

# THE RECENT ECONOMICS OF DROUGHT, MILK, EXPORTS AND WESTERN HAY MARKETS

Daniel A. Sumner, William A. Matthews and Hyunok Lee<sup>1</sup>

## ABSTRACT

The hay industry has weathered the California drought remarkably well maintaining production, sales and prices with no major disruption. The collapse in global and especially California dairy prices has probably had a more severe impact on demand for hay, which has meant hay prices in 2015 have fallen despite lower production and higher water costs in 2015. The high value of the U.S. dollar relative to currencies of both customers and competitors for both milk and hay has been behind some of the pressure on milk and hay markets.

**Key Words:** hay exports, hay prices, hay and milk economics, drought

## INTRODUCTION

The years 2014 and 2015 have been eventful for Western Hay markets for two main reasons. First, the drought that reached epic status in 2014, continued and intensified in 2015. That put pressure on hay acreage because of the reductions in irrigation water deliveries and relative benefits of shifting available water to permanent plantings (trees and vines) and crops that generate higher revenue per unit of water. The result has been a reduction in all field crop acreage in 2014 in the Central Valley of California and further reductions in 2015. Medellín-Azuara et al. (2015) provides a brief summary of drought economics and references to more detailed analysis.

The second major driver of hay economic issues has been huge swings in milk prices during 2014 and 2015. The price rise in 2013 and through much of 2014 was followed by a collapse of prices and profitability for the industry that buys most of Western hay. Behind these price swings are export supply and demand conditions, including rise in the value of the U.S. dollar relative to other currencies.

This brief paper reviews the economic forces and discusses what they mean for understanding the economics of hay markets. We consider especially milk and hay export markets and how the drought has affected those.

---

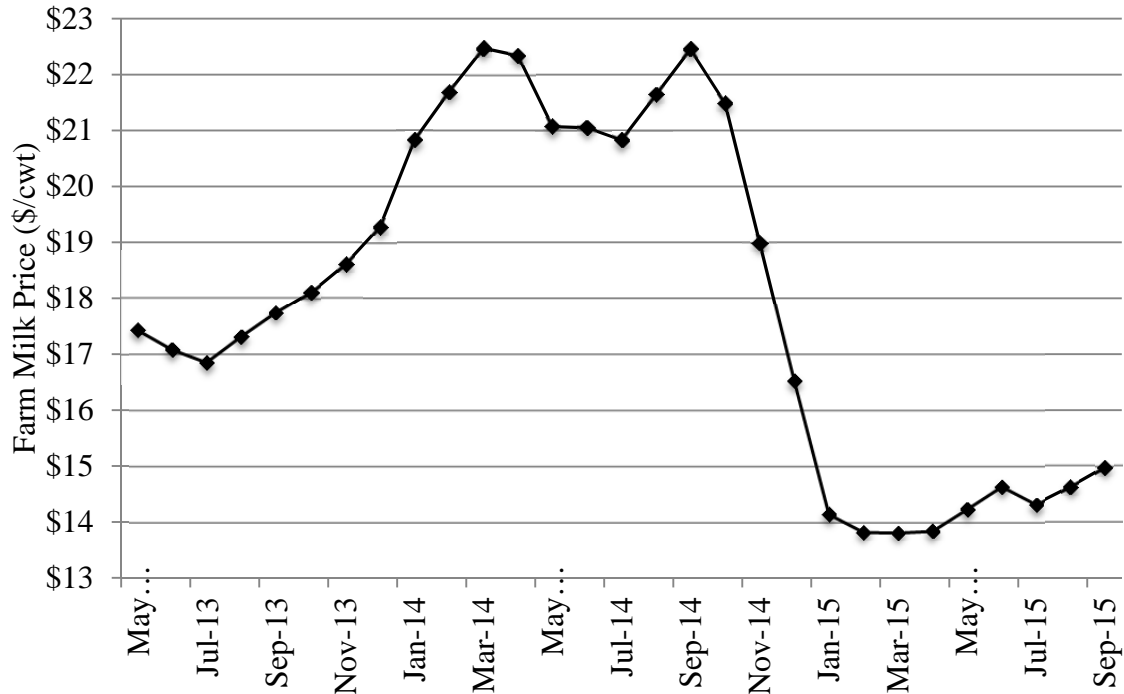
<sup>1</sup> Daniel A. Sumner, ([dasumner@ucdavis.edu](mailto:dasumner@ucdavis.edu)), Director University of California Agricultural Issues Center (AIC) and Frank H. Buck, Jr. Professor Department of Agricultural and Resource Economics, University of California, Davis, CA.; Bill Matthews ([wamatthews@ucdavis.edu](mailto:wamatthews@ucdavis.edu)), Project Scientist, AIC., University of California, Davis, CA. Hyunok Lee, Research Economist, Department of Agricultural Economics, University of California, Davis, CA. **In:** Proceedings, 2015 Western States Alfalfa and Forage Symposium, Reno, NV, 2 - 4 December, 2015. UC Cooperative Extension, Plant Sciences Department, University of California, Davis, CA 95616.(See <http://alfalfa.ucdavis.edu> for this and other alfalfa symposium proceedings)

## MILK PRICE AND EXPORT PATTERNS

The rise in milk prices in 2013 and 2014 was sudden and dramatic. Prices rose throughout the United States and in other countries as well. Figure 1 illustrates the rise in the California “overbase” price (the standard farm price) from around \$17 per hundredweight from May 2013 to July 2013. Milk prices peaked at more than \$22 per hundredweight in March and April 2014 before fluctuating between \$21 and about \$22.50 from May through October 2014. The collapse was even more sudden than the price rise with milk prices hitting about \$14 per hundredweight by January 2015 and remaining below \$14 per hundredweight through April before a gradual rise to about \$15 per hundredweight in September 2015.

The high prices during much of 2014 and especially during the hay growing season meant that milk producers maintained high demands for hay even in the face of a substantial drought. Hay prices rose to high levels to reflect strong demand in the face of reduced supply of hay from Central Valley sources. An additional factor in hay demand was reduced acreage of silage and the high cost of transport of silage relative to hay. Moreover, lower grain and oilseed prices further improved the profit of milk producers and increased their willingness to pay for quality hay. The collapse in prices removed profitability from milk production and has left most producers reducing equity waiting for prices to rise.

Figure 1. Average Monthly California Farm Milk Price, May 2013 to September 2015.



Note: The price shown is the California overbase pool price per hundred weight, which is representative of the patterns of other milk prices.

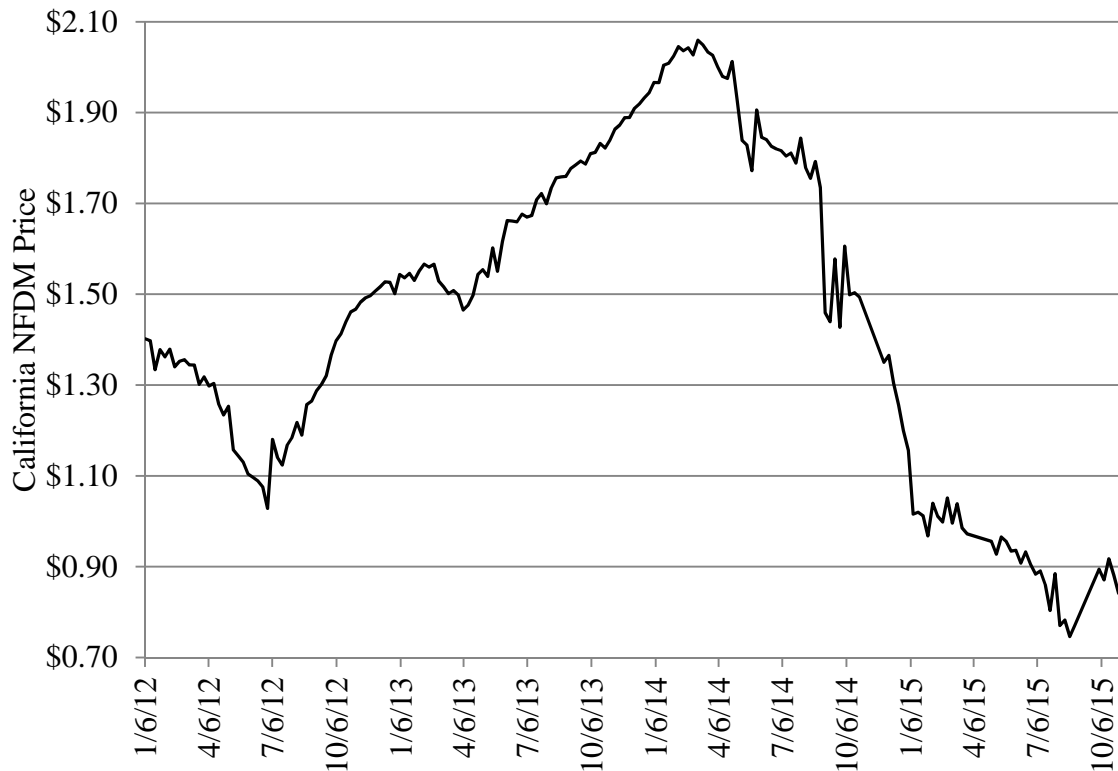
Source: CDFA Marketing Services Division, Dairy Marketing & Pooling Data.

[https://www.cdfa.ca.gov/dairy/prices\\_main.html](https://www.cdfa.ca.gov/dairy/prices_main.html)

Underlying the price of milk at the farm is the price of milk products. Figure 2 shows the weekly price of non-fat dry milk (NFDM) from January 2012 through November 2015. NFDM is a primary product from Western dairies and the top export product. NFDM prices rose from the middle of 2012 through March of 2014 before beginning an intermittent decline that continued for more than a year. Prices of NFDM have fluctuated between about \$0.75 per pound to about \$0.90 per pound from June through November 2015.

The low NFDM prices feed directly into regulated minimums for pool prices to producers in California and in federal milk marketing orders. They also reduce any over order premiums that may be available. Prices of cheese, butter and other processed dairy products also collapsed which is behind the low price of milk at the farm. Prices in other states are typically higher than California prices, but generally milk price in the West are well below average price in the Midwest or East.

Figure 2. Weekly Weighted Average Price per pound Received by California Producers for Nonfat Dry Milk, January 2012 to November 2015



Source: CDFA Marketing Services Division, Dairy Marketing & Pooling Data.  
(<https://www.cdfa.ca.gov/dairy/uploader/postings/nfdm/Default.aspx>)

Table 1 provides information on exports of dry milk powder over time and by market. Most dry milk powder is shipped to Mexico and then Asia. Demand remained strong in 2014 with volumes higher than 2013 in the largest markets. That means value of exports were especially high in 2014. The value of exports slowed in the last part of 2014 as prices collapsed and the rate of volumes of shipments did not increase. Exports of NFD in 2015 through September have been below 2014 except to Mexico. Given low prices, export value of NFD in 2015 through September is only about 61 percent of the 2014 export through September, with export prices averaging about 69 percent of 2014 export prices.

Table 1. Value and Volume of U.S. Dry Milk Powder Exports to Top Destination Countries and Rest of the World.

	2013	2014	2014 YTD	2015 YTD
	<u>Value (\$1 million)</u>			
Mexico	698	801	617	427
Philippines	222	296	246	137
Vietnam	144	192	164	93
Indonesia	205	183	142	101
China	239	182	170	62
Rest of World	668	640	529	324
Total	2,177	2,293	1,868	1,144
	<u>Volume (1,000 MTs)</u>			
Mexico	187	210	155	182
Philippines	60	72	58	52
Vietnam	41	53	44	38
Indonesia	56	45	34	32
China	67	52	47	26
Rest of World	184	167	135	120
Total	594	600	473	450

Note: YTD means year to date, which in this case refers to data through September.

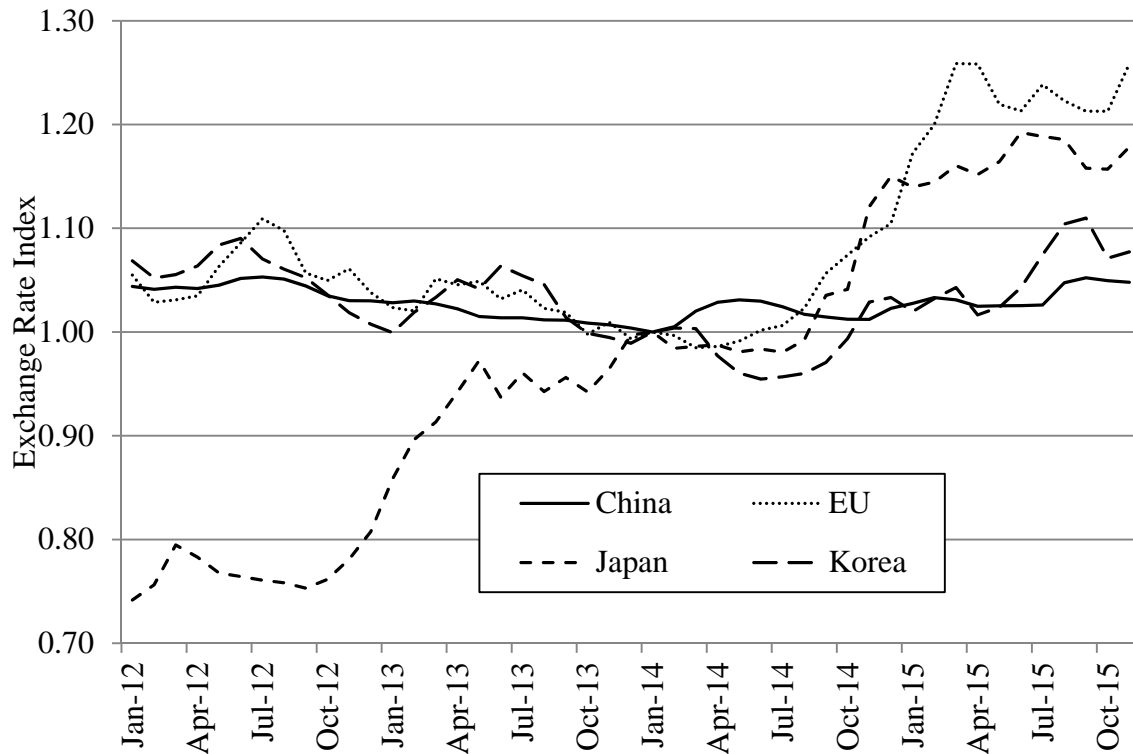
Source: Data comes from US Department of Commerce, accessed from the US International Trade Commission online database (<https://dataweb.usitc.gov/>)

Before turning to implication for hay markets, let us consider the role of the value of the dollar. Figure 3 shows the pattern of the value of the U.S. currency relative to four currencies that are important for global markets for milk and hay. Figure 3 sets the relative values at 1.0 for January 2014 for each currency and shows the trends relative to that point. Chinese currency (RMB) movements (relative to the US\$ has been the most stable, falling from about 1.05 and then rising again slightly. The Korean won has been more variable relative to the US\$ than the RMB, falling from about 1.07 and then rising again to about 1.10. The dollar has strengthened substantially relative to the Japanese yen throughout the period and has been about 10 percent higher than the January 2014 value throughout 2015. The most dramatic recent movements have been the value of the Euro. In 2015, The US\$ has risen more than 20 percent relative to the Euro. Europe is not a major import destination, but competes with the United States in dairy and

hay markets. The high value of the US dollar relative to these currencies (and relative to the New Zealand and Australian dollars) has caused exporting of both hay and milk to be more difficult in 2015.

Of course many factors affect international trade in addition to currency movements. Slowing income growth in China and economic problems in Europe and Japan have also reduced imports. The labor trouble at West Coast ports affected the pattern of shipments for many agricultural products including dairy products and hay in 2014 and caused a backlog (Gabrielyan and Sumner, 2015).

Figure 3. Foreign Exchange Rates Measured as Index of Foreign Currency to One US Dollar, Monthly, Not Seasonally Adjusted



Source: Federal Reserve Economic Data, Economic Research Division, US Federal Reserve Bank of St. Louis. (<https://research.stlouisfed.org/fred2>)

### DROUGHT

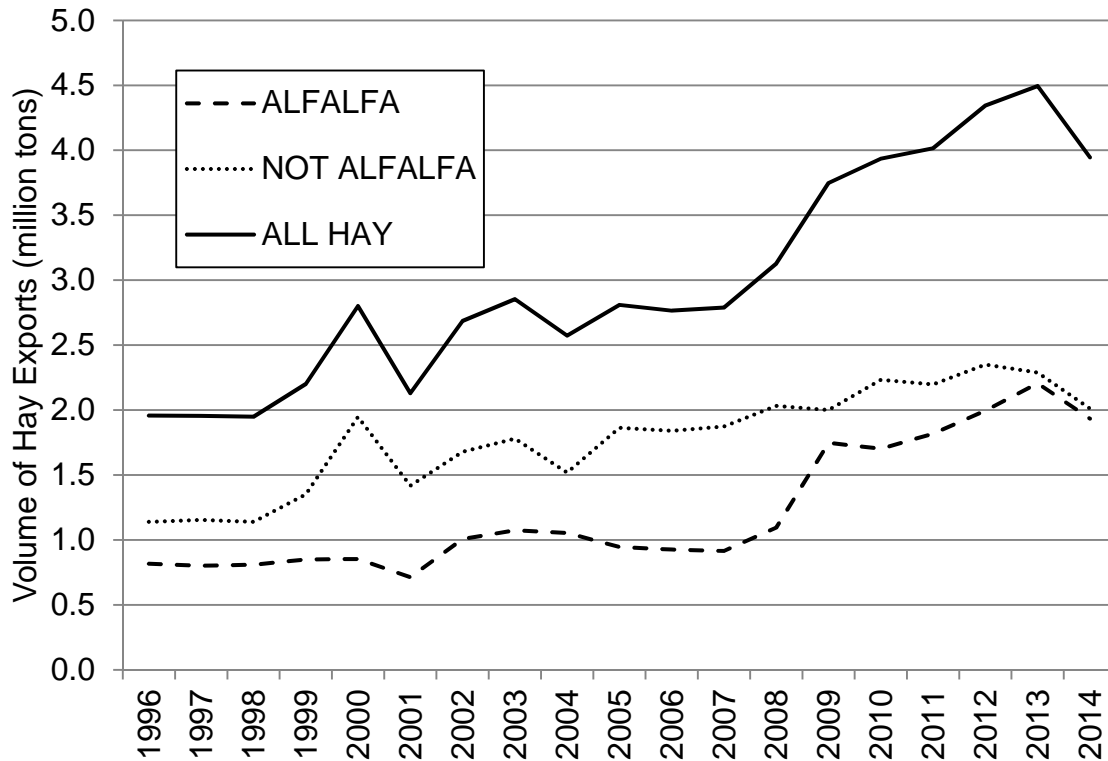
The California drought caused about 10 percent of irrigated cropland to be idled in California with hay and silage acreage being a substantial part of that. In percentage terms corn silage acreage fell more than hay acreage and overall area was down more than 10 percent compared to 2013 (For acreage reductions in 2014 and 2015, see Medellin-Azuara (2015) and the June 2015 USDA acreage report.) We note that besides affecting hay acreage the drought also affected pasture quality and hence increased the demand for hay from the livestock industry in addition to dairy.

The lower production of hay and silage and high milk prices cause high forage crop prices in 2014, but the collapse of milk prices mean culling of cows and much lower hay prices as documented by Seth Hoyt.

### HAY EXPORT PATTERNS

High milk prices and lower hay production 2014 account for the decline in the volume of hay exports in 2014 after a decade of increases (Figure 4). Hay exports grew by about 60 percent in volume terms to 4.5 million tons from 2007 through 2013. The decline to below 4 million tons in 2014 was a substantial change to this trend. Weaker demand from foreign buyers was a factor in lower exports. However Western U.S. hay prices were very high in 2014 driven on the demand side by high milk prices and on the supply side by the drought.

Figure 4. Volume of US Hay Exports, 1996 to 2014



Source: Data comes from US Department of Commerce, accessed from the US International Trade Commission online database (<https://dataweb.usitc.gov/>)

Table 2 provides both values and volumes on hay exports from Western ports for 2013 through September of 2015. We present these data for alfalfa separately from all hay. These data show the 10 percent volume drop from 2013 to 2014 affected alfalfa and other hay similarly. The value drop was about 14 percent for non-alfalfa, but about 6.8 percent for alfalfa, indicating a substantial rise in unit values for alfalfa exports in 2014 in absolute terms and relative to other hay.

The increase in hay exports in the first nine months of 2015 indicates weakened domestic demand given that the drought reduced acreage. Alfalfa export volumes are running about 6.9 percent higher in 2015, with export value up by 15 percent. Export volume and value for other hay are both higher by only about seven percent.

Table 2. Value and Volume of Hay Exports from US Western Ports<sup>1</sup>

	2013	2014	2014 YTD	2015 YTD
	<u>Value (\$1 million)</u>			
Alfalfa	645	601	450	518
Not Alfalfa	735	629	459	481
All Hay	1,379	1,230	910	999
	<u>Volume (1,000 MTs)</u>			
Alfalfa	2,209	1,928	1,462	1,561
Not Alfalfa	2,289	2,006	1,468	1,555
All Hay	4,498	3,934	2,930	3,116

<sup>1</sup> Includes ports in California, Oregon and Washington

Note: YTD means year to date, which in this case refers to data through September.

Source: Data comes from US Department of Commerce, accessed from the US International Trade Commission online database (<https://dataweb.usitc.gov/>)

Table 3 presents the US export volumes and values for Asian destinations almost all of which ship from West coast ports. The values fell from 2013 to 2014 except to China and have risen in 2015 except to Japan. Japan, however, remains the largest Asian destination accounting for more than 43 percent of Asian exports by value so far in 2015. China and Korea combine for another 40 percent of the value of shipments to Asia and both have grown strongly in 2015 relative to 2014. Hay exports in volume terms are also higher in 2015 relative to the first 9 months of 2014. The shipments to Asia reinforce the overall shipment patterns.

The export unit values by destination are provided for alfalfa and all hay for 2013 through the year to date in 2015. The alfalfa export prices for the big three markets are now similar as the price to the Chinese market has risen relative to Japan. In 2015 Korea has had lower prices than the other two big markets. Japan pays a higher price for hay other than alfalfa than it does for its imports of alfalfa hay.

Table 3. Value and Volume of All US Hay Exports to Asia by Country

	2013	2014	2014 YTD	2015 YTD
	<u>Value (\$1 million)</u>			
Japan	559	485	362	351
China	237	276	206	268
Korea	195	173	129	151
Taiwan	45	40	30	34
Rest of Asia	13	10	8	8
Total	1,049	984	734	812
	<u>Volume (1,000 MTs)</u>			
Japan	1,603	1,428	1,066	1,036
China	794	858	655	775
Korea	594	529	392	473
Taiwan	160	138	106	109
Rest of Asia	35	28	21	23
Total	3,186	2,981	2,240	2,416

Note: YTD means year to date, which in this case refers to data through September.

Source: Data come from US Department of Commerce, accessed from the US International Trade Commission online database (<https://dataweb.usitc.gov/>)

Table 4. Unit Values of US Alfalfa Hay and All Hay Exports to Top Asia Destinations and All of Asia.

	2013	2014	2014 YTD	2015 YTD
	<u>Alfalfa Hay (\$/MT)</u>			
Japan	327	328	326	340
China	303	324	318	345
Korea	320	331	328	320
Taiwan	297	315	310	342
All Asia	316	326	322	341
	<u>All Hay (\$/MT)</u>			
Japan	349	340	339	339
China	299	321	314	345
Korea	329	327	329	319
Taiwan	279	288	282	310
All Asia	329	330	328	336

Note: YTD means year to date, which in this case refers to data through September.

Source: Data come from US Department of Commerce, accessed from the US International Trade Commission online database (<https://dataweb.usitc.gov/>)



## PROSPECTS

We have examined the role of the drought, milk prices and exchange rates in hay markets, especially export with a focus on Asian markets. As of November 2015 no one knows whether the drought will continue in 2016, but even with above normal precipitation it is unlikely that irrigation water availability will return to normal. That and increased plantings of trees in the Central Valley of California likely means lower hay and silage supplies. Milk prices are expected to be higher than the depths they reached in 2015 so that suggests continuing tight domestic markets for hay. The strength of the dollar is another unknown in the equation over the next year.

In a longer term horizon, farm exports to Asia will gain if the Tran-Pacific Partnership (TPP) trade agreement is ratified. Lower tariffs and faster growth in Asian markets are the main contributions of this agreement for Western agriculture (Sumner, Lee and Matthews, 2015). Dairy exports are a large part of the economics of milk in the Western region, but the TPP includes only slight improvements in market access for dairy products. We note, moreover, that the United States already as a free trade agreement with Korea and China is not a part of the agreement, so direct implications for hay are small.

## REFERENCES

Gabrielyan, Georgi T., and Daniel A. Sumner. 2015. "Port Slowdown Impacts California Agriculture." *ARE Update* 18(4): 9-11. University of California Giannini Foundation of Agricultural Economics.

Matthews, William A., Daniel A. Sumner and Nina M. Anderson, "California Agricultural Exports, 2014." University of California Agricultural Issues Center, <http://aic.ucdavis.edu>.

Medellín-Azuara, Josué, Duncan MacEwan, Jay R. Lund, Richard E. Howitt, Daniel A. Sumner. 2015 "Agricultural Irrigation in This Drought: Where is the Water and Where Is It Going?" *ARE Update* 18(5):6- 8. University of California Giannini Foundation of Agricultural Economics.

Sumner, D.A., H. Lee, and W.A. Matthews. 2015. "What Does the Trans-Pacific Partnership Agreement Mean for California Agriculture?" *ARE Update* 19(1):1- 4. University of California Giannini Foundation of Agricultural Economics.

USDA National Agricultural Statistics Service. 2015. *Acreage*. ISSN: 1949-1522. Released June 30, 2015