

Agriculture's Boom-Bust Cycles: Is This Time Different?

By Jason Henderson, Brent Gloy and Michael Boehlje

U.S. agriculture is notorious for its boom and bust cycles. During the past 100 years, shifts in U.S. agricultural export activity triggered fluctuations in agricultural profits. Soaring wartime food demand during the 1910s and 1940s boosted U.S. agricultural exports and farm prosperity. A spike in U.S. agricultural exports during the 1970s sparked another surge in U.S. farm incomes. At the same time, low interest rates quickly translated rising incomes into booming farmland values, especially during the 1910s and 1970s when farmers used debt to finance their investments. These golden eras of a booming farm economy, however, quickly faded as economic and financial market conditions changed.

Today, U.S. agriculture is in the midst of another farm boom. Farm incomes are swelling due to record high exports and strong biofuels demand. Simultaneously, with historically low interest rates, farmland values have soared to record highs. While current conditions echo the rhythms of the past, farmers have hesitated to accumulate debt in financing new investments, raising the possibility that this time could be different.

Jason Henderson is the Omaha Branch Executive at the Federal Reserve Bank of Kansas City, Brent Gloy is the Director of the Center for Commercial Agriculture at Purdue University, and Michael Boehlje is a Distinguished Professor at Purdue University. This article is on the bank's website at www.KansasCityFed.org.

This article explores the foundations of U.S. agriculture's boom-bust cycles. Similar to past farm cycles, robust export activity is fueling record high agricultural commodity prices, rising profits, and booming farmland prices. Despite this similarity, one subtle difference remains. To date, farmers appear to have limited the debt and leverage in their farm enterprises. Only time will tell if this is enough for agriculture to break free from the patterns of past boom-bust cycles. Section I compares and contrasts past fluctuations in farm exports, prices, and profits. Section II investigates the relationship between debt, leverage, and farmland values. Section III explores the factors that may shape agriculture's future prosperity.

I. AGRICULTURE EXPORT, PRICE, AND PROFIT CYCLES

In the 20th century, agricultural fortunes followed a series of 30 year cycles. During the 1910s and 1940s, U.S. farm prosperity rose as two world wars cut global food production while boosting U.S. food exports. During the 1970s, surging exports triggered record high agricultural commodity prices and farm profits. Today, biofuels production and robust export activity to emerging nations, particularly China, have fueled another rise in agricultural prices and profits.

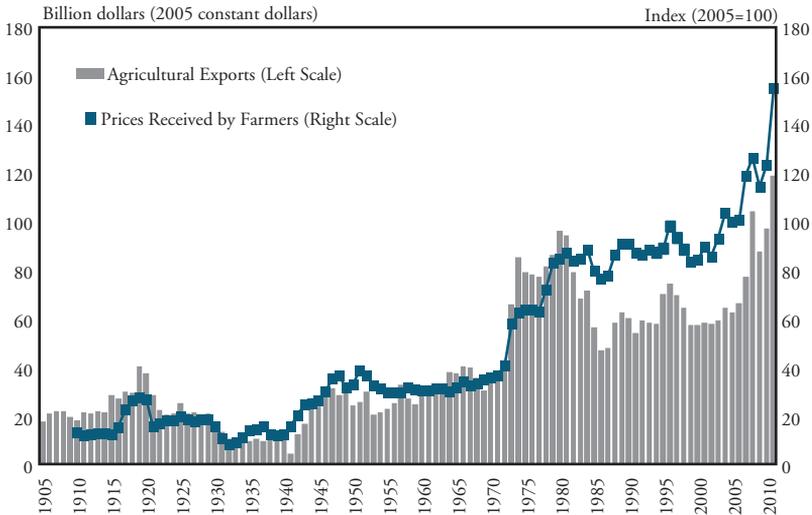
Agriculture's first cycle: 1910s to 1930s

World War I ushered in U.S. agriculture's first golden era of the 20th century (Paarlberg and Paarlberg). By the late 1910s, robust export demand during the war sent agricultural commodity prices and farm incomes climbing. During the second half of the 1910s, real U.S. exports rose sharply to satisfy wartime demand for food.¹ By the end of the war in 1919, U.S. agricultural exports had almost doubled pre-war levels, rising 10 percent per year from 1916 to 1919 (Chart 1). In fact, U.S. exports accounted for almost 20 percent of U.S. food production during the war.² The sharpest export gains emerged in the livestock sector, which rose fourfold.

Rising exports during World War I sparked a sharp increase in agricultural prices and farm profits. With wartime food demand and the war's associated global supply shock straining global food production, agricultural commodity prices jumped to record highs (Chart 1). From

Chart 1

U.S. AGRICULTURAL EXPORTS AND INDEX OF PRICES RECEIVED BY U.S. FARMERS



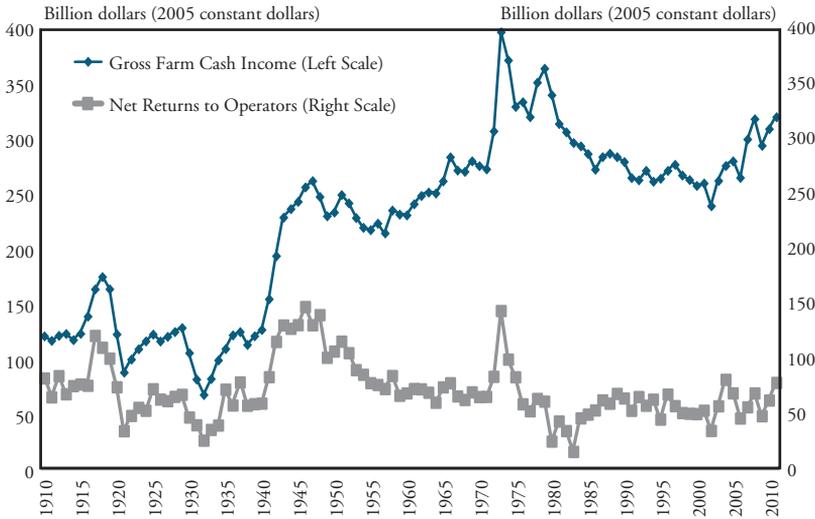
Note: Calculations based on U.S. Census Bureau and USDA data deflated with CPI from the Federal Reserve Bank of Minneapolis.

1915 to 1918, prices received by farmers for both crops and livestock doubled. Surging agricultural prices lifted farm revenues as gross farm cash farm income rose more than 70 percent (Chart 2). Despite higher input costs, net farm profits spiked to record highs as the returns to farm operators jumped 60 percent in 1917 and remained elevated through 1919.

Farm prosperity, however, was short-lived as global food production rebounded, export demand collapsed, and farm incomes fell. With the conclusion of the war, export demand faded. By 1922, U.S. agricultural exports returned to pre-war levels, slashing agricultural commodity prices by 40 percent from 1919 to 1921. Returns to operators plummeted. After stabilizing during the rest of the 1920s, the Great Depression of the 1930s triggered another collapse in U.S. agricultural exports. Moreover, the industrialization of U.S. agriculture through the adoption of the tractor and other mechanized equipment reduced the need for feed grains for draft animals. The combination of weak exports and increased food grain production led to another collapse in agricultural commodity prices and profits during the early years of the Great Depression.

Chart 2

GROSS FARM INCOME AND NET RETURNS TO FARM OPERATORS



Note: Calculations based on U.S. Census Bureau and USDA data deflated with CPI from the Federal Reserve Bank of Minneapolis.

Agriculture's second cycle: 1940s to 1960s

Similar to the 1910s, World War II sparked another farm export and income boom. A surge in wartime food demand boosted U.S. exports through the 1940s. After bottoming at \$4.3 billion in 1941, real agricultural exports quickly rose to \$25 billion by 1944. Similar to World War I, a wave of livestock exports fueled U.S. export growth during the war, while crop exports increased moderately.

In contrast to the previous farm boom, agricultural exports did not revert to pre-war levels after World War II. During the next two decades, agricultural exports rose steadily, led by crop exports. The adoption of hybrid seed corn in the 1940s produced bumper crops, which U.S. farmers increasingly sold in foreign markets. In addition, the 1954 Agricultural Trade and Development Assistance Act also supported U.S. agricultural exports' rise through the 1950s and 1960s (Duncan and Bickel). By the end of the 1960s, the United States was exporting roughly 15 percent of its agricultural production compared with less than 10 percent of its production between the two world wars.

Robust export activity during the 1940s, 1950s, and 1960s established a new plateau of elevated agricultural prices. Strong wartime food demand during the 1940s and food assistance programs during the 1950s and 1960s underpinned record prices through the next two decades. Agricultural commodity prices peaked in 1948, more than double 1930s lows. During the 1950s and 1960s, agricultural commodity prices remained elevated as export activity rose steadily.

Rising prices boosted gross revenues as farm cash incomes increased during the 1960s. During the 1940s, record high farm prices sparked record gross cash income and net farm profits. After easing during the 1950s, gross farm revenues marched higher during the 1960s with increased agricultural productivity.

After spiking in the 1940s, net farm profits eased through the 1950s and 1960s with rising agricultural production costs. During the 1940s, U.S. net returns to farm operators spiked, reaching \$150 billion by the end of World War II. Rising farm production costs, especially for manufactured inputs such as fuel, fertilizer, pesticides, and energy, cut net farm profits during the 1950s and 1960s. Still, U.S. net returns to farm operators hovered near their historical average of \$80 billion for most of the 1960s, but well below 1940s levels.

The consolidation in agriculture during the 1960s fueled stronger gains in per unit gross revenues from farming than in previous decades. After reaching almost 7 million farms in 1935, the adoption of the tractor and other mechanized equipment allowed fewer farmers to plant, cultivate, and harvest more acres. By 1969, the United States had 3 million farms.³ With fewer farm operations and stable profits, the net returns per farm rebounded to historical highs heading into the 1970s.

Agriculture's third cycle: 1970s to 1990s

Surging export activity once again ignited a rise to a new plateau in agricultural commodity prices and a spike in farm incomes starting in the 1970s. After two decades of steady export gains, trade negotiations with communist Russia and China opened new global markets to U.S. agriculture in the 1970s (Abrams and Harshbarger). Highlighted by the 1972 Russian wheat deal, the value of U.S. agricultural exports

doubled from 1970 to 1973. By the end of the decade, exports rose another 45 percent, reaching almost \$100 billion in 1979.

During the 1970s, surging exports underpinned a new plateau in agricultural commodity prices, and farm revenues reached a record high. From 1971 to 1973, agricultural commodity prices jumped 75 percent and remained elevated throughout the decade. Gross farm income hovered near record highs. U.S. farmers, however, were unable to maintain record high profits as a series of oil price shocks increased agricultural production costs and trimmed margins. Livestock producers also faced the mounting challenge of high feed costs as crop prices soared. While farm profits rebounded slightly after the 1973-75 recession, gross revenues and net profits were unable to achieve the record levels posted earlier in the decade.

U.S. agriculture could not sustain the 1970s prosperity and, similar to the 1920s, U.S. export activity collapsed during the 1980s. After peaking at \$96 billion in 1980, real U.S. agricultural exports fell sharply. A weak global economy, world debt problems, a strong exchange value of the dollar and trade barriers—including a Russian grain embargo—cut U.S. agricultural exports (Drabenstott). In 1986, agricultural exports bottomed at \$47 billion, half the levels posted five years earlier.

During the 1980s, farm profits disappeared as weaker export activity and bumper crops led to lower prices. Agricultural production expanded as farmers planted “fence row to fence row” and productivity gains emerging from the 1970s “Green Revolution” boosted yields. Weak demand and bin-busting supplies placed downward pressure on agricultural commodity prices, and gross farm revenues fell to 1960 levels. With elevated production costs, farm profits declined. By 1983, returns to operators were roughly 10 percent of the 1970s high. The result was a series of government programs restricting agricultural production to help underpin prices and profits.

The farm economy started to rebound in the late 1980s with stronger export activity. After bottoming in 1986, U.S. agricultural exports rebounded at the end of the decade, laying a foundation for steady export gains over the next 20 years. During the 1990s and first half of the 2000s, U.S. exports topped \$60 billion, even reaching above \$70 billion during the mid-1990s when global crop production declined temporarily.

Agricultural prices and profits strengthened again during the 1990s on strong export activity. For example, strong global demand and short crops abroad spurred exports to rapidly expanding Asian countries in the early 1990s. In 1996, agricultural commodity prices spiked and agricultural profits jumped to their highest level since the mid-1970s. The promise of rising prices and profits, however, was short-lived. An Asian financial crisis cut export demand, and bumper crops in the following years led to lower commodity prices (Gazel and Lamb). A series of ad hoc government payments to crop producers underpinned farm incomes from 1998 to 2001 before agricultural exports and prices started to grow again at the beginning of the 21st century.

Agriculture's current farm boom

Today, agricultural prices and profits are rising again with stronger agricultural exports. Strong global demand from expanding populations and rising incomes in developing countries such as China is fueling record-high exports. In 2011, real U.S. agricultural exports are projected to reach almost \$120 billion, roughly double 2006 levels. China has emerged as the top export destination, accounting for almost 20 percent of U.S. agricultural exports.

Concurrent with increasing export demand, the development of government policies and incentives for renewable fuel production substantially increased the demand for grains and oilseeds. The Renewable Fuels Standard, established in 2005, ignited ethanol and U.S. corn demand. According to the USDA, from 2000 to 2011, the amount of corn used in ethanol production surged from less than 650 million bushels to nearly 5 billion bushels.⁴ Although a portion of the grains and oilseeds used in renewable fuel production is returned to the feed sector in the form of byproducts, rising ethanol demand has reshaped U.S. corn markets (Abbott, Hurt, and Tyner).

Record high exports paired with biofuel demand have underpinned surging agricultural commodity prices and farm profits (Akers and Henderson). Since 2006, agricultural commodity prices have soared, with the combination of rising exports and renewable fuels demand straining agricultural crop supplies. Crop prices spiked in 2008 and again in 2011 with record exports. Livestock prices have also reached record highs with robust export demand.

These elevated agricultural commodity prices boosted farm profits to their highest level since the mid-1970s. Higher prices and increased productivity have lifted U.S. gross farm cash income to its highest level since the 1970s. Despite higher input costs, farm profits have also strengthened. In 2011, returns to operators are projected to reach almost \$80 billion, 35 percent above the 1990s average. Crop producers have benefited the most, with net returns surging the past four years. In contrast, rising feed costs have strained profit margins for livestock producers in recent years.

II. DEBT, LEVERAGE AND FARMLAND PRICE CYCLES

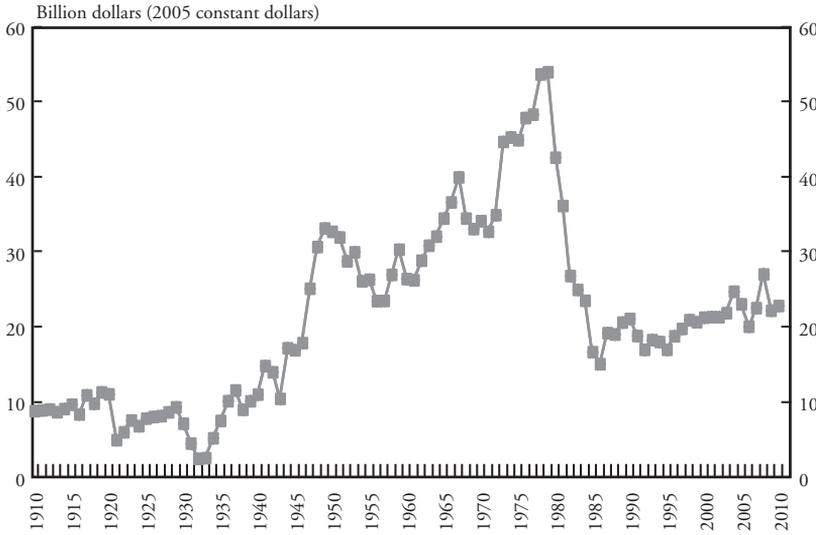
In addition to the cyclical nature of agricultural exports, prices, and profits, farmland price cycles also appear to be shaped by financial market conditions. Specifically, periods of rising farm exports, prices, and profits coincided with historically low interest rates. The combination of robust profits and low interest rates sparked agricultural investment booms, lifting farmland prices to record highs. A side effect of low interest rates, however, was that farmers often leveraged their farm enterprises to finance these investments, and the accumulation of debt strained farm finances when farm profits soured and interest rates rose.

Agriculture's first cycle: 1910s to 1930s

In conjunction with soaring profits, low interest rates helped fuel a 1910s farm investment boom. During World War I, interest rates, which were kept low to help finance the war, had significant implications for U.S. agriculture. First, farmers used low interest rates to finance their land purchases and other capital expenditures, such as tractors. In fact, farm capital expenditures on tractors, machinery, equipment, and other land improvements rose 35 percent from 1916 to 1919 (Chart 3). Second, low interest rates led to the capitalization of rising incomes into record high farmland values. From 1900 to 1919, the average price of U.S. farmland rose more than 70 percent, especially in the nation's Corn Belt, as increased agricultural productivity intensified the competition for land (Chart 4).

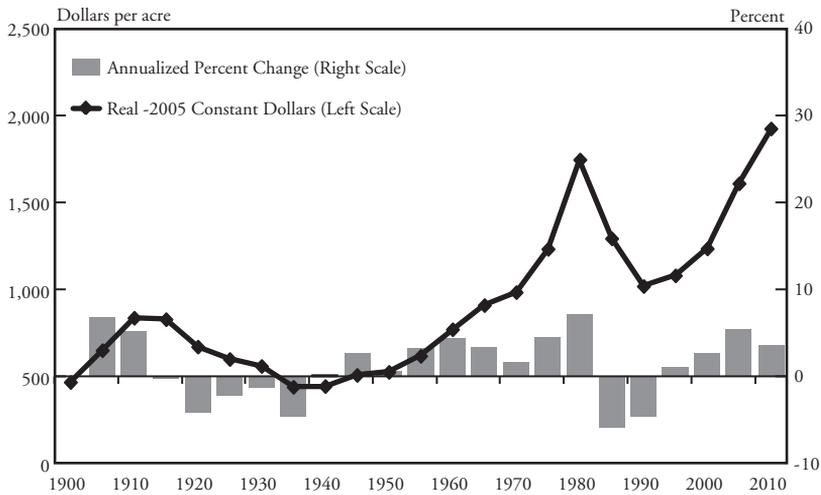
A side effect of rising profits and low interest rates was the accumulation of debt. During the 1910s, farm debt rose rapidly with the sharpest gains in farm mortgage debt (Chart 5). Between 1910 and 1920,

Chart 3
FARM CAPITAL EXPENDITURES



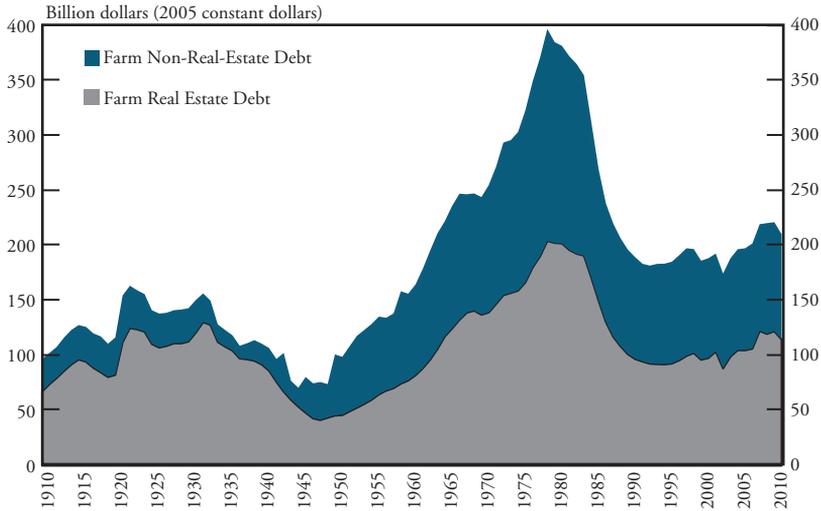
Note: Calculations based on USDA data deflated with CPI from the Federal Reserve Bank of Minneapolis.

Chart 4
U.S. FARM REAL ESTATE VALUES



Note: Calculations based on USDA data deflated with CPI from the Federal Reserve Bank of Minneapolis.

Chart 5
U.S. FARM DEBT



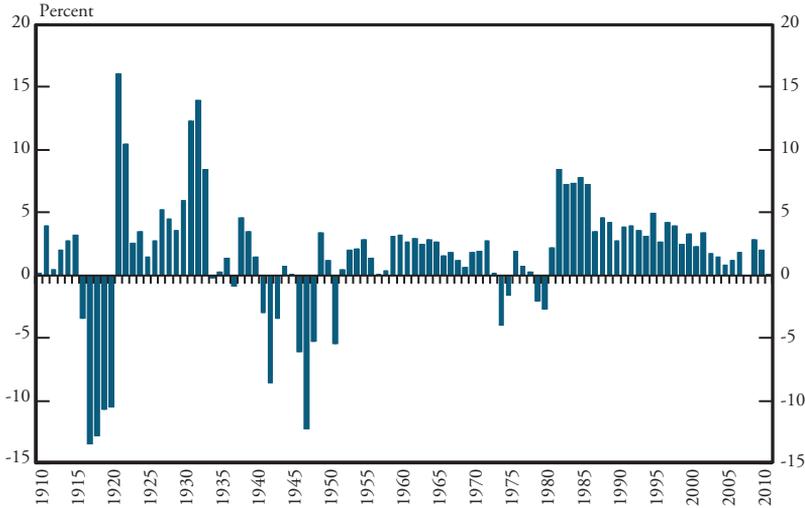
Note: Calculations based on U.S. Census Bureau and USDA data deflated with CPI from the Federal Reserve Bank of Minneapolis.

farm mortgage debt rose 20 percent, even after farmers paid down debt during World War I. By 1920, farm mortgage debt reached more than 12 percent of the total value of U.S. agricultural land, at that time a record high. Farmers also accumulated debt while financing tractors and other equipment as non-real-estate debt rose more than 90 percent during the decade.

The end of World War I, however, brought higher interest rates, which curtailed U.S. agricultural investments and cut farm asset values. In 1920, the Federal Reserve raised interest rates to control inflationary pressures that were building during the war (Chart 6). A U.S. recession ensued that curtailed agricultural demand. Weaker profits and higher real interest rates in the 1920s strained capital expenditures on machinery and cut the average farmland price almost 30 percent from 1916 to the mid-1920s. Lower interest rates during the rest of the Roaring '20s brought a short reprieve to U.S. agriculture in the form of larger profits, increased capital spending, and slightly lower debt levels. But weak profits and high real interest rates during the Great Depression triggered another collapse in farm investment and land values. By 1935,

Chart 6

REAL YIELD ON 10-YEAR TREASURY SECURITY



Note: Calculations based on U.S. Department of Treasury data deflated with CPI from the Federal Reserve Bank of Minneapolis.

farm capital expenditures fell almost 80 percent below their 1919 high. By 1940, the average price of U.S. farmland had dropped 66 percent from its record highs, retreating to the price level posted at the beginning of the century.

During the 1920s and 1930s, the collapse in farm incomes and land prices led to a wave of farm bankruptcies. Facing higher interest rates and lower incomes, many farmers struggled to service the debt they accumulated during the 1910s farm boom. The result was a surge in farm foreclosures during the 1920s and 1930s (Stam and Dixon). According to the U.S. Census Bureau, at its worst, almost 6 percent of U.S. farms were sold in 1933, with 70 percent of the sales due to foreclosure. In short, the 1910s farm boom turned into a 1930s farm bust.

Agriculture's second cycle: 1940s to 1960s

Similar to the 1910s, soaring incomes and low interest rates triggered a rebound in capital expenditures in the 1940s. Farm capital expenditures surged more than 12 percent annually over the decade. In addition to buying tractors and other mechanical equipment, farmers made significant investments in land and land improvements, such as

irrigation systems, drainage tile, and farm buildings. Competition for land intensified with the number of farms sold voluntarily rising to their highest level since 1919. By the end of the 1940s, the robust demand pushed the average U.S. farmland price more than 20 percent above the 1935 low.

Unlike the previous farm boom, farmers did not accumulate debt to finance their land purchases. In fact, during the 1940s, farm mortgage debt fell by half. According to the U.S. Census Bureau, the ratio of mortgage debt to the total value of farms with a mortgage fell from 41.5 percent in 1940 to 25.3 percent in 1950, with about half the decline emerging from lower debt levels and the other half attributed to rising land values. Non-real estate farm debt, however, more than doubled during the second half of the 1940s with purchases of tractors, combines, and other mechanized equipment. Yet, some of the increased use of debt could have been driven by improved access to credit after the struggles in the financial industry during the Great Depression. Despite increased non-real-estate debt, farmers did not leverage their farm enterprises as they did during the 1910s.

Another unique feature of the 1940s to 1960s farm cycle was stability in U.S. farm income and interest rates, which translated into steady gains in farmland prices and capital expenditures. During the late-1950s and 1960s, real interest rates fluctuated narrowly around 2 percent. With steady incomes, farm capital expenditures expanded modestly. Lower interest rates at the end of the 1960s, however, supported additional capital expenditures on machinery, equipment, and land improvements. Coupled with increased farm productivity and the elevated level of agricultural commodity prices and profits, the average price of U.S. farmland rose 3 percent annually between 1950 and 1969.

At the same time, after deleveraging during the 1940s, farmers began to accumulate debt to finance capital expenditures. During the 1950s and 1960s, farm debt rose roughly 5 percent per year, with slightly stronger debt accumulation in the 1960s. Still, during the 1960s, the farm debt-to-asset ratio averaged roughly 15 percent, near the average for the four subsequent decades.

Agriculture's third cycle: 1970s to 1990s

For the third time in the 20th century, real interest rates turned negative during the 1970s. High inflation and lower nominal interest rates created a negative real interest rate environment. Low debt service costs spurred equipment spending and a farmland price boom. Between 1970 and 1979, annual farm capital expenditures increased from \$32 billion to \$50 billion per year, as farmers boosted their capital spending on tractors, farm buildings, and land improvements. At the same time, bidding on U.S. farmland reached a fevered pitch. Low interest rates fueled the capitalization of farm incomes into record high farmland prices.⁵ During the 1970s, the average price of U.S. farmland jumped almost 80 percent, reaching record highs in 1981.

The 1970s surge in farm capital spending outstripped farm income gains and farmers continued to use debt to pay for the investment boom. Historically, farm capital expenditures averaged roughly 30 percent of net returns to farm operators. By 1977, capital expenditures on equipment, machinery, structures, and land improvements jumped to more than 80 percent of net returns to farm operators. With sluggish income growth toward the end of the decade and negative real interest rates slashing debt service costs, farmers leveraged their enterprises to pay for investments in land, equipment, and machinery. During the decade, farm debt continued to rise roughly 5 percent per year, with larger gains emerging in non-real-estate debt. Stronger debt accumulation emerged between 1975 and 1980 when farm capital expenditures rose faster than net farm incomes.

The debt accumulation of the 1970s contributed to the economic calamity of the 1980s. By 1982, when interest rates spiked as the Federal Reserve tightened monetary policy, farmers had more debt than they had capacity to service with their existing cash flows. The result was a farm financial crisis, a rise in farm bankruptcies, and the 1980s farm bust.

With shrinking profits and higher real interest rates, farm asset values and capital expenditures plummeted. After peaking in 1981, the average price of farmland dropped more than 40 percent by 1987, returning to 1960s levels. The farm bankruptcy rate spiked, topping levels experienced during the Great Depression. Capital expenditures

on machinery, equipment and land improvements dropped 70 percent below the 1970s highs.

Agriculture's current farm boom

Similar to past farm booms, today's low interest rates have fostered the capitalization of rising farm incomes into record high farmland values. Accommodative monetary policy by the Federal Reserve has pushed nominal interest rates to historic lows. The capitalization of incomes into farmland values has accelerated, with the average price of U.S. farmland rising 25 percent from 2004 to 2011. The surge in U.S. farmland prices has outpaced the rise in cash rents. In fact, the average farmland price-to-cash rent multiple, which is similar to a price-to-earnings ratio on a stock, surged to a record high of almost 30 in various Corn Belt states (Gloy and others).⁶

Despite the similarities in broader market and financial conditions, farm capital investments differ strikingly today from past farm booms. Unlike the 1970s, farmers today have been more restrained in their capital investments. To be sure, capital expenditures have risen sharply, but they have increased at roughly the same rate as farm profits. According to the Association of Equipment Manufacturers, four-wheel drive tractor sales jumped almost 30 percent in 2010, on par with the gains in real net farm income. Yet, in 2011, despite a 28 percent rise in U.S. net farm income, tractor and combine sales held steady. As a result, the ratio of farm capital expenditures to net income remained stable, hovering near its 10 year average of 40 percent.

In addition, U.S. farm debt accumulation has not accelerated as it did during the 1970s. The primary lenders to U.S. agriculture—commercial banks and Farm Credit Associations—report limited expansions in farm lending. According to data from the Federal Deposit Insurance Corp. Consolidated Report of Conditions and Income, farm debt outstanding at commercial banks has held steady since 2009 (Henderson and Akers). The Federal Farm Credit Banks Funding Corp. indicates that lending on real estate mortgages, production, and other intermediate loans by Farm Credit System institutions rose a modest 3 percent during the 12 months ending in September 2011.⁷

III. IS THIS TIME DIFFERENT?

Past boom-bust cycles for U.S. agriculture reveal some common threads. For more than a century, farm prosperity has shifted with U.S. agricultural exports. Surging exports spurred rising farm incomes, while plummeting export activity weighed heavily on farm incomes. In addition, leverage shaped fluctuations in agricultural land values. Low interest rates contributed to booming farmland prices and the accumulation of debt as farmers expanded investments in land, machinery, and equipment. Rising leverage, however, contributed to the farm busts of the 1920s and 1980s as farmers were unable to service their mounting debt. In short, if exports remain strong and leverage remains low, this cycle could be different. Several risks, however, surround these expectations.

Export expectations

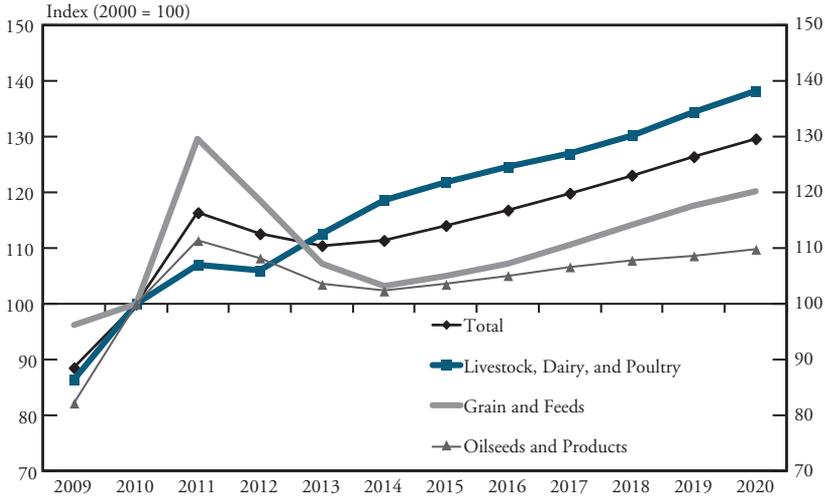
Current expectations point to some weakness in agricultural export activity over the next decade. According to the USDA, U.S. agricultural exports are projected to decline through 2015 before bouncing back at the end of the decade.⁸ From 2011 to 2020, the value of U.S. exports is expected to rise approximately 10 percent, well below the doubling of U.S. agricultural exports experienced over the past decade (Chart 7). Livestock exports are projected to account for a majority of the agricultural export gains over the next decade. By 2020, livestock exports, led by beef and pork, are projected to rise almost 30 percent above current highs, while grain, feed, and oilseed exports are expected to fall below 2011 highs.

Underpinning gains in agricultural exports is the expectation of rising population and income in emerging nations. According to the United Nations, world population is expected to grow from 7 billion to 9 billion between 2011 and 2050. A majority is expected to live in Africa, where the continent's population is projected to rise by 1.2 billion people. India is also expected to experience large population gains, while China's population is projected to remain stable over the next 40 years.

The projections surrounding world population, however, are highly variable and a potential risk to future agricultural commodity demand

Chart 7

U.S. AGRICULTURAL EXPORT FORECASTS

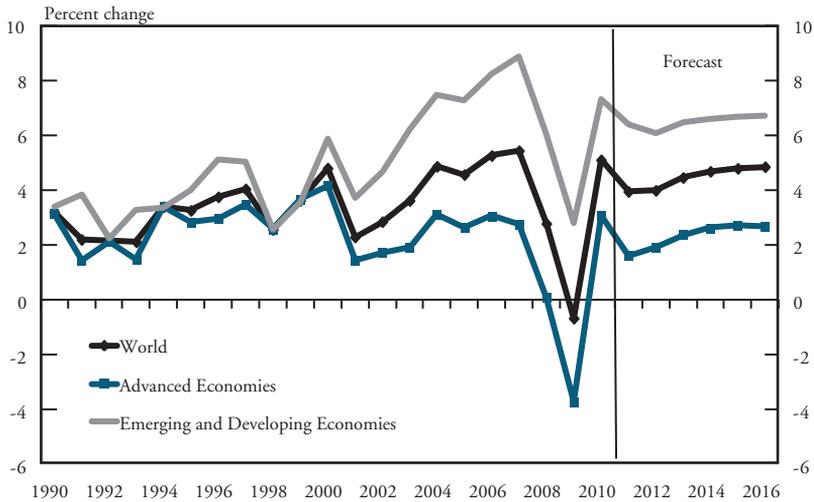


Note: Calculations based on USDA data
Source: USDA

forecasts. The United Nations' world population estimates in 2050 range from 8 billion to 10 billion. The population gains are concentrated in a few regions—primarily India and Africa, led by Nigeria, where sustained economic growth could be vital for additional population growth. Moreover, the strongest population gains are not expected to emerge in countries projected to experience dramatic income growth.

In fact, surging export activity will depend on rising incomes in developing nations. U.S. agricultural exports are expected to be driven by livestock products, an expensive food source. Over the past decade, unprecedented economic growth in China boosted per capita gross domestic product (GDP) fivefold, enhanced Chinese food consumption, and spurred U.S. agricultural exports. Today, China is the top export destination for U.S. agricultural exports. According to the International Monetary Fund, GDP growth in developing countries is expected to strengthen, but remain below the record highs at the end of the 2000s that sparked the agricultural export boom (Chart 8). The risk is that another developing country with rising populations, such as India or Nigeria, may not emerge as the next export market for U.S. agricultural products, meaning that U.S. exports could stagnate, albeit at elevated levels.

Chart 8
WORLD GDP



Source: International Monetary Fund

In addition, competition in global food markets is intense. As the BRIC countries of Brazil, Russia, India, and China have shown, nations with a rising level of economic development often boost their own food production capabilities (Henderson). With agricultural productivity in other developing nations well below U.S. standards, the adoption of technology could allow other emerging nations to build their agricultural sectors, fulfill a larger portion of their growing food demand, and limit U.S. agriculture's export potential.

In addition, growth in biofuels exports is also a risk. In 2011, the U.S. exported almost 90 million gallons of ethanol per month as a decline in Brazil's sugar cane production not only cut Brazil's ethanol production, but also raised the price of sugar and Brazil's cost of ethanol production. The emergence of ethanol exports allowed U.S. ethanol firms to expand production beyond current mandates. The risk is that U.S. ethanol exports could diminish in the future if Brazil's sugar cane and ethanol production rebounds. If exports fall or imports rise and policy support for ethanol tariffs or mandates wane, the United States could have a glut of ethanol. Moreover, the maximum mandated use of 15 billion gallons of corn-based ethanol has been nearly achieved, leaving limited spare capacity to consume ethanol in U.S. markets.

Despite attempts to encourage increased use through higher ethanol blends, U.S. consumption of ethanol will likely be constrained by a “blend” wall near 10 percent (Abbott, Hurt, and Tyner). In short, limited growth in U.S. ethanol consumption and exports are a risk to future agricultural commodity demand and farm profits.

Financial markets also pose a risk to U.S. exports, specifically the value of the U.S. dollar. The 2009 financial crisis coincided with a sharp drop in U.S. exports. With increasing financial market stress, investors flocked to U.S. Treasury markets in a flight to safety, and the value of the dollar rose. The strong dollar strained the price competitiveness of U.S. agricultural commodities in global markets, and the value of U.S. agricultural exports dropped 16 percent in 2009. Today, a lower value of the dollar is supportive of U.S. agricultural exports, but upward pressure on the dollar from broader cyclical trends or temporary financial market stress could shape future exports.

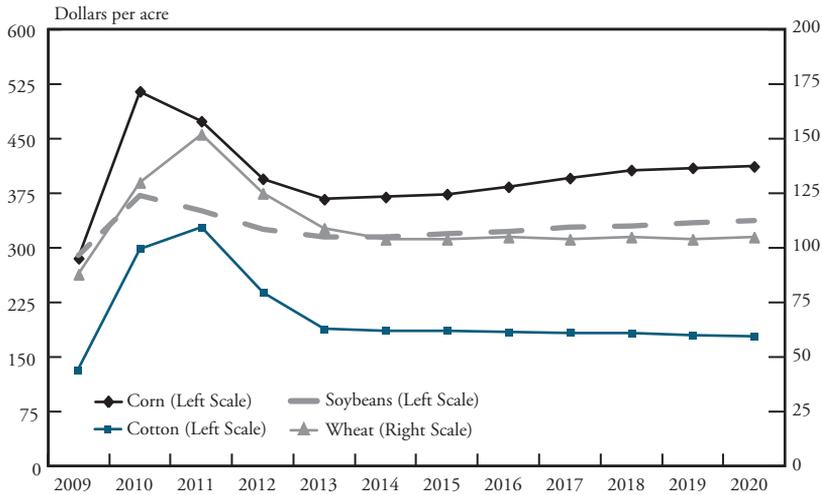
Leverage expectations

Financial markets also present a risk to farm debt and leverage. Low interest rates in the wake of the recent financial crisis have fostered the capitalization of booming farm incomes into high farmland values. Interest rates will likely rise when economic conditions return to more historical norms.

Higher interest rates could have two distinct impacts on U.S. agriculture (Henderson and Briggeman). Rising interest rates may place upward pressure on the dollar, which could indirectly trim U.S. agricultural exports, farm profits, and farmland prices. In addition, higher interest rates also boost the capitalization rate, which weighs further on farmland prices. The impacts are compounded in highly leveraged environments when higher interest rates raise debt service burdens, as the 1920s and 1980s demonstrated.

In addition, the ability of farmers to maintain low financial leverage while confronting narrower profit margins might be essential to agriculture’s future prosperity. Agricultural crop prices are expected to retreat in coming years as farmers boost production in response to today’s profitability. Combined with rising input costs projections, farm profit margins are expected to narrow in coming years. For example, net margins to corn production could fall almost 30 percent by 2013, with similar profit declines in other major crops (Chart 9).

Chart 9
NET CROP RETURNS OVER VARIABLE COSTS



Source: USDA

When profit margins narrowed in the late 1970s, farmers leveraged up their farm enterprises as real interest rates remained historically low and gross farm revenues remained elevated. If profit margins narrow and interest rates remain low, farmers might repeat the patterns of the 1970s and leverage the farm. Lower margins would squeeze internally generated cash to finance the purchase of fuel, fertilizer, seed, chemicals, and other inputs, and consequently boost the amount of operating debt required to finance agricultural production. A higher interest rate environment would increase the risk that farmers could struggle to service mounting farm debt.

One concern is that farmers may have more debt than some analysts project. According to USDA, U.S. farm real estate debt is projected to fall almost 3 percent in 2011. Commercial banks and Farm Credit Associations, however, indicate that farm debt is still on the rise. During the first three quarters of 2011, farm real estate debt in the Farm Credit Associations and commercial banks rose 4.4 percent and 0.6 percent, respectively, above year ago levels. In addition, non-real-estate debt at Farm Credit Associations and commercial banks also edged up. A future risk is that farmers could be increasing their leverage just as export growth and farm profits begin to slow.

IV. CONCLUSION

U.S. agriculture appears to be in the midst of another golden era. Strong global food demand and robust biofuels markets have strained the current production capabilities of global agriculture. The prospects of tight global supplies well into the future have spurred booming farm incomes. Historically low interest rates have quickly capitalized these burgeoning incomes into record high farmland values.

Past golden eras in agriculture quickly faded. The promise of sustained global demand shifted with economic conditions, and capital investments in agriculture led to increased agricultural supplies that trimmed farm prices and incomes. At the same time, leaner farm incomes were unable to support the record-high farmland prices, especially at higher interest rates. As a result, many farmers that worked to seize the emerging opportunities were left empty-handed as market and financial conditions changed.

While current conditions appear to be following the rhythms of the past, there is at least one distinct difference—leverage. With rising incomes and low interest rates, farmers are making significant capital expenditures on equipment, machinery, structures, and land improvements. Yet, many farmers have not used excessively high levels of debt to finance capital investments. History has shown that golden eras fade and that farm corrections devolve into farm busts in highly leveraged environments. Limited farm debt and leverage might be enough to keep any correction in agricultural profits from spiraling into a farm bust.

ENDNOTES

¹In this article, all nominal prices, income and farmland values were deflated to 2005 constant dollars using the consumer price index (CPI). Historical CPI data was obtained from the Federal Reserve Bank of Minneapolis, www.minneapolisfed.org/community_education/teacher/calc/hist1800.cfm

²Historical U.S. export data prior to 1935 was obtained from the Historical Statistics of the United States 1789 to 1945 and Bicentennial Edition: Historical Statistics of the United States, Colonial Times to 1970.

³According to USDA, the United States had 2.2 million farms in 2011.

⁴Data on the amount of corn used in ethanol production was obtained on Jan. 18, 2012, from USDA's Feed Grains Data: Yearbook Tables, www.ers.usda.gov/data/feedgrains/Table.asp?t=31

⁵For more information on the farmland value boom and bust cycle of the 1970s and 1980s see Barkema.

⁶Conversely, a multiple of 30 indicates that rent-to-value ratios on Corn Belt farmland have fallen to less than 4 percent.

⁷Farm Credit System debt was obtained from the Federal Farm Credit Banks Funding Corp.'s Third Quarter 2011 statement of the Farm Credit System, www.farmcredit-ffcb.com/farmcredit/financials/quarterly.jsp

⁸U.S. export forecasts were obtained from USDA Agricultural Baseline Projections for 2011-2020.

REFERENCES

- Abbott, P. C., C. Hurt, and W. E. Tyner. 2011. "What's Driving Food Prices in 2011?" *Farm Foundation Issue Report*, July 2011.
- Abrams, Richard K. and C. Edward Harshbarger. 1979. "U.S. Agricultural Trade in the 1970s: Progress and Problems" *Economic Review*, Federal Reserve Bank of Kansas City, May, www.kansascityfed.org/PUBLICAT/ECONREV/econrevarchive/1976/2q76dunc.pdf
- Akers, Maria and Jason Henderson, 2008. "Can Rising Exports Sustain the Farm Boom?" *Main Street Economist*, Federal Reserve Bank of Kansas City, Issue II, www.kansascityfed.org/publicat/mse/MSE_0208.pdf
- Babcock, Bruce. 2011. "Impact of Alternative Biofuels Policies on Agriculture, the Biofuels Industry, Taxpayers and Fuel Consumers." Proceedings of the "Recognizing Risk in Global Agriculture" Agricultural Symposium, Federal Reserve Bank of Kansas City, July 19-20. www.kansascityfed.org/publicat/rscp/Session2.pdf
- Barkema, Alan D. 1987. "Farmland Values: The Rise, the Fall, the Future" *Economic Review*, Federal Reserve Bank of Kansas City. Second Quarter, www.kansascityfed.org/PUBLICAT/ECONREV/econrevarchive/1987/2q87bark.pdf
- Henderson, Jason and Brian Briggeman. 2011. "What are the Risks in Today's Farmland Market?" *Main Street Economist*, Federal Reserve Bank of Kansas City, Issue 1, www.kansascityfed.org/publicat/mse/mse_0111.pdf
- Drabenstott, Mark. 1983. "The 1980s: A Turning Point for U.S. Agricultural Exports?" *Economic Review*, Federal Reserve Bank of Kansas City, April. <http://www.kansascityfed.org/PUBLICAT/ECONREV/econrevarchive/1983/2q83drab.pdf>
- Duncan, Marvin and Blaine Bickel. 1976. "U.S. Agricultural Exports—A Boon to Farmers" *Economic Review*, Federal Reserve Bank of Kansas City, July-August, www.kansascityfed.org/PUBLICAT/ECONREV/econrevarchive/1976/2q76dunc.pdf
- Gazel, Ricardo and Russell L. Lamb. 1998. "Will the Tenth District Catch the Asian Flu?" *Economic Review*, Federal Reserve Bank of Kansas City, September-October, 64(8) www.kansascityfed.org/PUBLICAT/ECONREV/PDF/2q98gazel.pdf
- Gloy, Brent, Michael D. Boehlje, Craig L. Dobbins, Christopher Hurt, and Timothy G. Baker. 2011. "Are Economic Fundamentals Driving Farmland Values?" *Choices, the Magazine of Food, Farm and Resource Issues*, Agricultural and Applied Economics Association. Second Quarter, Issue 2.
- Henderson, Jason and Maria Akers, 2011. "Large Banks Cut Rates and Boost Farm Lending" *Agricultural Finance Databook*, Federal Reserve Bank of Kansas City, October. www.kansascityfed.org/publicat/research/indicatorsdata/agfinance/2011-10-ag-fin-db.pdf
- Historical Statistics of the United States 1789-1945: A Supplement to the Statistical Abstract of the United States*. U.S. Department of Commerce, Bureau of the Census. www.census.gov/prod/www/abs/statab.html
- Historical Statistics of the United States. Colonial Times to 1970*, U.S. Department of Commerce, Bureau of the Census, www.census.gov/prod/www/abs/statab.html
- Paarlberg, Don and Philip Paarlberg, 2000 *The Agricultural Revolution of the 20th Century*, Ames: Iowa State University Press.

- Peoples, Kenneth L., David Freshwater, Gregory Hanson, Paul T. Prentice, and Eric P. Thor. "Anatomy of an American Agricultural Credit Crisis: Farm Debt in the 1980s" A Farm Credit System Assistance Board Publication.
- Stam, Jerome M. and Bruce L. Dixon. 2004. "Farmer Bankruptcies and Farm Exits in the United States, 1899-2002." Economic Research Service, U.S. Department of Agriculture. Agriculture Information Bulletin No. 788.
- Westcott, Paul. 2011. "USDA Agricultural Projections to 2020" Economic Research Service, U.S. Department of Agriculture, Outlook Report No. 111. www.ers.usda.gov/publications/oce111/.

