

THE DRIVERS OF HAY AND FORAGE CROP EXPORTS FOR THE WESTERN UNITED STATES

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ABSTRACT

Exports have provided an economic boost to the Western U.S. forage crop industry in the past decade and a half. Production of alfalfa and other hay crops was influenced by drought, low milk prices have reduced cow numbers in California, which was also affected by regulation. Such drivers may drive changes in number of cows in the western United States and how they are fed. Facing challenges at home, opportunities for hay in foreign markets continue to flourish with expansion of dairy demand and local production in developing countries such as China and reductions in import policy barriers in more mature markets such as Saudi Arabia. Export concerns arise as the U.S. reconsiders free trade agreements such as with Korea, but hay (and dairy) exports will flourish if barriers fall further.

Key Words: hay exports, hay and milk economics, trade policy

INTRODUCTION

Since 2010, hay and forage crop producers in the Western United States (Arizona, California, Idaho, Nevada, Oregon, Utah and Washington) have experienced significant shifts in costs and demand for their products, both in the U.S. and foreign markets.

On the supply side, California producers, which account for approximately 30 percent of hay production in Western states, endured 5 years of epic drought. As a result, hay and silage acreage declined because of reductions in irrigation water deliveries and from competition to divert remaining water towards permanent plantings (trees and vines) and crops that generate higher revenue per unit of water (Medellin-Azuara et al. 2015). Drought relief came with the record precipitation in early 2017, but recovery of planted forage crop acreage, particularly alfalfa, has yet to recover.

The major driver of domestic demand for hay and other forage is the Western dairy industry. Over the past seven years, dairy producers weathered dramatic swings in milk prices. In California, which accounts for 70 percent of Western U.S. dairy production, prices rose by xx percent from May 2012 to a high of \$22.47/cwt in March 2014 and then declined by 47 percent to May 2016 only to rise by xx percent to September 2017. Behind these price swings are export supply and demand conditions, including rise and fall in the value of U.S. dollar relative to other currencies. Demand and prices for Western U.S. dairy products are recovering slowly but the

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recent shocks show signs of shifting how Western dairies manage feed rations in efforts to reduce production costs.

Export demand for forage products also experienced volatility since 2010. From 2010 to 2013 the volume of U.S. hay products exported increased 16 percent from 3.8 million metric tons to 4.4 million metric tons. The gains experienced over that three-year period were lost in 2014 as export volumes fell to 3.9 million metric tons. Since that decline export volumes have recovered and surpassed 2013 levels.

Underlying the volatility are long-term trends that will dictate the importance of exports to the Western forage crops industry. In this brief paper, we will review these long-term economic trends and consider how changes in the region's dairy industry and foreign export markets will influence the Western forage industry. We also include analysis of current attitudes toward trade policy and its impacts on the Western U.S. hay and forage crop industry.

HAY AND FORAGE PRODUCTS FOR EXPORT MARKET

The volume of Western forage products available for foreign exports can be represented in the following simple equation.

$$\text{Volume for export} = \text{Volume of Farm Production} - \text{Volume for Domestic Use}$$

The volume of domestic use of Western produced alfalfa hay and other forage crops depends on the dynamics of the Western dairy industry. Since the year 2000 Western dairy producers have expanded milk production through an increase in herd size and continued improvements in the efficiency of the herd (Figure 1)(Sumner et.al 2015). From 2000 to 2014 the quantity of milk produced on farms in the seven Western states increased by close to 40 percent or around 21 billion pounds. Following the drastic drops in milk prices from 2014 to 2015 production volumes dropped slightly but the upward trend on production recovered somewhat in 2016.

For the first eight years of this decade the size of the dairy herd on Western farms increased at a steady rate of three percent per year going from 2.4 million head in 2000 up to over 3 million head in 2008. A decline in herd size coincided with the global economic crisis in 2009 when cow numbers on Western dairies fell from the 3 million head to 2.98 million head in 2010. Since this drop the herd size has recovered and has remained consistent at 3 million head since 2011 (Figure 1).

The stagnation in cow numbers has coincided with an increased efficiency on the part of the herd to produce milk. The continued evolution of cow genetics and improved farm management practices has resulted in a steady increase in the yield of milk per cow. From 2000 to 2016 milk production per cow in the Western U.S. herd has increased by slightly over 11 percent.

The continued increase in efficiency to produce more milk per cow through improved genetics could cause the Western U.S. dairy herd size to remain unchanged or decline if fewer cows are

needed to meet milk demands. This evolution could contract the demand for products from the Western hay and forage crop industry as fewer cows would need to be fed.

In addition to changes in herd size, management of feed rations on Western dairy farms could impact the long-run domestic use of hay and forage crops. Feed rations may alter to include less costly substitutes to hay such as corn silage. Examination of production trends for alfalfa and corn silage show that alfalfa production on Western farms has steadily declined since 2002 (Figure 2) while the production of corn silage has trended upward during the same time period. In 2002, Western alfalfa producers harvested the largest volume of alfalfa hay for the decade at 22.4 million tons. Annual harvest volumes declined since with the smallest crop harvested in 2015 at just over 18.7 million tons, a decline of over 16 percent in the 13-year period. Much of this decline is attributed to the drought experienced in California from 2010 onward, but a declining trend was noticeable prior to the drought.

The decline in alfalfa production among Western producers coincides with an increase in corn silage production. From 2001 to 2008 Western farms increased production of corn silage by 58 percent from just over 15 million tons to almost 24 million tons. Production dropped in 2009 but has since recovered and production remains high relative to the early 2000's (Figure 2).

EXPORT MARKET EXPANSION TRENDS

Decreased use of alfalfa hay and other forage crops by Western U.S. dairy farms could be off-set by increased demand for these products in foreign markets. Since the mid-2000's foreign export of hay products increased significantly in volume and value (Figure 3). From 2007 to 2013 the volume of U.S. forage product exports increased from 2.77 million metric tons to 4.5 million metric tons, an increase of 63 percent. Export volume declined in 2014 but have recovered with estimates of 2017 exports totaling close to 5.2 million metric tons.

The initial increase in exports is attributed to rapid increases in shipments to the United Arab Emirates (UAE). Volume of hay shipped to UAE went from 118,000 metric tons in 2008 to almost 680,000 tons in 2009. The level of exports to UAE reached a height of 823,000 metric tons in 2013 but has since declined to between 300,000 and 400,000 metric tons in each of the past four years. Since 2009 continuing increases in demand for alfalfa by China have been the main driver in the expansion of U.S. hay and forage crop exports (Figure 3). In 2007 exports of U.S. hay products to China totaled just under 5,000 metric tons by 2016 this volume had increased to 1.4 million metric tons, an increase of 265 percent in nine years. Export volumes in 2016 and 2017 have been further bolstered by increased shipments to Saudi Arabia. Policy changes restricting water use for agriculture within Saudi Arabia have required the Saudi demand for forage products to be met via imports. The Western U.S. forage industry has benefited from this policy change as export volumes to the country went from less than 100,000 metric tons in 2015 to over 400,000 metric tons in 2017.

Increased exports to Saudi Arabia are the result of policy changes that increase opportunity within an established market. Dairy cattle numbers for Saudi Arabia are estimated between 300,000 – 350,000 head, which is relatively small compared to the larger dairy producing

countries. In contrast the increased exports of forage crops to China are linked to an expanding market and increased demand for dairy products within the country. Since 2000, the growing economy of China has led to greater wealth per capita (Figure 4). From 2000 to 2016 per capita GDP in China has increased almost 290 percent. As individual wealth has increased so has the demand for improved diets that include greater consumption of animal protein, including dairy products. Using UN FAO statistics, the quantity of daily protein consumed in China from dairy products increased by 50 percent from 2000 to 2016 (Figure 4).

The rapid increase in demand for dairy products in one of the most populous nations in the world benefits the Western hay and forage crop industries in two distinct ways. First, in an effort to meet the rising domestic demand, China is expanding the size and quality of its domestic dairy herd. From 2000 to 2017, China's dairy cow numbers increased from 4.6 million head to 14.5 million head, an expansion of over 215 percent (USDA FAS). China is limited in providing necessary feed ingredients for this expanding herd domestically due to infrastructure and resource constraints, thereby creating export opportunities for Western U.S. forage crop producers. Continued growth in China's dairy market could further expand export opportunities for the Western U.S. forage industry.

In addition, milk production from China's domestic herd is primarily marketed to meet its own demand for fluid milk products. China's demand for processed milk products is primarily met through imports from foreign producers. Western U.S. dairy farmers have benefited from the growth in China's dairy market over the past decade and a half. For example, the monthly volume of whey powder exports the primary processed dairy product exported from the U.S. to China, went from an average of 3,500 metric tons in 2002 to over 18,000 metric tons in 2016, an increase of over 400 percent (Figure 5).

The evolution of current U.S. trade policy could also have a significant impact on the export of Western U.S. forage products. The Korea Free Trade Agreement (KORUS) which went into effect in March, 2012 eliminated duties on alfalfa and other forage crops over a five-year schedule (Table 1). Many of the relatively high duties on dairy products, which have been declining since the agreement's implementation, are scheduled for elimination by 2022. Both developments could have significant positive impacts on the Western forage crop industry. Korea has been among the top destinations for forage crop exports over the past decade and a half. The volume of hay exports to Korea in 2017 topped 1.1 million metric tons, placing it third behind Japan and China for largest destination (Figure 3). With the elimination of trade duties Korea could become an even bigger market for Western U.S. hay products. The gradual decline and eventual elimination of duties on dairy products in the next five years could further enhance opportunities for the Western forage industry as U.S. dairy products become more competitive in the Korean market. Korea has also emerged as a market for beef and dairy product exports, meaning exports to Korea also underlie some of the domestic demand for Western hay and other forage. Of course, any change to the enacted agreement through politically motivated renegotiation efforts could alter the expected market shifts in either direction.

PROSPECTS

We have examined the factors, both domestically and in foreign destinations, that influence volume and values of U.S. exports of hay and forage crops. These factors have a significant impact on the Western forage crops industry as over 95 percent of U.S. hay and forage crop exports likely come from the Western states of Arizona, California, Idaho, Nevada, Oregon, Utah and Washington.

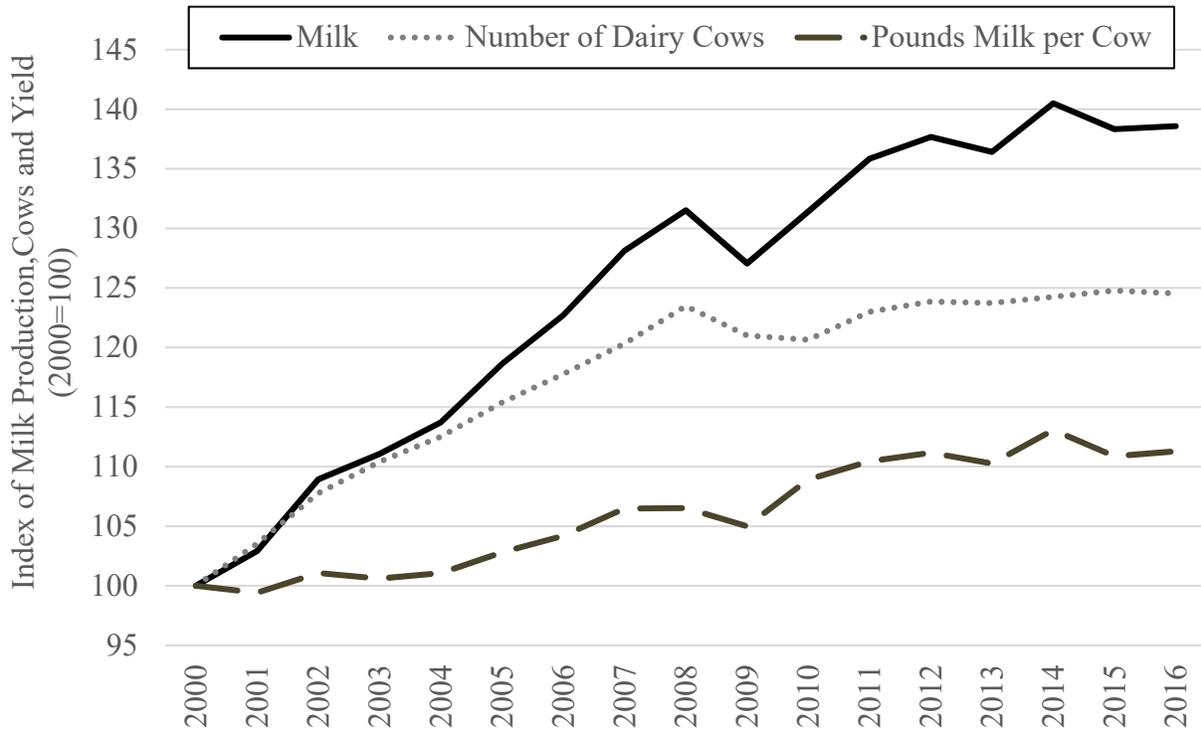
Production of alfalfa and hay crops has declined in recent years due to severe weather conditions in California and challenges facing the Western dairy industry. In addition, changes in dairy farm management related to feed rations could impact long-run hay production and prices.

Meanwhile, exports of hay and forage crops continue to expand due to policy changes in Saudi Arabia and increased demand for dairy products in China. The opportunity for exports to increase exist as the current trade agreement with Korea is maturing and duties on exports of forage crops have been eliminated. The scheduled decline and elimination of duties on processed dairy products in the future could further bolster the Western U.S. forage industry as Western dairy producers become more competitive in the Korean market. We note, however, that any renegotiation of this trade agreement, given the current political environment, could threaten any potential gains.

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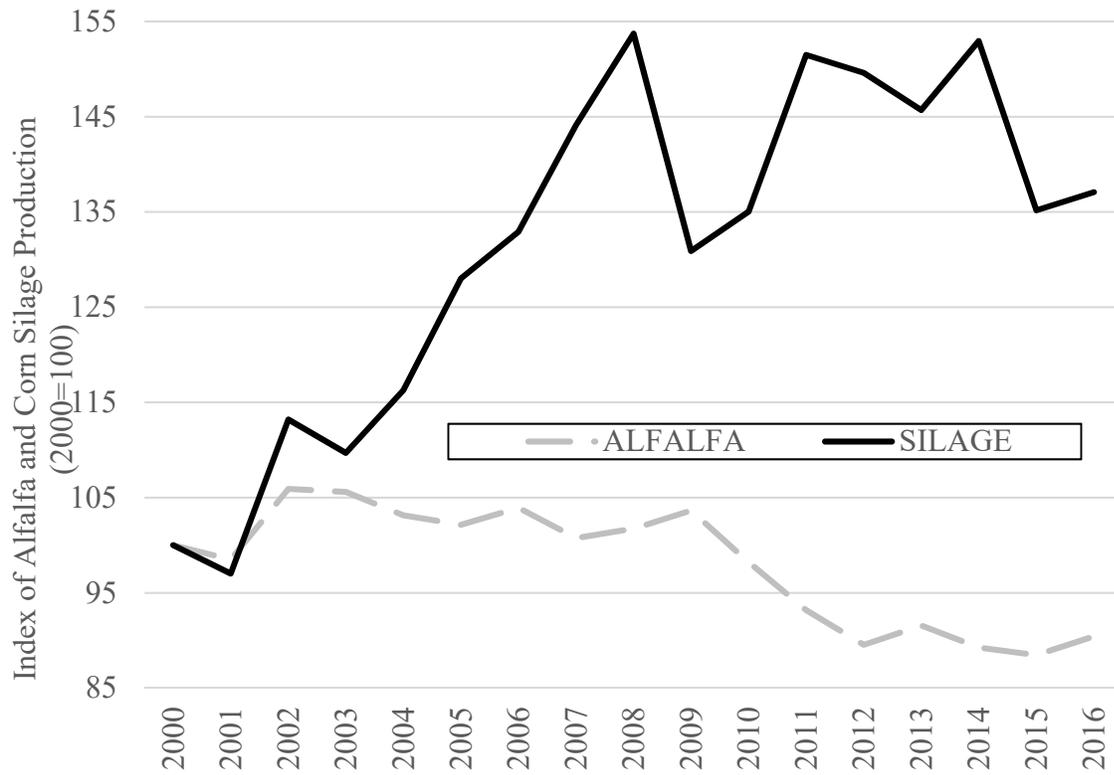
Figure 1. Index of Milk Production, Number of Cows and Annual Yield per Cow for Western States, (2000=100)



Note: Western states include Arizona, California, Idaho, Nevada, Oregon, Utah and Washington

Source: USDA NASS

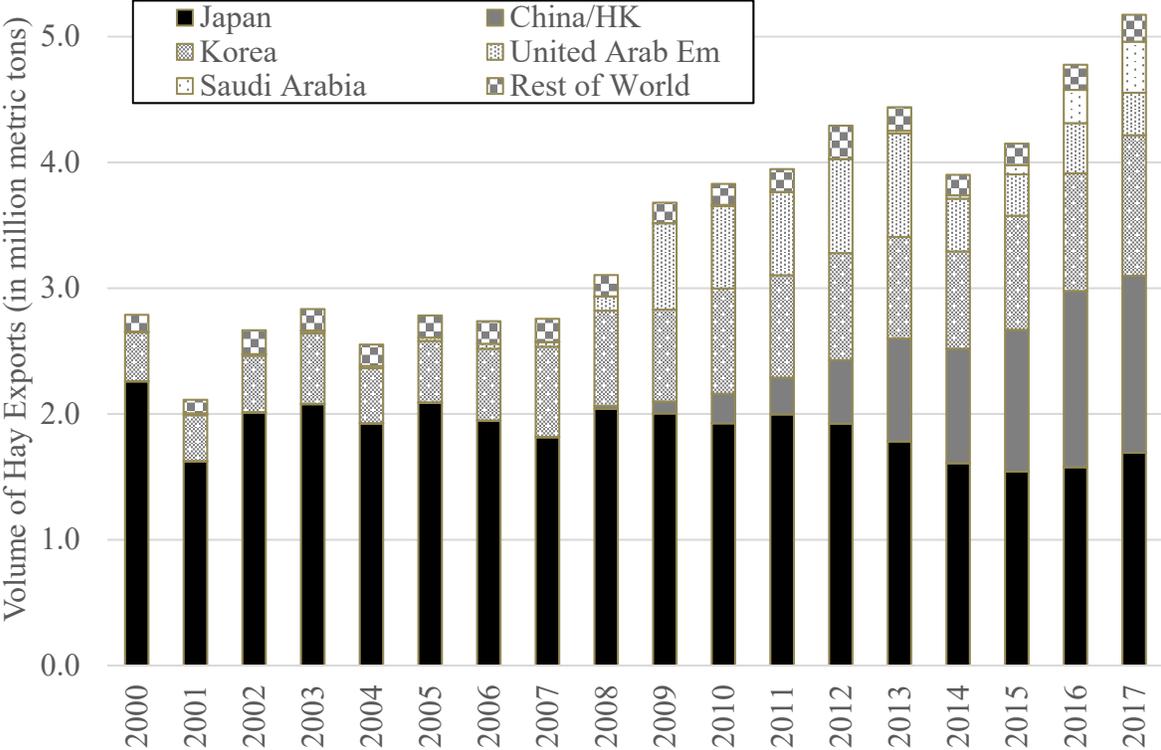
Figure 2. Index of Alfalfa and Corn Silage Production for Western States, (2000=100)



Note: Western states include Arizona, California, Idaho, Nevada, Oregon, Utah and Washington

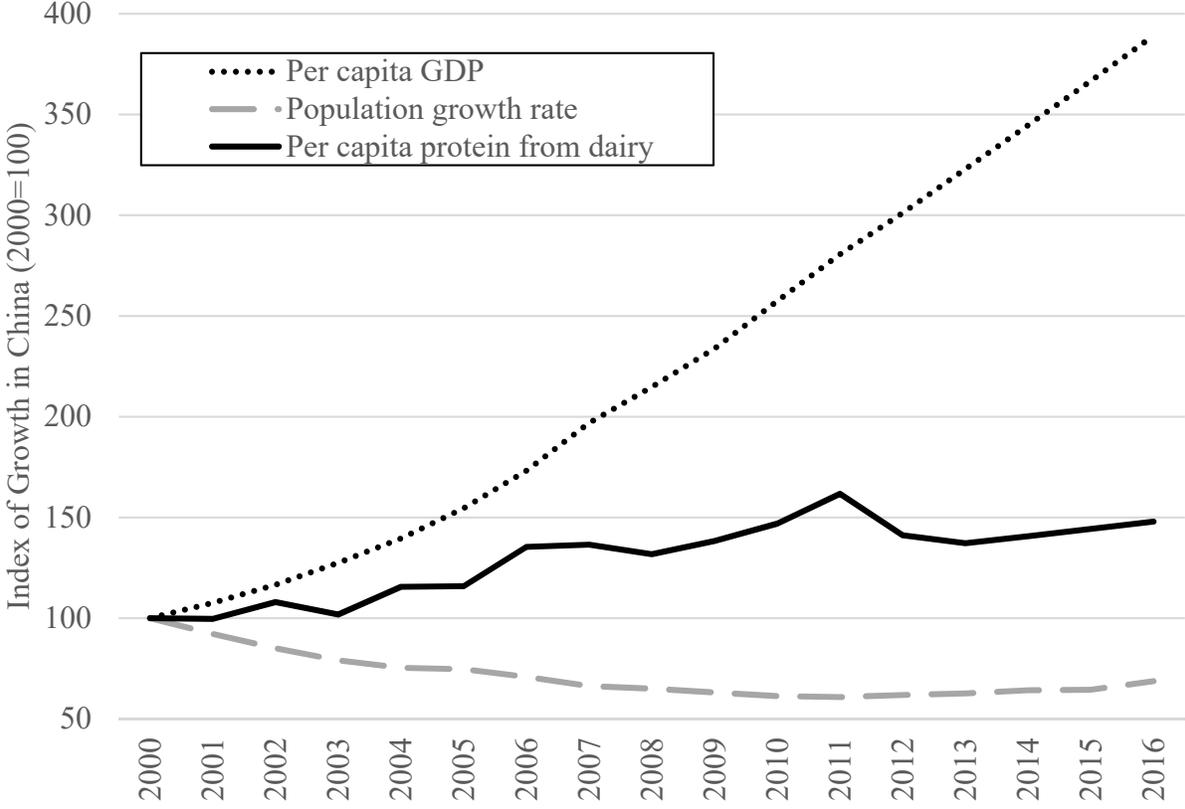
Source: USDA NASS

Figure 3. Volume of U.S. Hay Exports to Top Destination Countries, 2000-2017



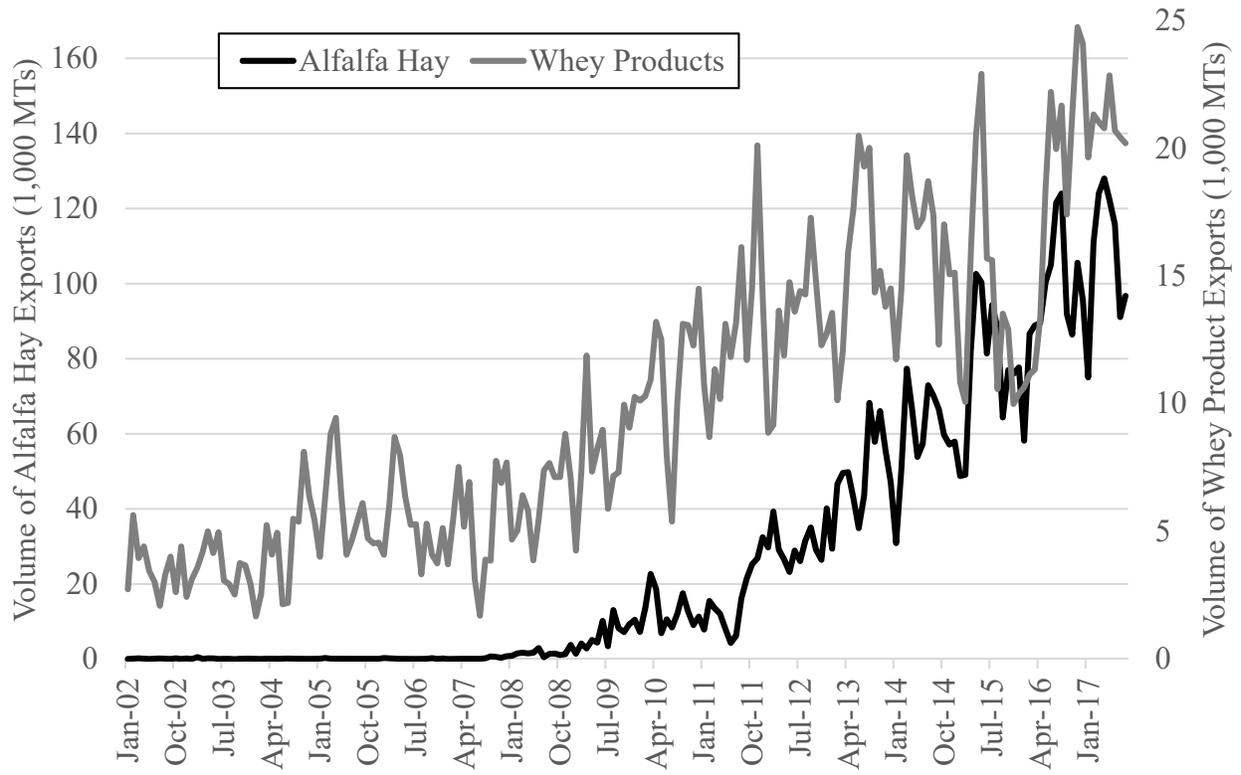
Source: Data comes from USITC Dataweb

Figure 4. Wealth, Population and Dairy Consumption in China, 2000-2016



Source: Population and per capita GDP data comes from World Bank, per capita protein from dairy consumption comes from UN FAOSTAT.

Figure 5. Monthly U.S. Exports of Alfalfa Hay and Whey Products to China, Jan 2002-July 2017



Source: U.S. Census Bureau

Table 1. Trade Terms for U.S. Exports of Hay, Forage and Dairy Products to Korea in KORUS

Hay Product	Base Rate	FTA Terms
Alfalfa meal and pellets	10%	Duty free year 5 (Jan 1, 2017)
Alfalfa bales	18%	Duty free year 5 (Jan 1, 2017)
Fodder, other	100.5%	Straight line decline to duty free at year 15
Dry milk powder	176%	Quotas increased 3% annually
Whey products	49.5%	Straight line decline to duty free at year 10
Butter fat	89%	Straight line decline to duty free at year 10
Cheese	36%	Straight line decline to duty free at year 15

Source: Korea-U.S. Free Trade Agreement, Final Text, 2012