

**Drought and the Western Alfalfa Industry:
A Dramatic Turnabout^{1/}**

James H. Cothern, Economist
Cooperative Extension Service
University of California, Davis

Mother Nature accomplished in one year that which could not be accomplished in eight years with agricultural policy--remove burdensome grain surpluses. During the course of this past summer, more than three billion bushels of corn were effectively removed from the market place, and that happening will move many other commodity markets with it, including alfalfa. Agriculture has been in the doldrums for eight years, and now, the combined actions of inflationary policies, USDA and Mother Nature are assisting in turning agriculture around. Whether or not the recovery is sustained will be in the hands of agriculture and economic policy makers, but the California alfalfa industry will be one of the short term beneficiaries of all that has happened. While present prices seem to point to maintenance of the status quo, an undercurrent of supply and demand related forces will collaborate to make the next 12 months one of the more exciting periods in alfalfa marketing history.

Alfalfa prices have remained remarkably stable over the past four of five years, with some periods of volatility during the winter months, and this year is likely to evidence even more volatility. That which is currently happening weather wise is far from normal and will have far reaching effects, lasting for an unknown time length. The cogent question asked by all who were affected this summer was, "How bad is the drought and how long will it last?" The answer to the first question was, "...It was devastating!..." and the second question remains unanswered because the Mid-Western U.S. has not recovered from this summer's circumstances and much of the West still suffers a critical lack of moisture.

Coarse grain alternatives to forages are also becoming more scarce. Evaluation and interpretation of current grain balance sheets alludes to a depression of production from the gray zone, which might be defined as "poor," to levels which will drain surplus stocks from the system.^{2/} It is far too early to understand all the ramifications, but empirical analysis combined with economic theory provides insight relative to an understanding of the problem.

In order to understand the overall implications of the prior observations, it is necessary to review regionally important alfalfa **stocks, production and yield** data, useful in providing a foundation for some of the underlying theoretical conclusions.

The Regional Alfalfa Stocks Situation

Transportation costs have tended to limit the California market to a region of six other states. These states, Arizona, Idaho, Nevada, Oregon, Utah and Washington have evidenced relatively large January 1 and May 1 stocks for the past several years. January 1, 1988 stocks were slightly over 13 million tons, the highest since 1982 (Table 1). May 1 stocks amounted to about 2.7 million tons, which were not as large as the same time in 1987, but certainly higher than the six year average, and especially higher than the 1983-86 time span (Table 2). Large May 1 stocks prevailed in Idaho in particular, as a result of rapid alfalfa acreage expansion and rather static usage, a phenomena true to a lesser extent in Washington and Oregon as well. May 1 stocks in California have tended to be on the low side in the majority of the past seven years, but large regional stocks and other and relative low grain prices have been offsetting circumstances.

^{1/} This paper is a rewrite and update of "Heat, Hysteria and Hype: The Pendulum Swings in the Hay Market," Prepared for Farm Advisor Use, Davis: June 19, 1988.

^{2/} See J.H. Cothern, "The Drought: A 1988-89 Grain Marketing Primer," **California Agricultural Economics**, Davis: October 13, 1988.

Production, Weather and Stocks: Interactive Dynamics

Alfalfa stock levels are only one of the factors in the hay pricing equation. Two other supply side considerations add extraordinary dynamics to the market. These are off season weather conditions and growing season environmental variables which combine to affect current year production possibilities.

In evaluating these variables, the following are worthy considerations

Winter weather and temperature conditions which affect the amount of hay used
Wet growing season weather which damages hay quality
Abnormally hot growing season weather and other environmental conditions which affect both quality and yields
Growing season length which may alter the number of cuttings, particularly in California and Arizona

According to USDA reports 1988 was a tough year, dry weather had dramatic effects on U.S. acreage harvested, average yields and resulting production.

Regional Acreage and Average Yields

Regional Acreage Down About 2 Percent

Government programs have encouraged expansion of forages during the past six years. After reaching a high of about 4 million acres in 1987, regional harvested acreage is estimated to be slightly over 3.8 million acres this year. A cutback in alfalfa acreage of about 125 thousand acres in California and Idaho was not offset by increases of 50 thousand acres in Utah, Washington and Nevada (Table 3).

Regional Average Yields Slumped.

A major reason total production has been increasing in the West is the fact that average alfalfa yields, pushed by technology, have been increasing. Each of the Western states, without exception, have boosted average yields over the five years prior to this one, led by the hot weather states of Arizona and California (Table 4). This year, none of the states demonstrated increased average aggregate yields from last year, and Utah, Idaho, Washington and Nevada all had lower average yields than last year (Table 4).

Regional Stocks and Production Down Slightly.

Perusal of October USDA reports indicates 1988 regional production will be about 18.7 million tons, down about 4 percent from last year (Table 5). This aggregate reduction in production has been brought about mainly by reductions in Idaho, California, Nevada and Oregon. Arizona farmers will harvest about the same amount of alfalfa as last year and total production will increase in Utah and Washington (Table 5). Favorable forage producing conditions existed in North Western Washington and Oregon, but the remainder of the Western states has been afflicted with the same miserably dry conditions as the Midwest. Irrigated areas of the West had smaller supplies of water, and with those conditions, alfalfa is usually one of first crops to suffer.

The U.S. and Regional Supply Situation

Aggregate U.S. Supplies Shocked.

It now appears U.S. supplies will decline by a whopping 17 percent, since the combination of U.S. production and May 1 inventories fell from about 117 million tons last year to about 97 million tons this year (Table 6).

The Region was not hit quite as hard. A combination of slight reductions in harvested acreage and slightly below average yields, coupled with rather modest May 1 stocks, will result in a regional supply estimated to total about 21.6 million tons, down about 6 percent from that which was available regionally last year (Table 6). The seven Western states' supply will comprise 37 percent of the 1988 U.S. total (Table 6).

California-Arizona Supplies Down Three Percent.

Arizona-California production combined with May 1 stocks will result in a total supply of about 9 million tons, down about 300 thousand from last year, but still larger than any of four years prior to 1987 (Table 7).

The California Supply Situation

California Production and Acreage Down Slightly.

California growers will harvest 1.1 million acres of alfalfa and are slated to harvest 580 thousand acres of other hay, according to the October USDA estimate (Table 7). Expect the "Other Hay" acreage to be pared some, although the USDA estimates were used in preparation of this report. Average yields of "Other Hay" will likely be pruned from October estimates as well, the magnitude admittedly uncertain due to prevailing weather conditions. "Other Hay" production estimates will likely be reduced further as dry weather continue, particularly if they continue through November and December.

The California Balance Sheet

California Supplies Down Two Percent.

Combining acreage, yield and stocks information into a California Hay Balance Sheet results in an overall perspective of the 1988-89 California hay marketing season. The total supply will total about 8.8 million tons, down about 200 thousand tons, or 2 percent, from last year, and about 2 percent higher than the total supply available two years ago (Table 8).

Estimating a December 31, 1988 inventory is a bit tricky, and this particular inventory number is not a particularly reliable measure of availability. December 31 inventories could be relatively large, particularly if the drought continues and growers hold for higher prices; paradoxically, market supplies will tighten as the longer term drought effects are absorbed by markets and growers anticipate higher prices during the winter.

Demand Side: The California Dairy Industry

The Dairy Program Will Keep Animal Numbers Large.

California dairymen have benefited from both the subsidization of milk and feed grains, resulting in an almost continuous expansion of dairy cow numbers and/or production over the past ten years. The Dairy Termination Program was ineffective in reducing both production and numbers of animals, evidenced by the fact that both remain at relatively high levels. July-September, 1988 U.S. milk production stood two percent higher than during the same period last year and milk cow numbers were nominally lower. California milk cow numbers totaled 1.018 million head in October, an increase of about 1.4 percent from the same period a year ago. The industry, like all concentrate using livestock endeavors, has been bankrolled by the costly grain program, and in addition, by price support, milk diversion and drought relief programs in addition to the now infamous Dairy Termination Program. While the events of 1988 may disrupt this pattern, it is highly likely the Dairy Dole will continue.

The down side of all the previous has been the inordinate cost to the public, continued maintenance of animal numbers and milk supplies above market clearing levels, and increased dependence of the dairy industry on government programs in order to survive. The up side has been the stimulus to the forage market created by maintenance of animal numbers above market clearing levels. The reality of all this is important in planning, since changes in the program also effect the forage producing industry.

Profit Optimization and Dairy Operations.

Contemporary commercial dairy enterprises of any magnitude use computer programs to "optimize" ration profitability based on respective nutritional cost-benefits. Over the past eight years these programs have been telling operators to minimize the use of forages in relation to cheaper, more readily available concentrates--particularly corn or barley, and high protein meals. As grain prices have escalated in relation to roughages, the program has generated more mixed signals, and as the events of 1988-89 are translated,

results will suggest more substitution of roughage for concentrates. This will increase the demand for high quality alfalfa and result in higher alfalfa prices.

Inventory Maintenance and "Hand-to-Mouth" Purchases

Compounding market pressure is the general operating strategy of "hand-to-mouth" purchasing, as opposed to firm inventory management programs. Historically, this has not been a faulty strategy when regional inventories are large, since USDA has provided some relief through the maintenance of large, publicly funded grain inventories, but this policy leads to obvious problems when supplies are dear. A pair of items are important here. A dearth of alfalfa supplies in much of the Mid-West will result in more West to Mid-West alfalfa movement than has historically prevailed. In addition, stocks of both hay and grain will vary by region resulting in more inter-regional movement, and all stocks will be in stronger hands this season, resulting in even more upward price pressure during the off season. "Hand-to-mouth" purchasers will be facing much more of a "sellers" market this year than any year since the late 1970's.

The previous theory suggests very strong and escalating demand for high quality roughage as the season progresses.

Agricultural Policy: A Wild Card

History provides some insight as to how USDA has managed drought situations. USDA officials relaxed acreage restrictions after the '82-83 marketing year and as a result, grain surpluses were accumulated which have lasted until this year. Projections presently indicate 1988-89 ending stocks of about 1 billion or less, down from 4.3 billion last year^{3/}. This will cause the trade's view of "safe, manageable or burdensome" supplies to change radically. History has shown that when stocks were reduced below 1 billion bushels extraordinary price variation followed. Corn stock levels approximate that number and wheat stocks are well below 1 billion bushels. In response to this "problem," the Secretary of Agriculture has announced 10 percent 1989 Set Aside requirements for both wheat and feed grains, both well below the respective 1988 requirement. This action may cause grain prices to soften in the second half of the marketing season if favorable weather evolves, but only creates more market uncertainty in the short term, since no one knows what 1989 weather will be like.

In addition, the Secretary's Office believes feed use of grain will be curtailed sharply by higher grain prices. Thus far, grain usage by poultry, hogs and dairy cattle producers does not show this effect; and in fact, we know those responses usually take much longer to filter through the system. Present USDA estimates of feed use and exports have been adjusted below last year at the same time and reflect USDA's view of the market response to lower supplies. It is not the trades' view, since another whole set of circumstances are also seen as being important--a softer dollar which enhances export expansion, continued strong demand for red and white meats, potential long term trade deals and a panoply of other factors are deemed important. It is likely that ending stock levels will be adjusted down throughout the year as USDA belatedly reacts to these market effects.

Summary and Conclusions

The present grain market volatility will have repercussions for all of the livestock producing sectors, particularly in the short term. California alfalfa producers should carefully monitor and evaluate feed grains, protein meal and forage balance sheets as they are adjusted throughout the winter to reflect the accumulated events of the summer and fall. While it is too early to project the eventual outcome of all this, alfalfa prices should move steadily higher as the season progresses. Expect winter season prices to average at least \$15-30 per ton higher for the early winter marketing season than during the same period last year. The news regarding 1988 grain crop size has been absorbed by the market, but changes in stock levels due to domestic and export usage, problems with disease and the like have not as yet been digested. Second half activity will be conditioned by the trade's interpretation of usage-export information and producers' response to the relaxed USDA policy regarding increased grain planting. Regional markets will become much broader in scope.

Agricultural markets have once again become "bull" markets!

^{3/} J.H. Cothorn, op. cit., p.- 7

Table 1
Hay Stocks on Farms and Ranches
December 31, 1982-88

STATE	December 31						
	1982	1983	1984	1985	1986	1987	1988
-1,000 Tons-							
Arizona	207.0	137.0	116.0	118.0	290.0	263.0	
California	2,669.0	1,608.0	1,323.0	1,414.0	2,330.0	2,341.0	
Idaho	3,073.0	2,712.0	2,850.0	3,036.0	3,304.0	4,008.0	
Nevada	628.0	749.0	781.0	808.0	963.0	897.0	
Oregon	2,165.0	1,958.0	2,185.0	2,023.0	2,100.0	2,200.0	
Utah	1,530.0	1,328.0	1,089.0	1,231.0	1,559.0	1,503.0	
Washington	1,652.0	1,337.0	1,528.0	1,471.0	1,868.0	2,104.0	
Seven Western States	11,924.0	9,829.0	9,872.0	10,101.0	12,414.0	13,316.0	
United States	99,476.0	106,650.0	89,280.0	100,632.0	121,734.0	119,749.0	
Seven Western/ United States	.1199	.0922	.1106	.1004	.1020	.1005	

*Source: California Crop and Livestock Reporting Service, USDA

Table 2
Hay Stocks on Farms and Ranches
May 1, 1982-88

STATE	May 1						
	1982	1983	1984	1985	1986	1987	1988
-1000 Tons-							
Arizona	109.0	333.0	73.0	66.0	55.0	25.0	41.0
California	471.0	337.0	368.0	314.0	400.0	345.0	368.0
Idaho	757.0	489.0	393.0	522.0	245.0	1,086.0	901.0
Nevada	105.0	125.0	195.0	135.0	130.0	206.0	207.0
Oregon	289.0	267.0	281.0	218.0	179.0	689.0	392.0
Utah	328.0	236.0	206.0	238.0	271.0	470.0	381.0
Washington	508.0	262.0	237.0	158.0	182.0	517.0	405.0
Seven Western States	2,567.0	2,049.0	1,753.0	1,651.0	1,462.0	3,338.0	2,695.0
United States	26,155.0	29,052.0	20,558.0	26,863.0	26,698.0	32,418.0	27,329.0
Seven Western/ United States	.0981	.0705	.0853	.0615	.0548	.1030	.0986

*Source: California Crop and Livestock Reporting Service, USDA

Table 3
Alfalfa Hay Acreage
Seven Western States, 1983-88

	Area Harvested					
	1983	1984	1985	1986	1987	1988
	-1,000 Acres-					
Arizona	145.0	150.0	145.0	155.0	160.0	160.0
California	950.0	1,020.0	1,030.0	1,080.0	1,150.0	1,100.0
Idaho	1,030.0	1,050.0	1,020.0	1,100.0	1,020.0	960.0
Nevada	230.0	235.0	235.0	240.0	245.0	250.0
Oregon	440.0	445.0	450.0	460.0	430.0	415.0
Utah	455.0	470.0	460.0	470.0	465.0	480.0
Washington	440.0	475.0	450.0	470.0	460.0	490.0
Seven Western States	3,690.0	3,845.0	3,790.0	3,975.0	3,930.0	3,855.0

*Source: California Crop and Livestock Reporting Service, USDA

Table 4
Alfalfa Hay, Average Yields
Seven Western States, 1983-88

	Yield					
	1983	1984	1985	1986	1987	1988
	-Tons-					
Arizona	7.3	7.2	7.1	7.6	7.8	7.8
California	6.4	6.5	6.5	6.6	6.7	6.7
Idaho	3.9	3.8	3.5	3.8	3.9	3.7
Nevada	3.9	4.0	4.1	4.1	4.2	4.0
Oregon	4.2	4.1	4.1	4.2	4.2	4.2
Utah	3.9	4.0	3.9	3.9	4.1	4.0
Washington	4.0	4.3	3.9	4.2	4.3	4.2

*Source: California Crop and Livestock Reporting Service, USDA

Table 5
Alfalfa Hay, Total Production
Seven Western States, 1983-88

STATE	Production					
	1983	1984	1985	1986	1987	1988
-1,000 Tons-						
Arizona	1,059.0	1,080.0	1,147.0	1,178.00	1,248.0	1,248.0
California	6,080.0	6,732.0	6,592.0	7,128.00	7,705.0	7,370.0
Idaho	4,017.0	3,938.0	3,852.0	4,180.00	3,978.0	3,552.0
Nevada	897.0	940.0	936.0	984.00	1,029.0	1,000.0
Oregon	1,848.0	1,825.0	1,778.0	1,932.00	1,806.0	1,743.0
Utah	1,775.0	1,880.0	1,833.0	1,833.00	1,906.5	1,920.0
Washington	1,760.0	2,043.0	2,050.0	1,974.00	1,978.0	2,045.8
Seven Western States	17,436.0	18,438.0	18,188.0	19,209.0	19,650.5	18,878.3
U.S.	82,212.0	90,017.0	85,048.0	91,552.0	84,554.0	69,581.0

*Source: California Crop and Livestock Reporting Service, USDA

Table 6
Total Alfalfa Supply
Seven Western States, 1983-88

STATE	Total Supply Available: May 1 Stocks Plus Production					
	1983	1984	1985	1986	1987	1988
-1,000 Tons-						
Arizona	1,392.0	1,153.0	1,297.0	1,233.0	1,273.0	1,289.0
California	6,417.0	7,100.0	6,906.0	7,528.0	8,050.0	7,738.0
Idaho	4,506.0	4,331.0	4,374.0	4,425.0	5,064.0	4,453.0
Nevada	1,022.0	1,135.0	1,071.0	1,114.0	1,235.0	1,207.0
Oregon	2,115.0	2,106.0	1,996.0	2,111.0	2,495.0	2,135.0
Utah	2,011.0	2,086.0	2,071.0	2,104.0	2,376.5	2,301.0
Washington	2,022.0	2,280.0	2,208.0	2,156.0	2,495.0	2,450.8
Seven Western States	19,485.0	20,191.0	19,923.0	20,671.0	22,988.5	21,573.8
United States	111,264.0	110,575.0	111,911.0	118,250.0	116,972.0	96,910.0
Seven Western/ United States	.28	.29	.28	.26	.34	.37

*Source: California Crop and Livestock Reporting Service, USDA

Table 7
California Hay Crop Production and Yield: 1978-88
Alfalfa and Other Hay Mixtures

Year	Alfalfa	Yield	Other Hay	Yield	Total Crop	Ave. Yield
	-1000 Acres-	-Tons-	-1000 Acres-	-Tons-	-1000 Acres-	-Tons-
1978	1,090	5.45	520	1.95	1,610	4.31
1979	1,050	6.00	510	1.95	1,560	4.67
1980	1,030	6.40	520	2.20	1,550	4.99
1981	1,050	6.30	515	2.40	1,565	5.01
1982	960	6.70	510	2.40	1,470	5.20
1983	950	6.20	530	2.50	1,480	4.87
1984	1,020	6.60	530	2.40	1,550	5.16
1985	1,030	6.50	540	2.40	1,570	5.02
1986	1,080	6.60	600	2.50	1,680	5.14
1987	1,150	6.70	520	2.50	1,670	5.39
1988	1,100	6.70	580	2.50	1,680	5.25

*Source: California Crop and Livestock Reporting Service

Table 8
California Hay Crop Production and Inventories: 1978-88

Year	Carryover : May 1	Alfalfa : Production	Other Hay : Production	Total Crop : Production	Total Supply	Carryover : December 31
	-1000 Tons-					
1978	1,082	5,940	1,014	6,954	8,036	2,226
1979	765	6,300	995	7,295	8,060	2,043
1980	620	6,592	1,144	7,736	8,356	2,708
1981	542	6,615	1,236	7,851	8,393	2,669
1982	471	6,432	1,224	7,656	8,127	1,800
1983	337	5,890	1,325	7,215	7,552	1,608
1984	368	6,732	1,272	8,004	8,372	1,323
1985	314	6,592	1,296	7,888	8,202	1,414
1986	400	7,128	1,500	8,628	9,028	2,330
1987	345	7,705	1,300	9,005	9,350	2,341
1988	368	7,370	1,450	8,820	9,166	1,700**

*Source: California Crop and Livestock Reporting Service

**December 1, 1988 Stocks Estimated by Author