

WHAT IS THE FUTURE OF ALFALFA IN A WORLD OF HIGH COSTS, HIGH-VALUE CROPS, AND GLOBALIZATION?

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INTRODUCTION

California's alfalfa producers make up one of the largest agricultural industries in the state. So, what does the future hold for it? In pursuing that question, the author gradually identified a large portfolio of threats to the industry including economic, political, social and environmental issues. Each of the threats, considered separately, seemed manageable, but once the author began to take a broader view and tried to consider the interrelationships between and among the threats he began to see the "big picture" and to realize that solutions are not obvious because the solution to one problem often is the source of another problem. The story behind each of the numerous threats, and the interrelationships between them, is laid out elsewhere (Blank). This paper tries to simply outline some of the biggest economic issues threatening the California alfalfa industry.

Nationally, agriculture is shrinking. The declining trends are apparent in Census of Agriculture data reported every five years by the U.S. Department of Agriculture. For example, in Table 1 are numbers from the 11 most recent censuses showing that land and farms are leaving agriculture. Both of these trends have been in place for decades and, until recently, have been explained as natural results of the "industrialization" of agriculture. Economists noted that as more technology is used in the agricultural production processes, more "economies of scale" would provide incentives for farms to grow larger (Johnson and Martin). Indeed, the number of large farms increased each year until recently (Table 1). Also, technology may generate a substitution towards capital (machines, etc.) and away from land, which may explain the decline in acreage. However, the trend of declining acreage in agriculture is very important because it is viewed as a proxy for the performance of the agricultural sector. The author's recent analysis of the trends in American agriculture found that there are relatively new changes in U.S. and global agriculture that pose real threats to producers in California and across the United States. Also, all of these threats are relevant to alfalfa producers in California. Therefore, the situation facing the hay industry in California is typical of what is happening nation-wide.

In general, the threats to American agriculture and to California alfalfa are derived from the intersection of global and local scales of decision-making. International economic development, personal finance decisions and political, social and environmental issues are all part of the portfolio of threats. At the top of the list of threats is the bottom line.

THE BOTTOM LINE

Profits to American agricultural producers are being squeezed. For an increasing number of commodities, *price is global, production cost is local*. Thus, profits vary by location. That means the markets and prices of commodities have become global in scope, while production

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costs remain local. With a single competitive “world price” ceiling affecting producers of a global commodity, it means that local costs determine the profit per unit for producers dispersed across the globe and, therefore, costs determine which producers will survive in the long-run.

Table 1. Census of Agriculture Trends in the United States

	Land in farms (Million ac)	Farms (1,000s)	Full-time farms (1,000s)	Farms of 1,000 acres or more (number)	Average farm size (ac/farm)	Vegetable acreage (Million ac)	Orchard acreage (Million ac)
1959	1,123.5	3,710.5	2,046.7	136,427	303	3.491	4.120
1964	1,110.2	3,157.9	1,695.7	145,292	352	3.334	4.251
1969	1,062.9	2,730.3	1,248.0	150,946	389	3.352	4.234
1974	1,017.0	2,314.0	1,302.6	154,937	439	3.124	4.190
1978	1,014.8	2,257.8	1,054.5	161,101	449	3.534	4.464
1982	986.8	2,241.0	1,053.6	161,972	440	3.331	4.751
1987	964.5	2,087.8	972.2	168,864	462	3.468	4.560
1992	945.5	1,925.3	932.5	172,912	491	3.782	4.771
1997	931.8	1,911.9	869.7	176,080	487	3.773	5.158
2002	938.3	2,129.0	962.2	176,990	441	3.433	5.330
2007	922.1	2,204.8	777.7	173,049	418	4.357	5.039

Sources: USDA 2008 and earlier censuses

What created global markets and prices? Technological advances. As research gave us new and better machines and methods of producing, storing, transporting and processing commodities, it made it increasingly possible for American and foreign producers to supply commodities to buyers in more distant locations (Antle). Within the last 30 years science has made it possible for “fresh” produce grown on one continent to be sold to consumers on another continent. In California, for example, consumers eat fruit from Chile during the winter and many of those consumers do not realize that they are eating imports, rather than the output of California’s own fruit industry. Why are American consumers unaware of the increasing amount of imported food in their shopping cart? The price, appearance and quality of the Chilean fruit, and other imports, are about same as that for local produce available during our summer. Although consumers benefit by having increased supplies available to them, the global effect of technological advances on American farmers is an increase in the competition between them and other suppliers of commodities.

Why local costs? Production costs will always be local because resources are inflexible. Land, obviously, is fixed in location and productivity, labor mobility is low for low-paying jobs in agriculture, and local supplies of other inputs like water, fertilizers, etc., affect the prices of those resources. In other words, a farmer or rancher’s costs per unit of production are dictated largely by the quantity and quality of resources close at hand.

What have been recent commodity price and cost trends? World prices, ignoring seasonality, were relatively stable or trending down in real terms due to increased total supplies and competition between suppliers until 2002 when global markets began to soar for reasons often outside of agriculture. Now, occasional price spikes occur in agricultural commodity markets due to the ease of money from hedge funds and other investment traders being transferred from stock and bond markets into commodity markets by using futures and options markets. When hundreds of billions of dollars are suddenly shifted into commodity markets the upward price effects spill over into most related crop markets. For example, when wheat or corn futures markets have an infusion of investment dollars, even in the short-run, the price of alfalfa hay is pushed up.

Local costs are rising across America. Land prices increase with capitalized investments and with pressures from non-agricultural uses such as urban sprawl, especially on the east and west coasts. In 1998, the average nominal price for an acre of farmland in the United States was \$974. In 2010 that price had increased to \$2,140, and in California it was \$6,700 (USDA 2010). Labor prices are being pushed up in the competition with non-agricultural opportunities that are increasingly available to workers. Other input prices also continue to increase.

So, if your prices are flat or declining (without adjusting for inflation), but your costs are continually rising, therein lies the profit squeeze. And even if commodity prices in general are rising, that does not mean that alfalfa prices will rise. Also, higher commodity prices means higher input costs for many agricultural producers. For example, when alfalfa hay, corn or wheat prices rise, livestock producers must pay more for those inputs. Hence, income at the farm level may be low and not improving for many industries in American agriculture.

Over the last 20-30 years, agriculture's gross profit margin has been in the 2-3% range, on average. That is relatively low – you could have done better taking your money to a bank (until the last couple of years!). Once again, therein lies more of the pressure. Thus, it should not be surprising that the scale of off-farm investments (such as shifting some family labor to non-agricultural pursuits) has increased such that, on average, over 90% of farm operator households' income comes from off-farm sources.

Efforts to improve the profit margin for commodities focus both on prices and costs. Strategies that have been successful in raising prices range from adding value to a commodity (through processing, etc.) to using strategic alliances or integration of producers and processors. Unfortunately, these strategies are not often available to most producers. Therefore, farmers and ranchers have focused mostly on strategies to lower costs.

Two general cost strategies have been most successful: (1) reducing cost/unit by increasing the scale of operations, and (2) reducing cost/unit with technological advances in production and/or harvest methods and machines, as well as developments that raise yields. The first strategy is most readily available to producers, so it was used nationally, as indicated by the steadily increasing average size of farms until recent years (Table 1). The second strategy has been the most successful – technological advances have kept American producers competitive, on average, with other commodity suppliers by greatly expanding yields and reducing costs per unit (large hay bales and their greatly reduced harvesting cost per ton of hay are a result of

technological advances). When technological advances occur, early adopters reap the greatest advantages, but those advantages erode over time as other producers catch up and adopt the technology. Also, the second strategy feeds the first because technological advantages have often come with high price tags (for harvesters, etc.) that add incentive for producers to expand farm size to fully capture the economies of size in the new technology. Both of these cost strategies have helped to slow the cost squeeze, but they are unable to reverse it permanently.

LOCAL DECISIONS

Faced with a falling world price ceiling and a steadily rising cost floor, individual American farmers and ranchers are being squeezed out of one commodity after another. When one product becomes unprofitable or simply less attractive relative to alternatives, producers are forced to look for another crop or livestock enterprise that offers better returns. As a result, low-revenue crops (like alfalfa) are often being replaced by higher revenue crops. This process can continue only as long as the local climate and productive resources are suitable for the production of a higher value commodity.

The aggregate result of these individual decisions is that American agriculture is moving up the “Farming Food Chain.” Figure 1 shows the four general categories of crops and that movement from one to another category is virtually always in the upward direction, meaning from lower to higher value crops. At the bottom of the chain are low-value annual crops, like grains, which require relatively low investments per acre and which involve assets that can be shifted into the production of another crop very easily. The second stage of land development involves low-value perennial crops, like alfalfa and other irrigated forages. These crops have a normal economic life of more than one year and require somewhat higher investments per acre, but they involve fairly flexible assets. The third stage requires relatively high investments in inflexible assets to produce high-value annual crops like lettuce and fresh tomatoes. Finally, high-value perennial crops such as tree and vine products lock growers into the highest and least flexible investments.

Figure 1. The Farming Food Chain

Development Stage	Crop Type	Investment, Asset Fixity
4th	High-value perennial	Very high, highly fixed
3rd	High-value annual	High, inflexible
2nd	Low-value perennial	Moderate, flexible
1st	Low-value annual	Low, very flexible

Source: Blank

High-value perennial crops certainly generate more revenue per acre than low-value annual crops, but there are drawbacks to moving to higher returning crops. First, more money per acre must be invested for higher value crops. For example, it is common for tree or vine crop producers in California to invest over \$20,000 per acre in improvements to land. Second, that investment goes into assets that are much less flexible than those used for lower value crops. Thus, higher returning crops are much more risky.

In a particular geographic area, climate and/or agronomic constraints may limit the feasibility of growing some crops. In particular, crops in categories 3 and 4 may not be feasible. In such cases, land moving up the truncated Farming Food Chain of that area will have to leave agriculture to attain the higher level of returns that would normally be available from higher category crops. Therefore, the number of crop categories available in a geographic area is determined by climate/agronomic conditions and land can leave agriculture from any available category, but it must leave agriculture if it is to generate returns above those of the highest returning crop available.

Table 1 documents America’s climb up the Farming Food Chain. Nationwide, acreage of vegetable crop production increased 25% between 1959 and 2007 despite the 18% decrease in total acreage in agriculture. Also, there was a 22% increase in orchard crop acreage between 1959 and 2007.² Table 2 shows that the national trends are being followed in California. The amount of California land in agriculture has decreased steadily recently and the same trend is seen in alfalfa acreage. As shown in Table 2, California’s land and number of farms in alfalfa are both following the national trends of decline. The reason? Producers are shifting land out of alfalfa and into higher value crops so they can earn more profits per acre, despite the additional risks faced in markets for specialty crops.

Table 2. Census, Alfalfa Trends in California and the United States

	CA Land in farms (Million ac)	CA Farms (number)	CA Land in alfalfa (1,000 ac)	CA Farms in alfalfa (number)	U.S. Land in alfalfa (Million ac)	U.S. Farms in alfalfa (number)
2002	27.6	79,631	1,176.0	4,391	22.6	344,197
2007	25.4	81,033	987.0	3,587	20.2	290,726

Sources: USDA 2008

For individual farmers and ranchers, profitability pressure creates the *need* to take on more risk (Blank), while government policy creates the *willingness* to take on more risk. Farmers are moving up the Farming Food Chain and counting on Uncle Sam to be there if disaster strikes.

² Some might argue that the increase in vegetable and orchard acreage is due simply to expanding demand for fruits and vegetables in the diet. However, that argument is inconsistent with the decrease in total acreage in farms. Clearly expanding demand contributes to the relative profitability of fruit and vegetable crops, but that only helps partially explain why some acreage is shifted from low-value crops to the higher-value crops (a “substitution effect”), it does not explain why acreage is taken out of agriculture. The *absolute* (low or negative) level of profitability of low-value crops also forces some acreage to shift into higher-value crop production or, if that shift is not possible or desirable, to shift out of agriculture (an “income effect”).

So, the profit squeeze is pushing producers to change the composition of their crop “portfolio.”

Total land in agriculture, in California and the U.S., is decreasing because eventually farmers and ranchers are *choosing* to leave agriculture out of personal economic necessity – it is an investment decision. The fact that “good” producers are leaving agriculture surprises people because of the following assumption mistakenly believed by many in agriculture: “the most efficient producer will be the last to disappear.” That assumption is not true! Being efficient is not sufficient for survival as a farmer or rancher. Consider these conditions:

1. Being *profitable* is necessary, but not sufficient for survival.
2. Being profitable and able to match or under-price all direct competitors are necessary, but not sufficient for survival in the long-run.
3. Conditions 1 and 2 above plus being willing to accept agriculture’s low returns on investments are sufficient conditions for long-run survival.

To illustrate the point, consider the case of a farmer in central California who wants to grow alfalfa. The costs of the irrigation systems and other improvements to land have helped push up his land costs such that he cannot make a profit in alfalfa despite the high yields that could be produced. He is forced to grow high-value annuals or perennials to generate enough revenue to have a reasonable chance of being adequately profitable in the long run. The producer must choose between those risky crops and the non-agricultural investment opportunities available to him. In many parts of America’s east and west (and California’s San Joaquin and Sacramento Valleys), urban sprawl is pushing land values up to levels that cannot be matched by any agricultural product. Thus, the farmer may *want* to stay in agriculture, and may choose to hang on as long as he can make some profit in tree and vine crops, but eventually he has to think of his family’s wealth. At that point, the best investment of his land and other assets may be outside of agriculture. Therefore, the most efficient producers are not necessarily the last to disappear because those farmers may be quick to find better alternative income sources.

The profitability of alfalfa is determined mostly by the economic performance of the industry which consumes most hay: local dairy producers. Although alfalfa hay is an important input for some beef producers and most horse owners, the vast majority of hay is fed to dairy cattle. As a result, the quantities of hay needed in regional dairy markets, and the prices dairy producers are willing to pay for high-quality hay, are the biggest determinants of profits earned by alfalfa growers. The linkage between hay profits and the dairy market may make alfalfa less risky than many other crops. Milk prices are set by the California government using a formula that tries to give dairy producers a reasonable profit so as to ensure adequate supplies of milk and, therefore, demand for hay from dairies will generally be stable. Weather patterns affect dairy hay demand, but not as much as does the price of hay itself. Thus, if hay acreage and yields do not swing widely, causing wide hay price swings, demand for hay will be relatively stable.

GLOBAL DEVELOPMENTS

Technological advances have wide-ranging effects over time. First, they lead to more efficient agricultural production and the globalization of markets by increasing total production and

creating methods of transportation and storage that enable those supplies to be distributed worldwide. These trends, in turn, fuel international economic development. Countries go through a series of development stages, each with a different focus, as they develop. Ultimately, nations withdraw their resources invested in lower stages as those resources are needed for new investments in higher stages. Stated more directly, economic development starts by focusing on *food*, then it focuses on freeing labor and other resources from agriculture for use in other, more profitable production as opportunities arise. Food is the entry level, the base industry (Blank). This shift is apparent in U.S. Gross Domestic Product data that show about 8% of GDP coming from farms in 1947 and only 0.7% coming from farms in 2000. All countries exhibit the same trend of declining importance for agriculture in their GDP as they develop.

American agribusiness firms are taking a global perspective and adopting the price and cost strategies noted earlier. Numerous examples exist now of how American agribusiness is maintaining its boom by increasingly seeking out the least-cost sources of agricultural commodities. That means they are using strategic alliances, direct foreign investment and other methods of securing foreign sources of the commodities they use as inputs into their processing and distribution industries (McCorriston and Sheldon; Swenson). By doing so, American firms both guarantee American consumers a steady supply of food, and they speed the economic development of the countries supplying us. It is part of an expanding system of mutual dependence that will assure America of an uninterrupted food supply. Unfortunately, this is often bad for American farmers because they have to compete with imports from less-developed countries that have much lower production costs.

CONCLUDING COMMENTS

In general, it appears that if markets are allowed to work and individual and global investment decisions are made without government intervention, production agriculture in America will continue shrinking. This trend reflects a normal reaction to an on-going profit squeeze in agriculture. The squeeze is a result of the increased level of competition in commodity markets. Improvements in production, storage and transportation technologies have shifted the nature of competition facing American producers from local to global in scale. That change, in turn, makes American commodity markets closer to being “perfectly competitive.” So, it should not be surprising that profits, on average, are approaching the level predicted by economic theory for a perfectly competitive market: zero. It is unfortunate for agriculture that this is occurring simultaneously with other changes in this country.

The difficulty American agriculture has in fighting these trends has this bottom line: *everything that is happening in this development of a global market is good for U.S. agribusiness firms and American consumers.* The fact that we now have both domestic and international producers willing to provide us with products at the same or lower prices means that we are eating better and the price is not going up (after adjusting for inflation). Politicians do not want to change that. As a result, in recent years American farm policy has shifted away from agriculture. The 1997 farm bill, the “Freedom to Farm Act,” clearly signaled that the U.S. government wants to get out of the agriculture business which, ironically, is what commercial agriculture has been requesting for decades. Farmers have said “let supply and demand set prices, not government

policies,” and that is what is happening. What this new policy means is that U.S. producers are now less protected from the competition of global producers. Unfortunately, there are 2 million American producers and in the long-run they cannot win any political battles against the 300 million consumers of the cheap food being provided by the global market.

In recent years the new farm policy has been slowed in its effects by Congress’s reluctance to get out of agriculture “when times are bad.” Natural disasters, such as floods and droughts, have combined with falling prices to cause economic harm to some regions of the country each year, and Congress has responded with huge aid packages. However, farm aid at recent high levels is not politically or economically sustainable.

The good news for alfalfa producers is that farm policy has favored dairy producers, so no dramatic policy changes are expected to affect alfalfa markets. Dairies will need hay. If alfalfa acreage does not swing widely as farms exit the industry, hay prices will generally track milk price trends. This means the future of alfalfa is in the hands of farmers that can produce and harvest hay cost-efficiently.

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