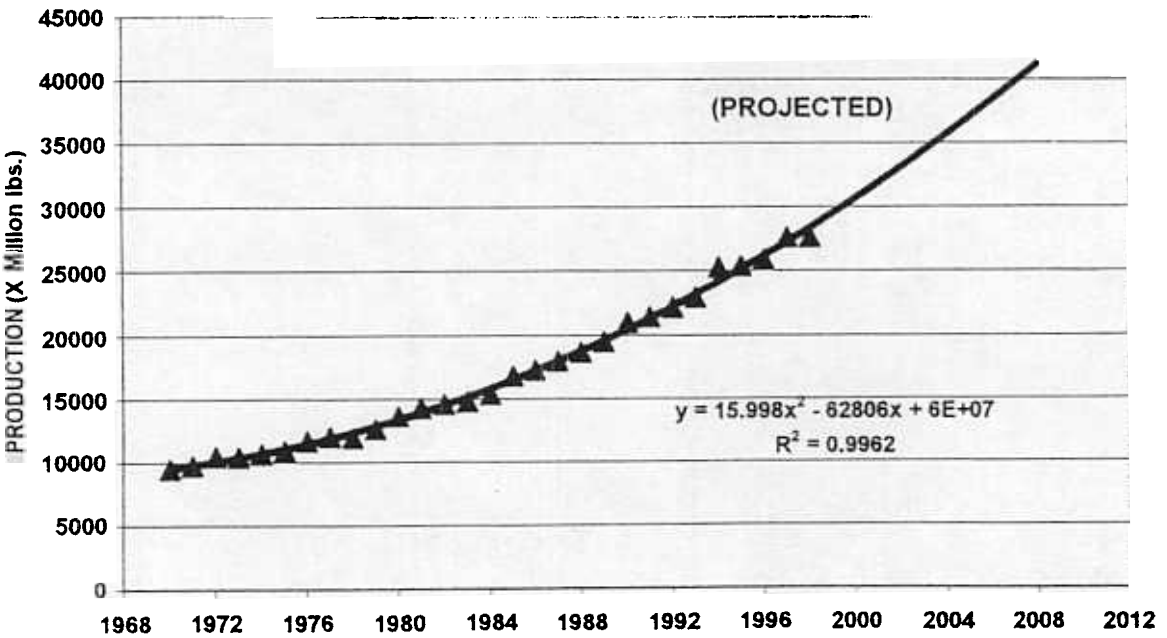

Figure 5. TOTAL NUMBER OF MILK COWS, CALIFORNIA 1970-1998
(Trend Projected to 2010)

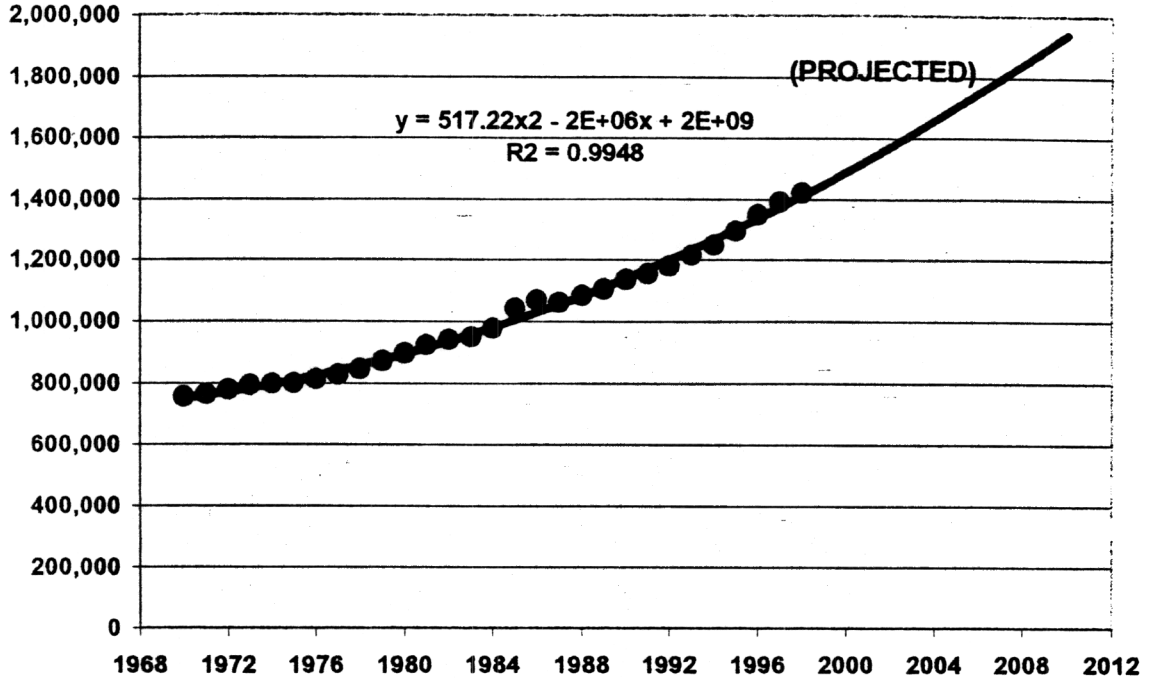

Figure 6. CALIFORNIA MILK PRODUCTION (per cow)
(Trend Projected to 2010)

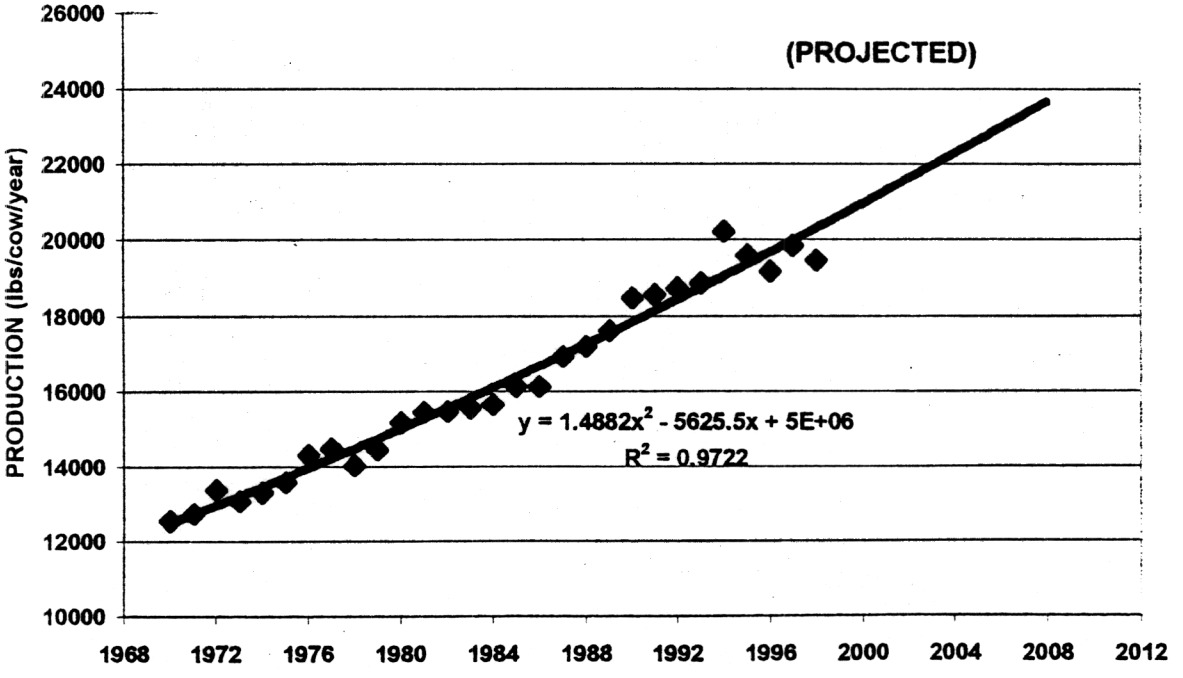

Figure 7. HAY PRODUCTION PER DAIRY COW
(Trend Projected to 2010)

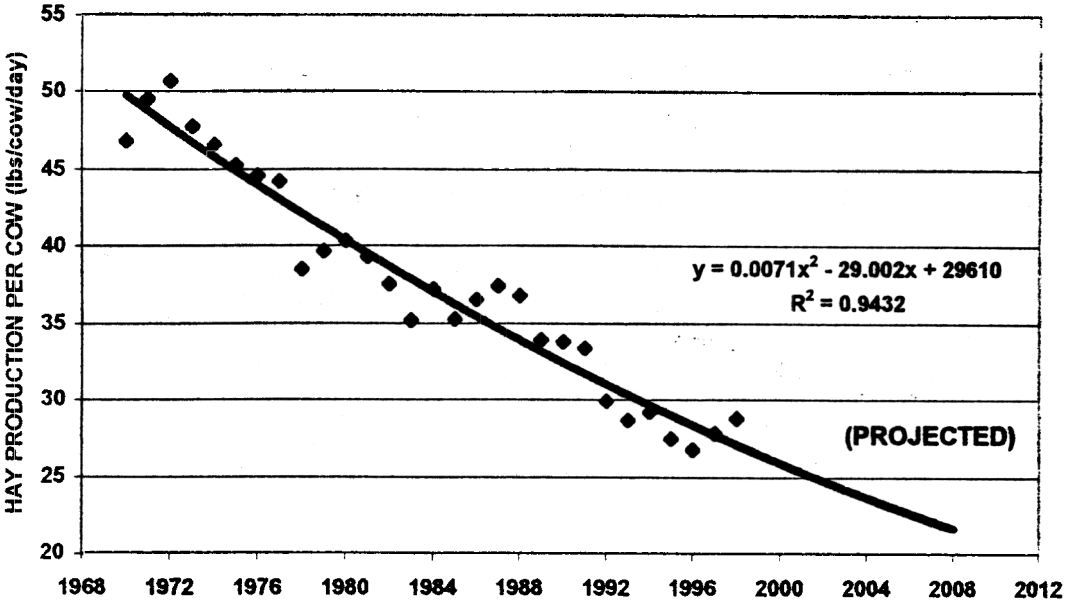

Figure 8. CHANGE IN CALIFORNIA CORN SILAGE ACREAGE, 1988-1998
(Trend Projected to 2010–note only 10 years data is used for projection)

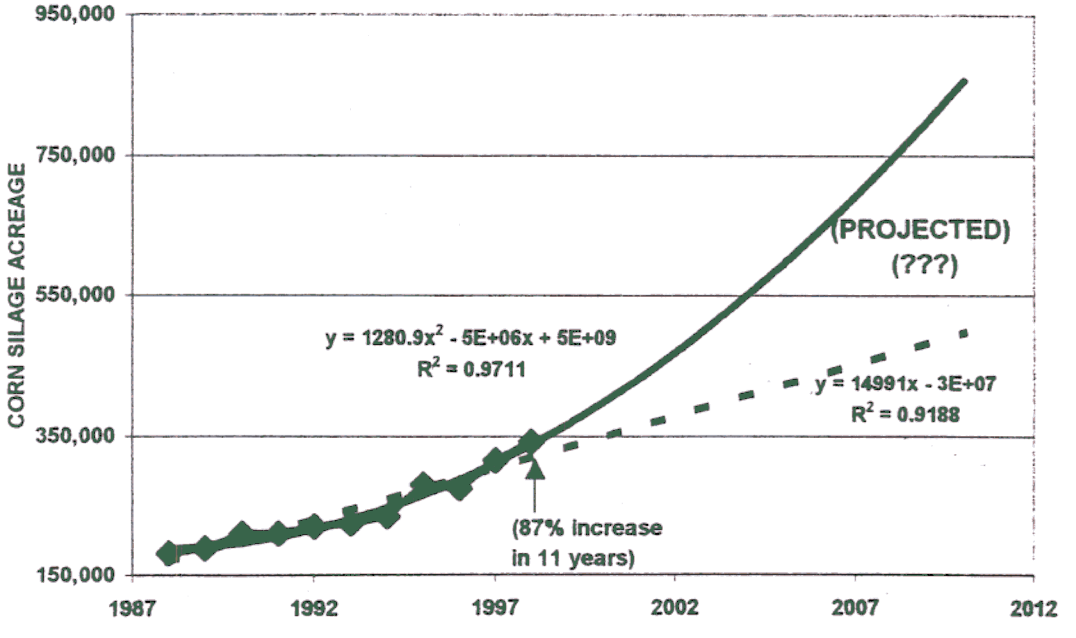

Figure 9. CHANGES IN RELATIVE EFFICIENCY OF CALIFORNIA DAIRY AND HAY YIELDS, 1970-1998