STATUS OF

Wisconsin Agriculture 2013

• Weathering the Drought • The Wisconsin Farm Economy • Current Outlook • Feeding Nine Billion

College of Agricultural & Life Sciences
UNIVERSITY OF WISCONSIN–MADISON
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UW Extension
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Status of Wisconsin Agriculture, 2013

An annual report by the Department of Agricultural and Applied Economics, UW-Madison and Cooperative Extension,UW-Extension

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Preface

Status of Wisconsin Agriculture is an annual agricultural situation and outlook report authored (except where noted) by faculty in the Department of Agricultural and Applied Economics, University of Wisconsin-Madison. Because of the large and complex effects of the 2012 drought on Wisconsin agriculture, we begin this issue with a summary of the nature and impacts of the drought and what might be in store in 2013. The remainder of the report contains three parts. Part I provides an overview of the financial environment in the Wisconsin farming sector. In Part II, market analysts review current conditions in major Wisconsin commodity sub-sectors and offer their forecasts for 2013. Part III contains a special article—a think piece that lays out information indicating that world agricultural output must double by mid-century to meet the food and fuel needs of an estimated population of nine billion people, and considers the opportunities and challenges this presents to Wisconsin's farm sector and the state's agricultural research, education and outreach programs.

Status of Wisconsin Agriculture is available for download at www.aae.wisc.edu/www/pub/. If you do not have internet access, contact Kathy Martin-Taylor, Department of Agricultural and Applied Economics, UW-Madison, 427 Lorch Street, Madison, WI 53706, to obtain a printed copy.

The faculty of the Department of Agricultural and Applied Economics welcomes your comments and questions on material in this report. We also encourage your suggestions regarding rural Wisconsin issues that we might address as special topics in subsequent editions.

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Status of Wisconsin Agriculture, 2013
Executive Summary

Drought, high temperatures, and other unusual weather conditions were the primary factors affecting the status of Wisconsin agriculture in 2012. The most visible effects were fields of stunted corn and sunburned alfalfa. This visible evidence of crop stress was manifested in sharp reductions in yields and production. Wisconsin corn production was down 17 percent from 2011; soybean output was off 11 percent. Hardest hit was alfalfa—a key forage for the state's dairy herd—with production down nearly a third. Some vegetable and fruit crops were also hit by the drought and heat, especially those grown without irrigation.

Dairy farmers and other livestock producers faced the dual problem of less home-grown feed available and much higher prices for purchased feed due to the widespread nature of the 2012 drought. Fortunately for some, larger than normal forage carryover, supplemental forage crops and additional corn silage salvaged from fields that did not make a corn crop added to the forage supply.

The huge question now is whether soil moisture can be replenished enough in the early months of 2013 to avoid a repeat of the drought of 2012. A drought sequel would yield a feed supply either inadequate or too expensive to maintain current livestock numbers, forcing dairy and livestock operations to reduce the size of their herds and flocks and sharply raising consumer costs for animal-based foods. A "normal" year would help rebuild stocks and help keep food and feed prices under control.

Even though they suffered through an unprecedented set of weather-related challenges in 2012, Wisconsin farmers ended up earning an estimated $3 billion in net farm income. This was second only to 2011's record high $3.8 billion and $1 billion more than they earned in 2010. Gross farm income was actually higher than the previous record set in 2011 by about $100 million. But much higher costs, especially for livestock feed, resulted in net income falling $800 million from 2011.

Record gross farm income came from higher prices for most commodities, with corn prices leading the way. Despite strong prices for corn, soybeans and other crops, the drought trimmed Wisconsin production too much to generate higher sales. In total, crop sales were down about $180 million. But adding crop insurance indemnities to market sales will likely more than erase that shortfall.

Livestock producers' market returns were higher than 2011 by about $110 million (adjusted for a large negative inventory adjustment in 2011). Milk prices in 2012 averaged lower than 2011, but milk production was up by more than 4 percent, leaving 2012 revenue at about the same level. Higher prices for red meat and poultry items increased gross revenue for other livestock producers. But the high prices that benefitted crop farmers represented higher costs to those feeding livestock, most of whom saw their bottom line reduced from what they earned in 2011.

While aggregate Wisconsin net farm income was at historically high levels in 2012, the drought created abnormally large disparity in net income among farmers depending on where and what they produced. Crop farmers in areas of the state unscathed by the drought did very well; those without crop insurance who ended up disking under stunted corn incurred huge losses. Dairy farmers who were able to harvest decent forage and feed crops to meet their needs were pleased with their net earnings; those who purchased all or most of their feedstuffs, whether because of business model or crop failure, were not.

Wisconsin farmers spent about $800 million more for farm inputs and services in 2012 than in 2011, an increase of 13 percent. Higher feed costs accounted for more than half of that increase. Among other big-ticket items, seed costs were up 12 percent, fertilizer up 9 percent, pesticides up 15 percent, and repair and maintenance costs up 15 percent.

On December 31, 2011, Wisconsin farmers held assets valued at $70 billion (not including the

value of operators' dwellings). Total debt was $9 billion, leaving equity at $61 billion. Farmers' equity rose by about $3.7 billion from December 31, 2010. Land and buildings made up three-quarters of the value of farm assets and real estate debt was two-thirds of total farm debt. The debt-to-asset ratio at the end of 2011 was 13 percent. That value compares to 12 percent five years earlier, with the increase due to $1.2 billion more real estate debt. While it's higher than in recent years, a debt-to-asset ratio of 13 percent still represents a strong financial position overall. And there is no indication that the kind of land speculation by farmers that led to the farm financial crisis of the mid-1980s is occurring today.

2012 in Review

General economy. The lingering effects of the Great Recession slowed economic growth in 2012, and political gridlock brought the country to the "fiscal cliff" that dominated headlines during the latter part of the year. But there were several encouraging signs that the economy was recovering. GDP growth exceeded 3 percent in the third quarter, the first time this level of growth has been reached in many quarters. The housing market is showing signs of life, the unemployment rate is falling slowly but consistently, and the federal deficit in 2012 will be smaller than the more than $1.3 trillion in red ink we've seen in each of the last three years. But these positives were in part offset by fears of Congress' inability to effectively cope with budget shortfalls. The value of agricultural exports—including dairy exports—is expected to set records in 2012. This is based on higher world prices for most U.S. farm exports despite mostly smaller export volumes.

Farm Input Costs. Major fertilizers (NP&K) cost about the same per ton in 2012 as in 2011 and were much less expensive than 4 years earlier. Gasoline and diesel prices were variable over the year but averaged close to 2011 levels. Seed costs were higher as more farmers planted more acres to more-expensive GMO varieties and land rents increased in concert with high prices for corn and soybeans. Interest rates remained very low by historical standards. But farmers' loan demand increased and loan repayment rates slid a bit as many farmers saw drought-related decreases in income. Land values increased again in response to high crop prices, but there are some signs that land values and land rents are tapering off due to the uncertainties created by the drought.

Dairy. Dairy farmers fared worse in 2012 than they did in 2011 for two reasons: milk prices averaged lower and feed costs were higher. U.S milk production increased 4 percent in the first quarter, driving milk prices well below 2011 levels. Farmers responded to lower profits by cutting production, which caused pricess to rise later in the year. The profitability of milk production was especially low in the West, where a larger proportion of dairies purchase all or most of their feed. Wisconsin ended up setting a new production record of more than 27 billion pounds, marking the 7th consecutive year of production gains. With the exception of fluid milk, domestic consumption remained solid and exports absorbed more than 13 percent of the milk solids produced in the U.S.

Livestock and Poultry. U.S.meat production in 2012 was essentially flat, and U.S. per capita consumption declined by about 2.5 pounds to 202.2 pounds—the fifth consecutive year that per capita use has fallen. Fortunately, population growth and, more important, rising exports, have picked up the slack. Net exports of pork, broilers and turkey as a percent of production hit new highs in 2012, and net cattle exports remained positive.

Corn and Soybeans. What started in March as a very promising year for corn and soybean production turned decidedly sour by June, when it quit raining in the Corn Belt. National corn acreage planted was record high, but a 17-percent-lower yield dropped 2012 corn production 1.6 billion bushels (13 percent) below 2011. Soybeans did better than corn, with yields down only 6 percent and production off less than 4 percent. Corn and soybean prices reacted swiftly to anticipated production shortfalls, but fell off some as higher prices rationed use. Yields of Wisconsin corn and soybeans dropped more than the national average.

Fruits and Vegetables. Both vegetable and fruit growers were negatively affected by the 2012 drought and extreme summer heat. Yields of processing vegetables grown on non-irrigated acres

were sharply reduced, and high temperatures constrained pollination and growth even on irrigated acres. In contrast, potatoes (nearly all irrigated) did well under 2012's unusual weather patterns. The fall crop was planted much earlier than normal, and high temperatures promoted early and rapid tuber growth. The end result was the second largest Wisconsin crop on record. Wisconsin fruit growers were challenged in 2012 not only by the drought, but also by abnormally warm temperatures in mid-March. This led to early blooming of apples and cherries and subsequent freezing of developing buds. Apple production was off 60 percent from 2011 and tart cherry producers suffered a near crop failure. Grape yields were down 20–40 percent due to frost and drought, but less incidence of diseases and pests resulted in better quality. Cranberry growers had to scramble to cut water use because of drought-depleted reservoirs, but managed to slightly top 2011 production.

2013 Preview

General Economy. The macroeconomic picture for 2013 remains blurred, even though draconian fiscal cliff tax increases and expenditure cuts were averted by a compromise budget bill passed by Congress and signed into law on New Year's Day. This is partly due to uncertainties about how budget deficit/fiscal cliff issues will be resolved by the new 113th Congress. Agricultural interests are justifiably worried about how attempts at resolution will affect domestic and foreign demand for agricultural products. Agricultural trade will likely be reduced from 2012, perhaps sharply, as anticipated high U.S. commodity prices encourage foreign buyers to look elsewhere for cheaper sources of supply.

Farm Input Costs. Fertilizer and fuel prices should remain close to last year's levels in 2013. But seed prices will be higher due to strong demand and a reduced seed harvest due to the drought. Higher crop prices will likely raise rents, but the increase will be smaller than in recent years. Credit will continue to be readily available to qualified borrowers at continued low interest rates.

Dairy. Wisconsin dairy farmers should see about a 90 cents per hundredweight higher milk price in 2013. Soybean meal prices should be lower, but corn prices are expected to be even higher than 2012. For farmers short of forages, hay will be scarce and expensive because of a much smaller national crop. Consequently, dairy farmers with enough home-grown corn and forages should do well in 2013; those needing to purchase corn and forage will struggle. Another drought year would change the dairy outlook substantially, trimming cow numbers and elevating milk prices to levels that would sharply reduce exports and cut domestic use of dairy products as well.

Livestock and Poultry. Meat production will slip in 2013—beef and turkey by 3–5 percent and pork and broilers by 1–2 percent. Smaller meat supplies will yield higher prices to producers and consumers. Meat exports are expected to remain strong despite higher prices, but domestic use could fall by as much as 5 pounds per capita as consumers respond to higher prices at grocery stores and restaurants.

Corn and Soybeans. Very low carry-in and drought-reduced production of corn and soybeans will keep prices high and usage low in the 2012/13 crop year. USDA forecasts the largest hits on corn use to be in ethanol production (down 10 percent) and exports (down at least 25 percent). Corn exports could fall below 1 billion bushels after averaging more than 2 billion bushels in the six crop years preceding 2010/11. Average corn prices are expected to be in the $6.80–$8.00 per bushel range. Soybean supplies are not as tight as corn, but tight enough to yield a crop year average price forecast by USDA of $13.55–$15.55 per bushel. Soybean exports are expected to remain at close to 2011/12 levels.

This year's special article looks at the challenges and opportunities that production agriculture will encounter over the next 40 years as it gears up to supply the needs of an expected world population of nine billion in 2050. Given a finite land base and a changing climate, what can we do to ensure an adequate supply of food, fiber, and renewable fuel? The answers lie in strengthening our agricultural research base, providing well-trained agricultural specialists, and promoting collaboration among stakeholders.

Weathering the Drought:

How Wisconsin fared, and what lies ahead[1]

The 2012 crop year reminded us that agriculture is an activity that we conduct at the pleasure of nature. The southern half of Wisconsin was on the northernmost boundary of what USDA-ERS termed the "most severe and extensive drought in at least 25 years." About 20 percent of the nation's cropland was affected by the drought in mid-June; by mid-August, that figure had expanded to about 57 percent. Wisconsin was not in the heart of this historic drought, but we were full participants.

Along with the lack of precipitation came record-breaking heat. Wisconsin experienced its 8th hottest June–August period since 1894. Like the drought, Wisconsin's heat wave was part of a broader pattern: Nationwide, summer 2012 was the 3rd hottest. The freakish warm spell in March combined with the summer season to give Wisconsin its warmest January–August period on record, easily surpassing the previous record set in 1987. As of the end of the year, it appears certain that 2012 will be the hottest. on record for the contiguous U.S. (going back to 1895, when records become good enough to evaluate this).

June was a month of extremes. Depending on where you farm, field crops were damaged by either too much or too little rain. The northwestern third of the state suffered heavy downpours, including a storm that dumped 10" on Duluth and caused extensive flash flooding and soil erosion in Wisconsin. In contrast, a very dry June across southern and much of central Wisconsin brought the full weight of drought to bear. The south-central climate district had but 0.48" of rainfall in June, about 10 percent of normal. It was the driest June on record for the southwestern and south central districts and the third driest for the southeast. June is our typically rainiest month statewide, and in terms of crop development and soil moisture storage, perhaps the month when we need rain the most.

The rainfall observed during June and July 2012 across the southern third of the state was quite unusual. Odds of getting so little rain during that early part of the growing season are slim—about 0.5 percent. The last time we had a comparably dry June and July was in 1988. But there was an important difference between that year and 2012: this year we had a wetter winter and spring. In terms of precipitation, the first six months of 1988 were at the 31st percentile (June–July had been wetter in 69 percent of previous years). In 2012 the main growing season started off wetter than normal, at the 58th percentile (the first half of the year had been wetter 42 percent of the years to date), so we went into the year with better soil water reserves than was the case in 1988.

What was the impact on corn and soybean crops?

Due to warmer than normal conditions during March, planting started quickly and then was delayed by wet conditions around May 1. Over the entire growing season, growing degree-day accumulation was above the 30-year normal. During May, June and July, precipitation was significantly below average in southern Wisconsin and significantly above average in the northern part of the state. Drought conditions continued through August and September in the southern half of Wisconsin and were also observed in the northern half of the state. Due to a dry and warm September and October, good grain drying occurred with harvest grain moisture lower than normal in all trials.

Crop productivity is an excellent indicator of drought intensity. Most grain crops have specific stages of development during which drought stress has the biggest impact on yields. Stress during mid-vegetative stages may reduce ear size by reducing the number of flowers on the ear and may reduce plant height and leaf size. Usually, drought stress during early vegetative stages has

1. This article was compiled by Bob Mitchell using contributions from Bill Bland (Soils), Joe Lauer and Shawn Conley (Agronomy). AJ Bussan and Rebecca Harbut (Horticulture). Ed Jesse, Bruce Jones and Paul Mitchell (Ag and Applied Economics), and Mike Rankin (UW-Extension Crops and Soils Agent, Fond du Lac County).

Top Ten Corn States, (Ranked by 2011 Production						
	Yield, Bu/A		*Prod, Mil Bu.*		*% Change in:*	
State	***2011***	***2012***	***2011***	***2012***	***Yield***	***Prod***
Iowa	172	139	2,356.4	1,904.3	-19.2%	-19.2%
Illinois	157	101	1,946.8	1,252.8	-35.7%	-35.6%
Nebraska	160	139	1,536.0	1,271.8	-13.1%	-17.2%
Minnesota	156	168	1,201.2	1,386.0	7.7%	15.4%
Indiana	146	100	839.5	605.0	-31.5%	-27.9%
South Dakota	132	94	653.4	502.9	-28.8%	-23.0%
Wisconsin	156	125	517.9	431.2	-19.9%	-16.7%
Ohio	158	125	508.8	452.5	-20.9%	-11.1%
Kansas	107	91	449.0	382.0	-15.0%	-14.9%
Missouri	114	75	350.0	251.2	-34.2%	-28.2%
US	147	122	12,358.4	10,725.2	-17.0%	-13.2%

little effect on grain yield. Greatest yield reductions usually occur with sustained drought stress during late vegetative stages (2-leaf stage through 5-leaf stage) and throughout the reproductive stages. Corn's most sensitive stage is a three-week period around silking. Stress during this period reduces the number of flowers that are successfully fertilized. Stress after silking increases kernel abortion, and if the stress continues, reduced seed size.

As the table above shows, nine of the nation's 10 top corn-producing states felt the drought's impact, but the pain wasn't shared equally. The data reflect the outline of the area most affected—curving from the northern plains through Missouri and the southern portions of Illinois and Indiana. Wisconsin fared comparatively well, but not nearly as well as Minnesota, where both yields and production were up from the previous year.

For soybeans, there are two periods during which soil moisture is critical: at planting and during the reproductive stages from bloom through pod fill. In Wisconsin the main reproductive growth in soybeans occurs from early July to mid-September. Soybeans in this stage use about 1/4 to 1/3 inches of water per day. Too little water can cause flowers and young pods to abort and can also reduce plant growth—the plants reduce metabolic activity to survive dry spells and resume growth when normal moisture returns.

Wisconsin soybean growers experienced dramatic variation in weather conditions in 2012. Drought and near record high temperatures (39 days above 90° F) across large portions of Wisconsin led to a projected statewide average soybean yield of 39 bu/A; down 7.5 bu/A, about 16 percent, from 2011. Nationally 2012 soybean yield is estimated at 39.3 bu/A, down 6.2 percent from 2011.

Federal crop insurance payments offset a portion of Wisconsin corn and soybean growers' drought-related losses. At year's end, the crop insurance program had paid out nearly $200 million to the state's corn growers and $22 million to its soybean producers. Wisconsin's participation in the program was below the national average: An estimated 70 percent of the state's corn acreage and 73 percent of the soybean ground was enrolled, compared to 84 percent for both crops nationally. The payout to Wisconsin corn farmers relative to what they'd paid in was also below the national average. On average, Wisconsin corn producers received $1.06 for every dollar paid in premiums; nationwide, corn farmers received $1.43 per dollar in premiums. This reflects that drought damage to corn was less severe here than in other states. Note that this indemnity payment information is not yet complete, as claims are still being processed, but the bulk of the payments have been made at this time.

Effect on Wisconsin Corn Yields, 1988 Drought

	1978-1987		1988		
Location	Sample Plots	Yield	Sample Plots	Yield	Percent Difference
Arlington	756	185	166	131	-29
Janesville	706	184	166	151	-18
Lancaster	706	146	166	71	-51
Fond du Lac	718	138	151	114	-17
Galesville	718	157	151	162	3
Hancock	719	170	151	198	16
Marshfield	510	125	126	99	-21
Spooner	534	115	116	87	-24
Average*		155		128	-17

*Weighted average of common locations during 1988 and 2012 plot tests.

Effect on Wisconsin Corn Yields, 2012 Drought

	2002-2011		2012		
Location	Sample Plots	Yield	Sample Plots	Yield	Percent Difference
Arlington	758	222	160	203	-9
Janesville	702	232	147	183	-21
Lancaster	658	219	147	146	-33
Fond du Lac	631	196	132	189	-4
Galesville	615	214	132	215	0
Hancock	626	207	132	243	17
Marshfield	756	170	232	167	-2
Spooner	690	156	210	131	-16
Average*		202		180	-11

*Weighted average of common locations during 1988 and 2012 plot tests.

The impact of the 2012 drought was significant across Wisconsin, but not as bad as it was in 1988 as shown in the tables above. Grain yield in the University of Wisconsin hybrid performance trials was significantly lower at all southern locations.

Will there be enough feed for dairy and livestock?

Dairy and, to some extent, other livestock production depends on two types of feed: corn and oilseed-based concentrates and forages. The effect of the drought on corn and oilseed production is well reported. Nationally, 2012 corn production is forecast to be down about 13 percent. National soybean production is expected to be about level with 2011. Wisconsin corn production in 2012 fell short of 2011 by about 90 million bushels (17 percent) and soybean production was off by about 8.5 million bushels (11 percent).

While corn will be in tight supply, corn trades in a national market and will be available to Wisconsin dairy and livestock producers in 2013—at a price. If ethanol fuel blending mandates remain in place (which appears likely), rationing of the short corn crop could make that price high, possibly resulting in altered rations, lower milk yields and slower weight gains for other livestock. Given the size of the U.S. soybean crop, soybean meal should be available at prices close to 2012.

Less is known about forage supplies to feed Wisconsin cattle in early 2013 before new crops are harvested. Wisconsin stored forages consist primarily of dry hay, haylage and corn silage. Only dry hay trades in a market broader than the state. Consequently, forage supplies are more localized, making it harder to supplement short supplies.

The latest USDA crop production forecast put Wisconsin dry hay production in 2012 (alfalfa plus other hay) at 3.08 million tons, down 25 percent from 2011. USDA doesn't track haylage and green chop hay production, but it is safe to assume that these too will be about 25 percent below 2011 tonnage.

Acreage planted to corn silage in Wisconsin in 2012 was about the same as in 2011, but yields were lower. Reductions in corn silage yields were probably about the same as yields of corn harvested for grain — about 20 percent on average. The silage yield may be lower because a larger than normal share of total corn silage production was from drought-stunted corn originally intended for grain.

Looking at all forage harvested in 2012, it would appear that Wisconsin has a shortfall of 20-25 percent compared to forage supplies available in 2011. Moreover, because of parched pastures, grazers used a larger than normal share of the 2012 hay crop early in the season.

However, forage supplies in 2012 have been and will be increased over the estimated amount of hay and corn silage harvested in several ways:

• Short-season grasses were frequently double-cropped on harvested winter wheat and processing vegetable land. Under normal conditions, the wheat and vegetable fields would have been kept fallow after harvest.

• Planted acreage of winter rye in Wisconsin is reported to be much larger in 2012. Winter rye will be harvested as silage in 2013 in time to plant corn for silage.

• There was significant harvesting of marshes and other low-lying areas that are too wet to harvest in normal rainfall years or that yield such poor quality hay that they are usually not worth harvesting. This hay is marginally suitable for young stock if supplemented with higher quality forages.

• Similarly, growers baled much larger proportion of stalks from corn harvested for grain rather than leaving it as cover. Like marsh hay, corn stalks have minimal nutritional value but can be treated to improve palatability and nutrition for use in non-milking cow rations.

• Many farms started 2012 with larger-than-normal forage inventories, thanks to outstanding crops in 2010 and 2011 in much of the state. This will help make up for 2012 shortfalls, but will leave farms with little "insurance" inventory if 2013 is a short forage year.

Despite these creative methods of augmenting forage supplies, some dairy and livestock producers will run short. They have two main options: Buy expensive dry hay (currently selling at $250–$300 for dairy quality), or liquidate or downsize their operations in order to match forage needs with forage availability.

Will a shortage of forage cause a major shrinkage of the Wisconsin dairy herd? Some farmers will undoubtedly empty their barns of feed and then empty their barns of cows. But that will be uncommon, and the effect on cow numbers minimal. Wisconsin farmers have proven to be as resourceful in stretching feed supplies as they are in meeting other challenges posed by the marketplace and Mother Nature.

How were Wisconsin vegetable producers affected?

Vegetable crops were affected by adverse weather, particularly drought and heat, on multiple levels in 2012. Yields on processing vegetables planted in non-irrigated areas during spring were 50 to 80 percent less than anticipated. Heat and dry weather led to poor pollination in peas, snap beans, and sweet corn and abortion of pods; a number of crops were not harvested as a result. Many non-irrigated fields were not planted once the calendar turned to June due to poor soil moisture and low likelihood of germination.

Even irrigated processing vegetables were affected by extreme heat during June and July, which reduced pollination. On many fields, due to split set on peas and snap beans, half of the pods were either over mature or immature, resulting in very poor yields. Later-planted processing vegetable crops did reach record level yields with excellent quality, allowing the processors to meet production plans for the year. Many growers of irrigated vegetables planted and harvested emergency forage crops to assist Wisconsin dairy and livestock farmers facing shortages.

Fresh market vegetable farms also experienced dramatic losses. Many have irrigation but also rely on rainfall to meet crop water demands. Many of them could not meet irrigation demand and saw losses in quality and yield. Heat and dry weather negatively affected pollination of vine crops, tomato, pepper, eggplant and other crops, leading to poor shape and quality. Many harvested crops could not be sold due to defects in quality. Many other crops exhibited quality losses due to nutrient deficiencies because lack of soil moisture constrained nutrient uptake.

What was the impact on fruit crops?

The drought conditions had varied impacts on the fruit industries. Some vineyards and orchards are irrigated. These faced the challenge of having enough water to irrigate; they continue to be concerned about the low reservoir levels. Growers whose orchards and vineyards are not irrigated invested a great deal of time and resources in hand-watering trees and vines or installing irrigation systems.

Growers face additional concerns going into winter. Trees and vines that enter dormancy under stressed conditions are less hardy and therefore more vulnerable to winter cold damage, which can result in loss of production or loss of whole trees or vines. This will impact productivity for several years—it takes 3–7 years for replacement trees to reach production levels of a mature plant—and mean that growers will incur the cost of replacing the trees or vines.

While most cranberry growers had sufficient water for irrigation, growers were concerned about having enough water to move through the marsh for harvest. This concern continues, as they will need to move the water onto the beds again to make ice for the winter. A shortage of water may limit growers' ability to protect their crops from winter damage.

Although the drought created great challenges and costs to fruit growers during the 2012 season, the impact on productivity is not likely to be fully realized until 2013. The majority of crop loss that occurred in 2012 was due to damage caused by the spring frost.

How will the drought affect the greater economy?

So far, the 2012 drought has had only a minimal effect on total output of goods and services at the national level (GDP). Farm output represents less than 1 percent of GDP, so drought-related reductions in crop production have a small overall effect. The impact on processors, who had less to process and paid more for their raw product, has been larger. Especially hard hit were ethanol plants that found it hard to acquire local supplies of corn at any price. Many temporarily shut down and most others operated at well under full capacity. This emphasizes the local nature of the drought's impact on employment and economic activity: While the national impact was small, the impact on Hometown, USA was, in many cases, large.

According to USDA's Economic Research Service (ERS) food price inflation in 2012 was about the same is the average increase over the last 20 years; 2.5–3 percent. Foods containing grains have shown only small retail price increases even though prices for those crops rose significantly. That's because the cost of grain accounts for only a small part of the retail price of products such as bread and breakfast cereal. Over all foods, commodity costs account for about 15 percent of retail food prices. That proportion is higher for meat and dairy products, but until the fourth quarter of 2012, meat price increases were tempered by larger slaughter of cattle and hogs as producers trimmed their herds to cut feed costs. Farm milk prices also were relatively flat until later in the year.

The 2012 drought will have a larger effect on food prices in 2013, when ERS expects food price inflation to be in the 3–4 percent range. Much of that increase will come from higher-priced meat products. Meat supplies will be tighter due to the liquidation of herds that occurred in 2012.

Other economic indicators besides food price inflation may be more adversely affected in 2013 than last year as the effects of the 2012 drought trickle through the U.S. economy. Like in 2012, effects will be localized unless the drought continues into 2013. In that case, all bets are off.

How do things look going into 2013?

The modest successes in crop yields observed across the dry regions of Wisconsin in 2012 were due in no small part to crops' ability to tap deep soil water reserves. The outlook for 2013 depends in part on the extent to which those reserves are refilled before the season gets underway. The water-holding capacity of Wisconsin soils varies considerably: sandy soils hold very little, deep prairie soils store quite a bit.

We can be confident that subsoil reserves will be refilled everywhere if we get 12" of post-growing season rainfall, and less than that will be adequate for many soils. During September, October and November of 2012, 4–10" of precipitation fell across the state; November was disappointing; precipitation was half or less of normal. Unfortunately, December, January and February are Wisconsin's three lowest-rainfall months of the year. Normal precipitation for this period statewide is 3.6".

The seasonal outlook through March for precipitation offers no insight: there are equal chances of conditions being above normal, normal or below normal. This is typically the case in Wisconsin. The prognosticators haven't been able to develop useful relationships between our weather and the major global signals, such as El Nino, that are predictive elsewhere.

The drought of 2012 will enter the record books and the memories of those whose livelihoods depend on the climate. We are making good progress climbing out of the soil moisture deficit that it left behind, but we need a better-than-average winter to start the 2012 growing season with confidence.

I. Status of the Wisconsin Farm Economy

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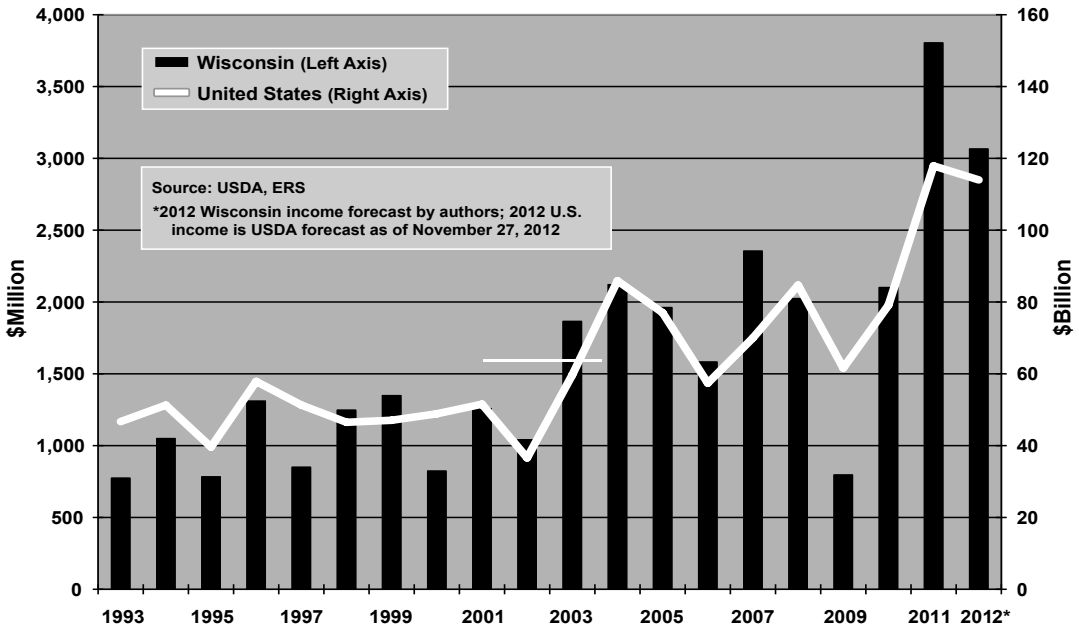
Wisconsin Farm Income

Despite facing the challenges brought on by drought, Wisconsin farmers netted $3 billion in 2012. Although that's a decline of 21 percent from the record $3.8 billion they earned in 2011, it's $1 billion more than 2010 net revenue.[1] Crop receipts are expected to be down from 2011 by about $180 million. Livestock receipts will likely exceed 2011 by about $160 million. Other farm income, in part from crop insurance indemnities, should add about $100 million or more to gross income.

Crop revenue was lower in 2012 mainly because of reduced earnings from corn and soybeans. Prices were higher for both crops, but not by enough to offset yield reductions induced by the drought. Crop insurance will compensate for some of crop farmers' smaller sales. The amount of revenue received by individual corn producers varied significantly depending on where in the state they farmed and on whether they had purchased crop insurance.

Milk checks received by dairy producers should total about as much they received in 2011. While milk prices were off from the record levels of 2011, especially early in the year, higher production offset lower prices. Cash receipts from sales of

Net Farm Income: U.S. and Wisconsin



1. Over the years, our December estimates of current year Wisconsin net farm income have usually been within 10 percent of what USDA reports the following August. However, our estimate in last year's Status of Wisconsin Agriculture missed the mark by quite a bit. In December 2011 we estimated 2011 earnings at $2.4 billion; nine months later, USDA put the figure at $3.8 billion. This is a good opportunity to explain how we go about estimating Wisconsin's net farm income. We start with USDA's late-November estimate of percentage changes in farm revenues and costs at the national level. We apply those percentages to Wisconsin's previous-year revenues and costs, but adjust them with more specific Wisconsin information where possible (we have excellent data on Wisconsin milk sales and prices and we know how year-to-year changes in Wisconsin crop yields and harvest compare to national averages). As it turns out, we based our estimate on moving numbers. After we'd published our estimate, USDA revised its figure for Wisconsin 2010 net farm income upward, so we were applying their percentages to a smaller number than they eventually settled on.

Derivation of Wisconsin Net Farm Income ($1000)

		2010	*2011*	*2012 (est.)*
	Value of crop production:			
	Food grains	76,219	148,585	160,000
	Feed crops	1,287,048	2,188,098	1,950,000
	Oil crops	679,858	845,048	800,000
	Fruits and tree nuts	217,113	228,343	230,000
	Vegetables	465,924	546,387	620,000
	All other crops	344,637	373,938	390,000
	Home consumption	3,883	2,900	4,000
	Inventory adjustment	148,150	1,789	0
	Total Crops	3,222,832	4,335,088	4,154,000
plus:	**Value of livestock production**:			
	Meat animals	982,310	1,374,014	1,400,000
	Dairy products	4,147,199	5,245,114	5,250,000
	Poultry and eggs	401,158	408,203	440,000
	Miscellaneous livestock	366,077	383,057	430,000
	Home consumption	20,996	18,688	20,000
	Value of inventory adjustment	52,048	-58,937	0
	Total Livestock	5,969,788	7,370,139	7,540,000
plus:	**Revenues from services and forestry:**			
	Machine hire and custom work	131,417	67,177	70,000
	Forest products sold	20,810	21,480	20,000
	Other farm income	215,498	226,610	320,000
	Gross imputed rental value of farm dwellings	922,831	970,063	1,000,000
	Total	1,290,556	1,285,330	1,410,000
equals	**Value of agricultural sector production**	10,483,176	12,990,557	13,104,000
less:	**Purchased inputs:**			
	Farm origin	1,970,215	2,417,364	2,920,000
	Manufactured inputs	1,396,646	1,620,639	1,745,000
	Other purchased inputs and Services	2,021,425	2,116,563	2,291,000
	Total	5,388,286	6,154,566	6,956,000
plus:	**Government transactions:**			
+	Direct Government payments	259,414	196,027	300,000
-	Motor vehicle registration and licensing fees	12,795	12,792	14,000
-	Property taxes	410,000	360,000	400,000
	Total	-163,381	-176,765	-114,000
equals	**Gross value added**	4,931,509	6,659,226	6,034,000
less:	**Depreciation**	1,416,619	1,481,372	1,555,000
equals	**Net value added**	3,514,890	5,177,854	4,479,000
less:	**Payments to stakeholders**			
	Employee compensation (total hired labor)	779,477	756,868	765,000
	Net rent received by non-operator landlords	183,239	154,700	180,000
	Real estate and non-real estate interest	485,535	463,553	470,000
	Total	1,448,251	1,375,121	1,415,000
Equals	**Net Farm Income**	**2,066,639**	**3,802,733**	**3,064,000**

Source: Economic Research Service, USDA. Values for 2012 are authors' forecasts based on November 27, 2012, U.S. income estimates (http://www.ers.usda.gov/data-products/farm-income-and-wealth-statistics.aspx#27396).

meat animals, poultry and eggs, and miscellaneous livestock are also expected to be higher in 2012.

But in the aggregate, higher costs of production for livestock producers will more than eat up revenue gains, and dairy farmers will experience smaller net income than 2011. Farm costs will exceed 2011 by more than $800 million. More than half of that cost increase will come from much higher feed costs, as many livestock producers had to turn to the market to supplement their drought-depleted home-grown feed supplies.

Shifting Wisconsin Farm Commodity Value: A Long View

Wisconsin automobile license plates still read "America's Dairyland." Even though California passed Wisconsin to become the number-one milk-producing state 20 years ago, there are plenty of reasons to keep the license plate as it is. Wisconsin milk production is increasing. The state continues to rank first in production of cheese, which rising per capita consumption indicates is increasingly becoming a "designer" dairy product. Milk sales represented 45 percent of the value of farm commodities marketed in Wisconsin in 2011, compared to less than 18 percent for California.[2]

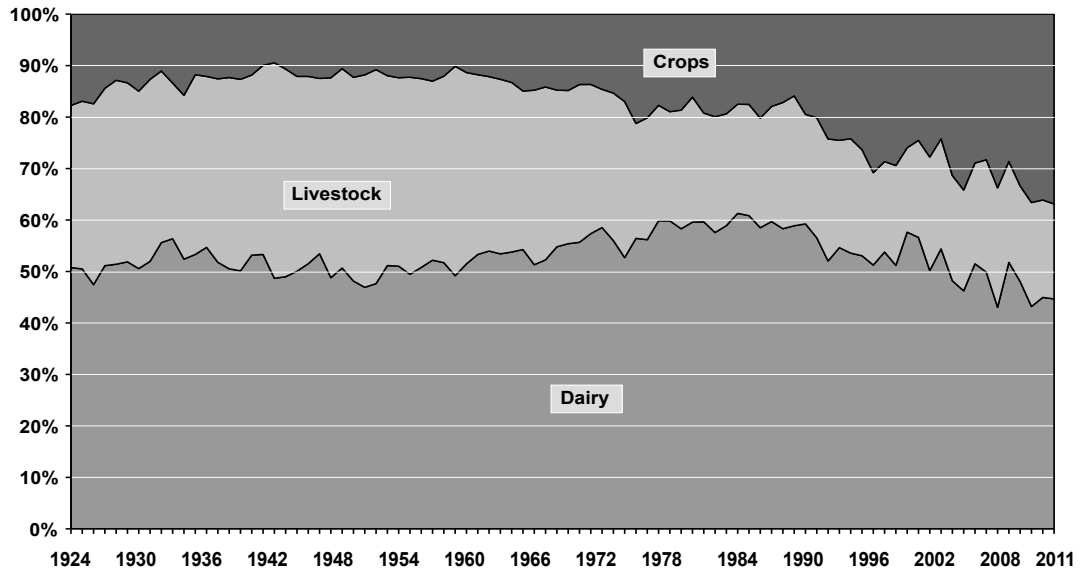
But while Wisconsin milk production and dairy revenue continue to grow, the relative contribution of dairy — and other livestock — to farm income has changed over time. Part of the state has joined the Corn Belt. The following charts illustrate this.

The first chart allocates Wisconsin farm revenue among key commodities from 1924 through 2011. It shows that dairy's share was very steady for more than three decades—about half of total revenue from 1924 through the 1950s—and then began a long climb, peaking at over 61 percent in the mid 1980s. Dairy's share of the state farm earnings peaked at a time when the federal dairy price support program fixed minimum milk prices at 80 percent of parity. Since the mid-1980s, dairy's share of farm commodity sales has trended downward, but with considerably more variability, reflecting greater fluctuation in milk prices.

Livestock's share of total farm commodity sales was quite steady at 35 to 40 percent from 1924 through the late 1950s. But then came a long slide, from 40 percent in 1958 to under 20 percent in the last two years.

The downtrends in the portion of Wisconsin farm revenue that comes from dairy and livestock reflects the substantial increases in sales of crops, mostly corn and soybeans. The share

Wisconsin Cash Receipts from Farm Marketings: Percent of Total from Commodity Sector



2. Only two states had a higher ratio of milk sales to total farm commodity value in 2011 than Wisconsin: Vermont (73 percent) and New York (52.5 percent).

of revenue from crops decreased from about 18 percent in the mid-1920s to about 10 percent during World War II, when the federal government encouraged production of livestock products by mandating high prices. In the early 1960s, crop revenue as a percent of total began to trend up, often jerkily, to its most recent level of 37 percent. Crops' share of revenue from sale of Wisconsin farm commodities is now twice that from non-dairy livestock and 8 percentage points less than dairy's.

The second chart compares commodity revenues differently — as actual values adjusted for inflation. This chart emphasizes Wisconsin agriculture's shift from livestock toward crops.

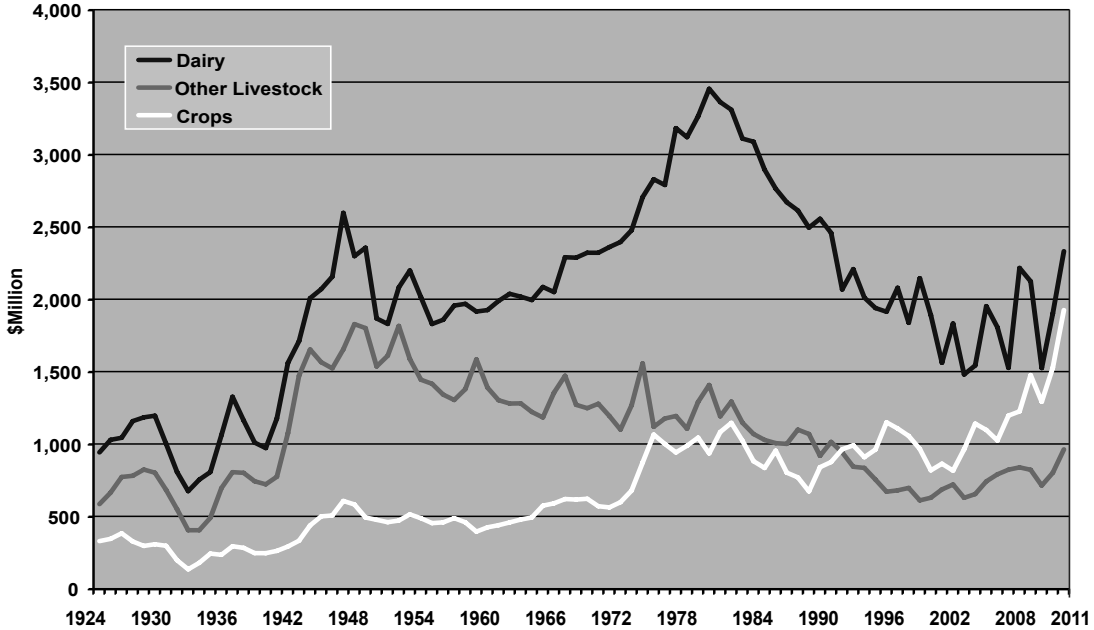
It shows the war-driven increases in dairy and livestock revenue, a small slippage in dairy following termination of war-time price supports, and the dramatic increase from less than $2 billion in 1954 to nearly $3.5 billion in 1979, and then an even more dramatic drop-off in real dairy income—constant dollar sales in 2002 were only 40 percent those of 1979.

This chart also shows that real farm revenue from non-dairy livestock has more or less continuously eroded for most of the 1924 to 2011 period. It fell by two-thirds in the 50 years between 1948 and 2002, from a peak of $1.8 billion in 1948 to a trough of $610 million in 1998 before recovering to about $1 billion in 2011.

Changes in crop revenue were much less dramatic until recently. Between 1924 and 1944, crop revenue in inflation-adjusted dollars was consistently under $500 million. From 1945 to the early 1970s, revenue was within a few million dollars of $500 million until the "Russian grain scandal" and increasing export opportunities created a new plateau at $1 billion. Strong exports kept crop revenue at this level (with substantial year-to-year variability) until the mid 2000s, when ethanol mandates and expanding biodiesel production began an era of rapidly climbing crop revenue, nearly doubling from $1 billion to $2 billion from 2005 to 2011.

It's unlikely that crop prices will keep rising at such a dramatic rate. Dairy's share of Wisconsin's farm earnings could rise as a result of structural changes in the state's dairy industry (larger and more productive farms) and regional shifts in dairy profitability (higher grain prices shift the advantage toward the Wisconsin-style model of home-grown feed). On the other hand, there is also a possibility that increasing consumer interest in plant-based diets could have an impact on revenue shares. In any case, more acreage will likely be used for crops that are not fed to Wisconsin livestock, suggesting that crop revenue will continue to make up an increasing proportion of Wisconsin farm revenue.

Wisconsin Cash Receipts from Farm Marketings: 1982-84 Dollars



Wisconsin Farm Balance Sheet—December 31, 2007-2011

	2007	*2008*	*2009*	*2010*	*2011*
			$Million		
Assets: Livestock inventory	814	831	928	762	818
Assets: Crop inventory	2,234	2,000	1,876	2,107	2,805
Assets: Purchased inputs	379	372	425	402	436
Assets: Cash invested in growing crops	66	54	67	78	77
Assets: Prepaid insurance	51	60	56	56	68
Assets: Other	2,014	3,501	2,685	3,057.	2,348
Total Current Assets	5,558	6,818	6,038	6,463	6,552
Assets: Investment in cooperatives	174	226	488	242	361
Assets: Land and buildings	45,972	47,224	47,943	48,906	52,530
Assets: Farm equipment	6,9678	6,227	7,130	7,030	7,365
Assets: Breeding animals	3,568	3,174	2,899	2,923	3,103
Total Noncurrent Assets	56,681	56,850	58,460	59,100	63,359
Total Farm Assets	62,239	63,668	64,497	65,563	69,911
Liabilities: Notes payable within one year	593	544	620	535.	499
Liabilities: Current portion of term debt	725.	713	813	834	887
Liabilities: Accrued interest	214.	194	218.	238	259
Liabilities: Accounts payable	181	174	185	208	175
Total Current Liabilities	1,712	1,624	1,836	1,815	1,820
Liabilities: Nonreal estate	1,014.	1,172	1,366	1,209	1,192
Liabilities: Real estate	4,804.	4,031	4,473	5,356.	6,064
Total Noncurrent Liabilities	5,818.	5,203	5,839.	6,565	7,256
Total Farm Liabilities	7,531	6,827	7,675	8,379	9,076
Farm Equity	54,708	56,841	56,823	57,184	60,835
Assets: Operators' dwellings	9,645	9,339	8,680	9,518	8,357
Total Operator Equity	64,353	66,180	65,502	66,701	69,192

Source: Agricultural Resource Management System (ARMS), Economic Research Service, USDA.

Wisconsin Farm Balance Sheet

The balance sheet for Wisconsin farming strengthened in 2011. During that year, asset holdings of Wisconsin farms rose in value by about $4.4 billion, while total debts increased about $700 million. As a result, the equity, or net worth, of Wisconsin farms grew by about $3.7 billion.

Wisconsin farmers have experienced gains in net worth in three of the last four years. The exception was 2009, when very low milk prices forced dairy farmers to take on more debt to cover operating expenses and reduced the value of their dairy cattle and other assets. Since 2007, Wisconsin farm equity has increased by over $6.1 billion.

Wisconsin farms have also built liquidity. Current assets (crops, livestock and other inventory normally turned into cash within a year) are up about $90 million, while current liabilities (debts due within a year) are essentially unchanged. That means Wisconsin farmers have more working capital. This means Wisconsin farms are better positioned to withstand the reduced cash flow that occurs when incomes drop or expenses rise as they can from year to year.

Most of the gain in the net worth of Wisconsin farms has come from appreciation of real estate values. Between 2010 and 2011, the value

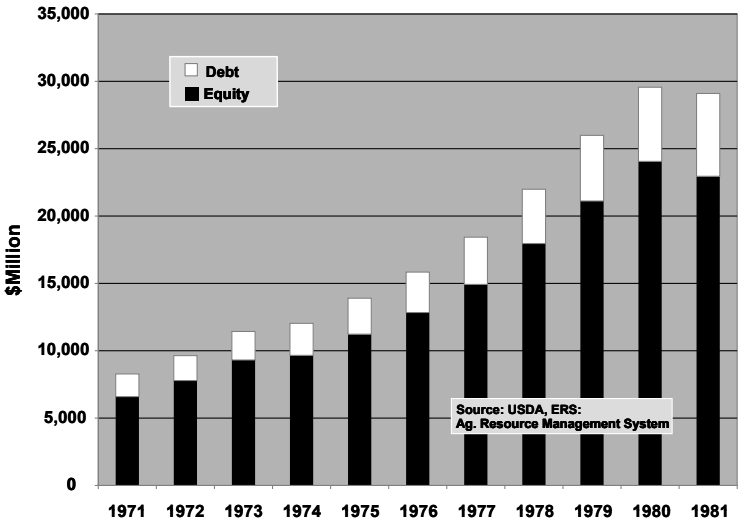
of land and buildings rose about $4 billion. The increase in real estate values was accompanied by an increase in real estate debt of about $700 million. So the net gain in equity from real estate was around $3.3 billion in 2011.

Recent increases in farm land values in Wisconsin and other Midwestern states have raised some concern about a repeat of what happened in the 1970s and early 1980s, when farmers eagerly snapped up farmland at inflated prices. The bubble burst in the mid 1980s, causing land values to plummet and leaving many farmers under water (owing more for their land than the land was worth).

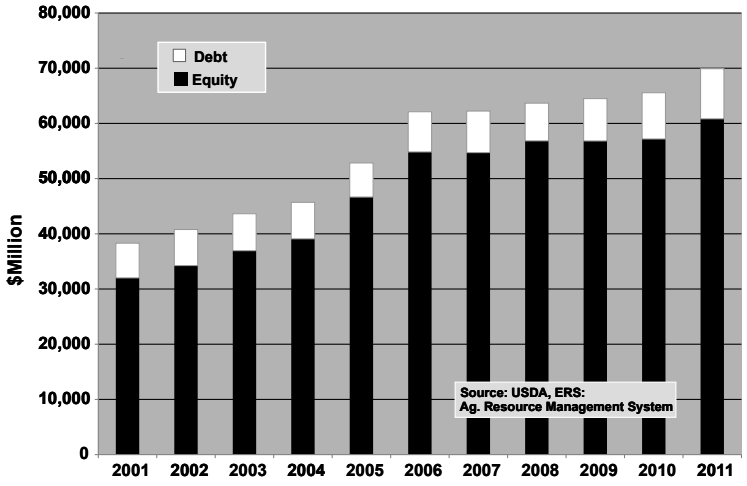
Comparing the two charts shown here suggests that a recurrence is not in the offing. The first chart tracks the debt position of Wisconsin farmers in the years preceding the 1980s drop in land values; the second chart shows their debt situation over the past decade. The first chart shows farm debt rose at an increasing rate over the 1971–1981 period. It also shows that the value of assets (the sum of debts and equity) roughly doubled from 1971 to 1976 and almost doubled again between 1976 and 1980. This dramatic escalation in assets, primarily from real estate appreciation, was fueled largely by farmers' increased borrowing.

The second chart shows that over the past ten years, farm debts have been almost constant while the value of assets has risen by about $30 billion. And since 2006, both assets and debt have increased at historically modest rates, especially when compared to the 1970s. We are not seeing a rerun of the scenario that set the stage for the 1980s farm crisis.

Wisconsin Farm Balance Sheet, 1971-1981



Wisconsin Farm Balance Sheet, 2001-2011



II. Current Outlook: Wisconsin Agricultural Commodities, Production Inputs and the General Economy

In this section, analysts discuss the current economic situation and the 2013 outlook for Wisconsin agriculture. We begin with a discussion of the general U.S. economy, which has a major impact on agriculture through its effect on domestic food demand and agricultural exports. Next, conditions and prospects for major farm inputs are discussed. Finally, commodity specialists offer their insights on what happened in 2012 and what to expect in 2013 for major Wisconsin farm commodities: dairy, livestock and poultry, corn and soybeans, and fruits and vegetables. Readers are encouraged to contact authors for more current or more specific information regarding their analyses.

General Economy and Agricultural Trade

William D. Dobson (608-262-3248)

Synopsis

It's possible that political gridlock and recession will emerge in the aftermath of the 2012 near-status quo elections. But more likely, after messy and protracted political negotiations, the U.S. economy will avoid the worst of the fiscal cliff and continue a labored recovery, featuring real GDP growth of 1.5–2 percent, relatively high unemployment of about 7.5 percent, and inflation remaining low at around 1.5 percent. Food prices for consumers are likely to increase by 3–4 percent in 2013, partly due to the 2012 drought.

Housing is beginning to show improvement, which will contribute modestly to economic growth in 2013. U.S. sales of cars and light trucks also are expected to remain strong at about 15 million, reflecting pent-up demand for these items.

Total U.S. exports are expected to grow by only about 3.1 percent in 2013. That's less than in the past two years, when export growth of 6.7 percent in 2011 and 3.3 percent in 2012 was a source of strength for the economy. The less robust growth projected for the year to come reflects weakness in the euro zone, China, Japan and elsewhere in the global economy.

If the U.S. economy can avoid nasty shocks, and if Congress and the Obama administration create a credible longer-term plan to lower deficits, the economy can build upon recent sources of strength with real GDP increases of 3–4 percent in 2014 and 2015 and a decline in the unemployment rate to about 7 percent. But these are big, multi-faceted "ifs."

The USDA forecasts that U.S. farm exports will total a record $145 billion in fiscal 2013. However, the export outlook is murky, and there are many forces that could keep ag exports lower than what USDA projects.

Despite the drought, U.S. net farm income in 2012 rose to a near record $114 billion in 2012. The farm income picture for 2013 is clouded by uncertainties about weather, macroeconomic policies, farm policy and agricultural exports. But any big negative developments will be cushioned by the generally strong financial position of most U.S. farmers (their aggregate debt-asset ratio was a very healthy 13 percent going into 2012). And the longer-run outlook for U.S. farm incomes is very positive given the prospect of tight supply-demand balances in world food markets.

The Lingering Legacy of the Great Recession

Macroeconomic statistics in the accompanying table describe a laboring economy. Real GDP growth has followed a weak trajectory since 2010, when the recession was technically over. Unemployment remains stubbornly high, though the jobless rate began to decline modestly in September 2012. Inflation has remained mostly subdued from 2010 through 2012, allowing the Federal Reserve to continue a near-zero interest rate policy and quantitative easing (otherwise known as printing money) to stimulate the economy.

Housing start figures are increasing, although they remain well below pre-recession levels. Estimates of annual housing starts are revised quarterly, and those issued during the first three quarters of 2012 averaged only 36 percent of highest 2005 figure.

1. Editor's Note: Since this section was drafted, falling from the fiscal cliff was averted by passage of a compromise budget bill on January 1, 2013. The text was not modified to reflect the new bill because of its temporary nature and likely modification following seating of the new Congress. The discussion of fiscal cliff issues remains relevant even though the terminology is no longer relevant.

Macroeconomic Statistics for the U.S. Economy

Year or Quarter	*Real GDP Growth*	*Unemployment Rate*	*Inflation Rate (CPI)*	*Housing Starts*	*Federal Surplus or Deficit*
	%	*%*	*%*	*(Mil. Units)*	*$ Billion (FY)*
2000	3.7	4.0	3.4	1.573	236.1
2001	0.8	4.7	2.8	1.601	126.9
2002	1.8	5.8	1.6	1.710	-160.3
2003	2.5	6.0	2.3	1.854	-377.1
2004	3.6	5.5	2.7	1.950	-412.8
2005	3.1	5.1	3.4	2.073	-318.7
2006	2.7	4.6	3.2	1.812	-248.2
2007	1.9	4.6	2.9	1.342	-161.5
2008	-0.3	5.8	3.8	0.900	-454.8
2009	-3.1	9.3	-0.3	0.554	-1,415.7
2010	2.4	9.6	1.6	0.586	-1,294.2
2011	1.8	9.0	3.1	0.612	-1,296.8
2012 Q1	2.0	8.3	2.5	0.715	-457.2
Q2	1.3	8.2	0.8	0.736	-125.3
Q3	3.1	8.1	2.3	0.786	-230.6

*Source: IHS Global Insight, U.S. Executive Summaries, 2010-2012.

The size of the Federal deficit continues to limit opportunities to use big new fiscal policy initiatives to stimulate the economy. Federal deficits were down to $1.1 trillion for fiscal 2012, about 28 percent below the $1.4 trillion figure for fiscal 2009. But annual deficits near $1 trillion are not sustainable over the long run. Shortfalls of this size will lead to further downgrades of the nation's credit rating, higher interest rates on Treasury securities issued to finance current government spending, higher costs of servicing the national debt, and, if continued for many years, a sharp reduction in the value of the dollar.

Canada in the early 1990s and European countries in recent years have faced deficit and debt problems like those that the United States could encounter in the not-too-distant future. The experiences of these countries offer lessons: It is less painful to fix problems sooner rather than later, when credit markets force a change.

Policy Challenges

The U.S. faces policy challenges to spur a slow-growing economy stemming from a recession stemming from a deep financial crisis. Short–term fiscal policy measures (e.g., temporary income tax cuts, Social Security payroll tax cuts, cash for clunkers, mortgage relief programs, and $787 billion of stimulus spending) undoubtedly prevented the U.S. economy from sinking into a deeper recession but failed to produce robust growth. Neither has the Fed's quantitative easing.

Generating strong, sustained growth requires new, longer-term policy measures, including the reform of entitlement programs, better job training for evolving labor markets, reform of the federal tax code and reducing overall spending to sustainable levels. This is a big job that will take years to complete, assuming there's the political will to tackle it. The big, near-term effort will involve avoiding the worst of the fiscal cliff and shoring up the U.S. economy to deal with weakness in global markets. The Fed has continued to use quantitative easing to supplement fiscal policy measures.

Avoiding the Worst of the Fiscal Cliff. The fiscal cliff refers to tax increases and spending cuts scheduled to take place automatically at the beginning of 2013 in lieu of action by Congress and the Administration to prevent them. Among the ten important tax increases scheduled to begin in the new year are termination of the Bush tax cuts, elimination of the temporary two-percentage-point cut in Social Security payroll taxes, and the end of inflation indexing for the Alternative Minimum Tax.

Ending the Social Security tax cut alone could take $125 billion out of consumers' pockets in 2013.

Fiscal cliff spending cuts result from the sequestration measure that was part of debt-ceiling deal reached between Congress and the Obama Administration in the summer of 2011. These automatic cuts scheduled for 2013 to 2022 amount to $110 billion per year, split equally ($55 billion) between defense and non-defense discretionary spending. Social Security and Medicare programs are exempt.

Implementing these fiscal cliff measures would increase taxes and reduce federal spending by about $600 billion (equivalent to 3.5–4 percent of GDP) in 2013 in an economy still weakened by the 2007–2009 recession. The threat of the fiscal cliff, Super Storm Sandy and other uncertainties shaved up to 0.5 percentage point off GDP growth in late 2012 and early 2013. In reaction to these uncertainties, business investment —a source of strength for the economy—declined at a 1.3 percent annual rate in the 3rd quarter of 2012. If full effects of the fiscal cliff go unchecked, the U.S. economy is likely to topple back into a recession that will bear a prominent "made in Washington, D.C." label.

A tricky part of preventing damage from the fiscal cliff relates to timing, since impacts of the cliff were scheduled to begin on January 1, 2013. Congress had very little time during its 2012 lame duck session to address major tax and spending policy changes. Most of the work completed in that session amounted to steps needed to avoid the worst of the fiscal cliff. Big decisions relating to taxes may be pushed back into early 2013 or later if an extension of most of the Bush tax cuts can be agreed upon. Gridlock extending far into 2013 on major tax and spending issues could be exceedingly damaging to the economy.

Adjusting to Weakness in Global Markets. Weakness in global markets would exacerbate problems related to a failure to deal effectively with the fiscal cliff. Exports have been a source of strength for the U.S. economy in the past three years but are now weakening. U.S. exports are expected to grow by only about 3.1 percent in 2013, lower than in 2011 and 2012 when exports expanded by 6.7 percent and 3.3 percent, respectively, and much lower than the 11.1 percent growth of 2010.

The U.S. and global economy have been spared problems that would have accompanied a collapse of the euro. This came partly as a result of European Central Bank President Mario Draghi's mid-2012 pledge to buy as many government bonds as needed from euro zone nations with troubled economics. In return, those nations must request financial bailouts from euro zone officials and agree to fiscal policy reforms.

While the euro has averted collapse, many euro zone economies are mired in recession and will see little or no growth in 2013. And countries that have requested bailouts will find it difficult to meet deficit reduction pledges. For 2013, this means that most weak economies of Southern Europe (Spain, Italy and Portugal) will remain in the euro zone and will have manageable interest costs on bonds issued to finance deficits and debt. But Spain — where the unemployment rate was about 25 percent late in 2012 — will find it difficult to craft a viable economic recovery plan. Moreover, despite repeated rescue efforts, Greece may exit from the euro zone late in 2013 or 2014 and revert to use of drachma, which would be devalued by 60 to 70 percent relative to the euro.

U.S. firms that are big exporters and investors in euro zone countries (Caterpillar, IBM, 3M, McDonalds, Kimberly Clark, DuPont, Ford and GM) have seen their earnings reduced as a result of the European recession. And near-term prospects are not bright for euro zone economic growth, which is expected to average barely above zero for 2013.

Weakness in global markets is not confined to the euro zone. While China's economy is improving, growth in the world's second-largest economy is likely to be subdued in 2013 (at about 7 percent, well below the 10 percent average growth of the past 30 years). Also experiencing weaker growth are Japan (which had negative GDP growth in the 3rd quarter of 2012), India and Russia.

Quantitative Easing Efforts by the Federal Reserve. The Fed's dual objectives are low inflation (2 percent or lower) and job growth. In mid-September 2012, Fed Chairman Ben Bernanke announced a new quantitative easing program (QE3), mostly aimed at increasing employment. Under QE3, the Fed will buy $40 billion of mortgage-backed securities per month for an open-ended period. QE3 will likely absorb the full supply of mortgage-backed securities issued by government-sponsored agencies during much of 2013. IHS Global Insight expects those purchases to translate into a 20–25 basis point reduction in average mortgage interest rates.

Bernanke concedes that QE3 is no panacea, but he expects little fiscal policy stimulus out of Congress and the Administration in the next few months and so feels that Fed action is necessary to boost the economy.

QE1 and QE2 didn't do much to stimulate the economy, even when accompanied by substantial short-term fiscal policy measures. The Fed cites studies showing that QE1 (late 2008) drove 10-year Treasury interest rates down by 40–110 basis points and that QE2 (late 2010) pushed the 10-year rates down by 15– 45 basis points. Economic growth remained subdued and unemployment high despite the presence of QE1 and QE2 and fiscal stimuli. Economic fore-

casters estimate that if QE3 results in purchases of $500 billion in mortgage-backed securities or Treasury bonds for a year, it will boost economic growth by 0.2 to 0.3 percentage points and reduce the jobless rate by 0.1–0.2 percentage points.

QE3 will reduce mortgage interest rates modestly, increase stock prices and reduce the value of the U.S. dollar. Normally, a weak dollar would unambiguously foster larger U.S. exports. But QE3's impacts on the dollar will be partially offset by weakness in the euro and currencies of other major exporters. Chairman Bernanke has urged financial leaders in other countries to stop "shadowing the dollar" and let their currencies rise in value as the Fed pushes down the value of the dollar. Few are likely to heed his advice.

Recent Fed policies amount to government controls on interest rates. These policies reduce the cost of capital relative to labor, giving companies incentives to substitute capital for labor and presumably limiting the effectiveness of Fed policies for increasing employment. The low interest rates also reduce incomes of senior citizens and others who depend upon interest earnings on CDs and savings accounts for a living. This may cause these individuals to pursue volatile, higher-risk investments.

Quantitative easing carries with it the risk of inflation. First, because monetary policies take effect after sometimes lengthy time lags, the Fed may not be able to time needed increases in interest rates accurately once a stronger recovery in underway, causing the massive amounts of liquidity in the U.S. and world markets to ignite inflation. The Fed then may have to slam on the brakes, push interest rates higher and short-circuit the recovery. Secondly, while low interest rates make it inexpensive to finance large government deficits, the cost of financing the deficits and debt will increase sharply if interest rates are increased to contain inflation. For example, each one percentage point increase in interest rates would push up costs for servicing the federal debt held by the public by about $110 billion per year, crowding out other federal programs.

Fed Chairman Bernanke announced in mid-December 2012 that the Fed will supplement QE3's $40 billion per month purchases of mortgage bonds with $45 billion in monthly purchases of longer-term Treasury bonds. These purchases would continue as long as unemployment remained above 6.5 percent and inflation was below 2.0 to 2.5 percent. This could be a long time, lending credence to wags' comments that QE3 means QE eternity. It is unclear whether the Fed can exhibit the wizardry needed to unwind impacts of such long-lasting money printing without damaging the economy during the next few years.

If the big policy challenges outlined above can be addressed successfully and no nasty shocks hit the economy, the U.S. economy may gain momentum and exhibit real GDP growth of 3–4 percent beginning in 2014 and 2015. According to a common rule of thumb, such increases in GDP could reduce the unemployment rate to about 7 percent.

Agricultural Income

In late November, the USDA forecast U.S. net farm income at $114 billion for 2012. This is down $3.9 billion (3.7 percent) from 2011 but the second highest on record. Higher prices for most crops and crop insurance indemnity payments have helped to offset impacts of lower crop production resulting from the 2012 drought. Federal crop insurance payments will provide big income supplements, since more than 80 percent of the acreage of major U.S. field crops is covered by the insurance.

The high net farm income figure masks the financial damage that will be sustained as a result of the drought by many dairy, beef, hog and poultry producers who paid sharply higher prices for feed and forage purchased in 2012. Livestock and poultry producers lacking strong balance sheets and adequate access to credit will be hit hardest. Major financial losses have occurred in hog farming, dairy farming (particularly in California) and integrated poultry feeding operations. Further consolidation will occur in these segments of the U.S. farm economy as a result of these financial problems.

Farmland prices, especially in the U.S. corn and soybean belt, continued to increase during early 2012, but the rate of increase slackened in the 3rd quarter as drought fears escalated. Prices for "good" farmland in the portion of the 7th Federal Reserve District covering Wisconsin decreased by 2 percent during July-October 2012. Even so, average prices for good farmland across all 7th District states were up by an average of 13 percent from year-earlier levels. The Wisconsin price increased by 8 percent during this period, while Iowa farmland prices were up 18 percent.

Most 7th District bankers surveyed anticipated that farmland prices would stabilize or even rebound in the 4th quarter of 2012. Prospects for stable or higher farmland prices stem in part from expectations that high crop and livestock returns will be capitalized into farmland prices. But another factor is involved. The Fed's near-zero interest rate policies have steered investment funds away from low-yielding instruments and into assets such as farmland.

Agribusinesses face substantial risk in 2013 as a result of the drought.

Many firms saw their raw product costs rise as a result of short supplies. Adjustments to supply shortfalls have varied. Large, integrated hog and poultry producers imported corn and soybeans, albeit in limited amounts, from Brazil and Argentina in 2012. Cargill buys grain and oilseeds from multiple countries to supply customers in China and other foreign markets. Exporters with this capability will possess a major competitive advantage in 2013.

Deere's stock price—a barometer of expected U.S. net farm income—has held up well. But many farmers, especially livestock producers hit hard by the drought, have postponed buying big-ticket items such as tractors and combines until there's less uncertainty about farm policy, economic policies, weather and other factors.

While uncertainties exist in 2013, the longer-term outlook for U.S. farmers is bright because of a tightening supply-demand balance. Luther Tweeten, an Ohio State agricultural economist, estimated that in the 1960s, excess production capacity in U.S. agriculture was about 6 percent. Today it is near zero. With a few exceptions (notably Brazil and parts of Africa), there's also little excess production capacity in the rest of the world. Reduced yields and a slower pace of gains in productivity will add to supply tightening. Worldwide, year-to- year gains in productivity for crops and livestock have declined from 2 percent in 1962 to 1 percent in 2012.

These trends in supply and productivity, coupled with increased demand in the face of growing population and incomes worldwide, point to substantially higher farm product prices over the long run. Given these developments, it's not that surprising to see double-digit annual increases in U.S. farmland prices.

Agricultural Exports

In November the USDA forecast that the value of U.S. agricultural exports will reach a record $145 billion in fiscal 2013, up from $135.8 billion in fiscal 2012. This forecast may seem anomalous in view of the supply-reducing impacts of the 2012 drought. The USDA bases its forecast on several developments, including higher volumes and value of wheat exports and higher values of soybean, rice and horticultural products. Export values for most other agricultural products were forecast to remain essentially flat or decline.

Record-high prices for corn and soybean exports in the fall of 2012 led to some reductions in U.S. export sales. Importers from China, in particular, opted to buy corn and soybeans from Brazil and Argentina rather than pay more in the U.S. Corn exports were hit hardest by the stiff foreign competition. The USDA forecasts that corn exports will be $10.7 billion in fiscal 2013, down 5 percent in value (19 percent in volume) from the previous year.

Buyers' responses to high U.S. prices also promise to produce longer-term effects. If U.S. prices are not competitive, both Brazil and Argentina are likely to claim a larger share of soybean and corn exports in the future. Brazil, in particular, has not fully exploited its land base and has incentives to expand production of export crops. Analysts point out that Brazil could become the world's largest producer of soybeans as early as 2013, knocking the U.S. out of that position.

According to the U.S. Dairy Export Council (USDEC), U.S. dairy exporters in 2012 maintained their export market share at about 19 percent of volume in competition with other Big-5 dairy exporting countries — New Zealand, EU, Australia, and Argentina. But the U.S. dairy export product mix changed in 2012. U.S. traders increased their share of cheese and maintained their share of world NDM/SMP exports but lost shares of world butterfat and whey products.

Dairy exports for fiscal 2013 are difficult to predict. The USDA uses a drought response scenario to predict lower dairy exports, indicating that dairy exports will fall by about $170 million to $5 billion in fiscal 2013 as high feed costs lead to lower milk production and reduced supplies for domestic use and exports.

Weaker demand in global markets will exert some downward pressure on prices in dairy export markets in 2013. But the USDEC forecasts increased U.S. cheese and butter exports and overall strength in average dairy export market prices in 2013. Its analysts believe that drought-related export shortfalls are likely to be manifested mostly in lower exports of skim milk powder.

U.S. bilateral and multilateral agricultural trade negotiations under the Doha Round of the World Trade Organization (WTO) remained on the back burner in 2012 and probably will stay there in 2013. But Russia's entry into the WTO in 2012 is likely to result in some longer-term expansion of U.S. agricultural exports to that country. There also are signs that the U.S. will try to move along negotiations on the Trans Pacific Partnership in 2013. If that partnership materializes, it would likely lead to an expansion of U.S. agricultural exports.

In summary, drought-related supply shortfalls for some products, foreign buyers' sticker shock to U.S. corn and soybean prices, possible weakness in foreign demand for wheat, soybeans and horticultural products and weakness in global markets all suggest that agricultural exports are likely to be below the record totals forecast by the USDA for fiscal 2013.

Farm Production Costs

Bruce Jones (608-265-8508)

Production Inputs

Prices of key farm inputs have been volatile over the past six years. Prices of fertilizers and fuels spiked in 2008, moderated in 2009 and have been trending upward at relatively steady rates since then.

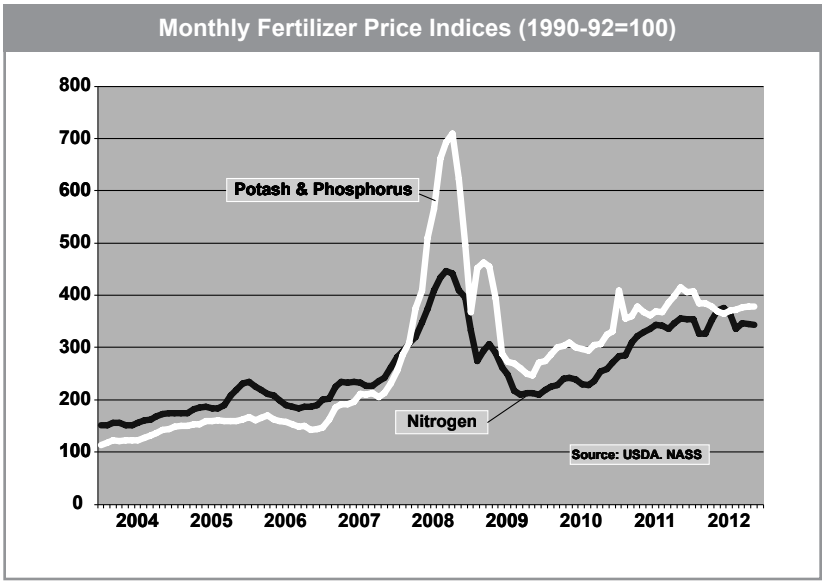
Nitrogen prices have increased about 50 percent since 2010. Most of that run-up happened in 2010 and 2011. Fortunately for farmers, nitrogen prices stayed relatively constant in 2012. They're high now, but they are still about 25 percent lower than in 2008.

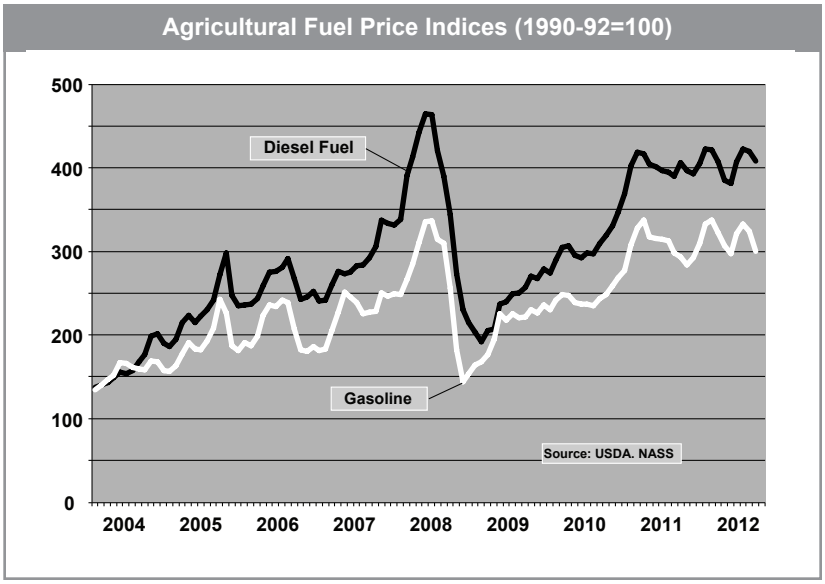
Potash and phosphate prices have also settled down since spiking in 2008. In late 2012 they were down about 40 percent from 2008 levels. Prices for both have been relatively constant and are down a bit from what they were in late 2011 and early 2012.

Fuel prices have mirrored those of fertilizers—up dramatically in 2008 and falling off the following year. Since 2009, the prices of both diesel fuel and gasoline have trended upward. As a result diesel and gasoline are now near to what they were in 2008.

Lately diesel and gasoline prices have been relatively stable. The bad news is they have held constant at relatively high levels. This will likely continue through 2013.

The U.S. Energy Information Agency (EIA) is forecasting modest declines in fuel prices for the coming year. This is based on the assumption that while demand for fuel will rise as disposable incomes increase, these will be offset by drops in household fuel needs as older vehicles that get fewer miles per gallon are replaced with newer fuel-efficient vehicles.





EIA expects global oil inventories to expand in the first half of 2013, mostly because of increased supplies from non-OPEC countries, including Canada and the U.S. This should help keep oil prices from rising dramatically in the coming year, because inventories can be drawn down in response to upward ticks in oil prices.

Seed prices have about doubled since 2006, and there is no sign that this trend will abate. One reason that seeds costs are up is the increased use of seeds that are genetically modified to resist plant pests. The higher seed costs have been partially offset by lower spending for farm chemicals as farmers are able to cut back on use of insecticides and herbicides. It remains to be seen whether that will continue to be true in the future. Seed supplies are likely to be a little tight in the coming year, because demand will remain strong in the face of continued high corn and soybean prices, and seed production was down due to the 2012 drought.

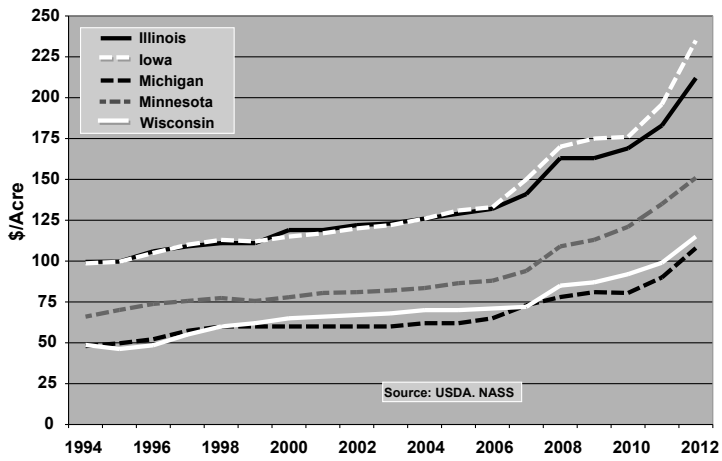
Farmland Rents

Cash rents for Wisconsin farmland continued to rise in 2012. Average cash rents were up about $16 per acre, or 16 percent, from $99 to $115. Cash rents in both Iowa and Illinois topped $200 per acre in 2012. Average cash rents were $212 per acre in Illinois (up 15.8 percent from 2011) and $235 in Iowa (up 19.8 percent).

Robust growth in cash rents is not a new development. The uptick in cash rents in Wisconsin and neighboring states in 2012 is on par with what happened in 2008 in response to a sharp rise in corn and soybean prices. Wisconsin cash rents rose about 18 percent that year, while rents in Iowa and Illinois rose 13 percent and 15.6 percent respectively.

It is a good bet cash rents will continue to rise in 2013. But the increase probably won't be as large as in the last few years. Last year's drought was a stark reminder for both farmers and landlords that high crop returns are by no means a sure thing. Farmers will likely be a little less eager to pay top dollar. As they do their break-even analysis on rents, they may be inclined to bid a little less for the land and put the difference toward crop insurance.

Farmland Cash Rents



Credit

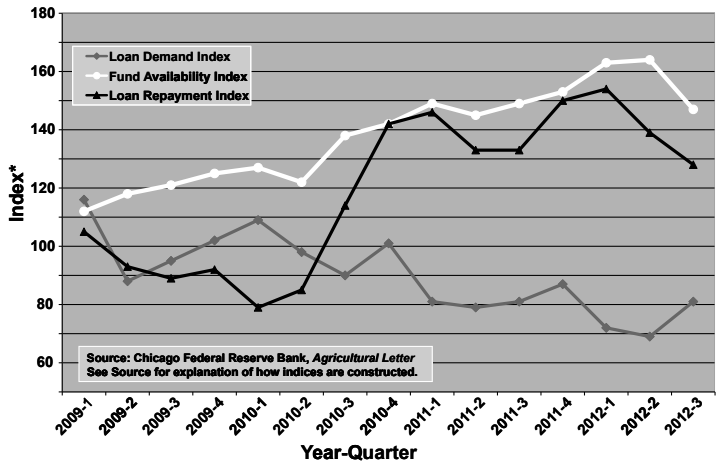
Bankers surveyed by the Chicago Federal Reserve Bank indicated current credit conditions have deteriorated somewhat from 2011.[1] This slippage in credit conditions is not surprising given that some farmers saw their incomes drop due to drought conditions across much of the Midwest.

Loan demands were up in the third quarter of 2012, while loan repayment was down in both the second and third quarters. These patterns are to be expected in a drought year. Demand for loans rise because farmers need more funds to cover operating expenses for the balance of the growing season and early harvest. Repayments are down because farmers are either holding off on selling grains in hopes of further increases in grain prices or using proceeds from sales to stock up on livestock feed.

The availability of loan funds is reported to have dropped slightly over the past year. This again is what one would expect when farmers' demands for loans increase and repayments on existing loans decline. The contraction in loan funds is relatively small and the availability of loan funds in the third quarter of 2012 is still well above what it was in 2009. There is no reason to expect credit to be in short supply in 2013.

Some observers of farm land markets worry that lenders may be repeating the mistakes made in the 1970s, when plentiful credit encouraged farmers to get into bidding

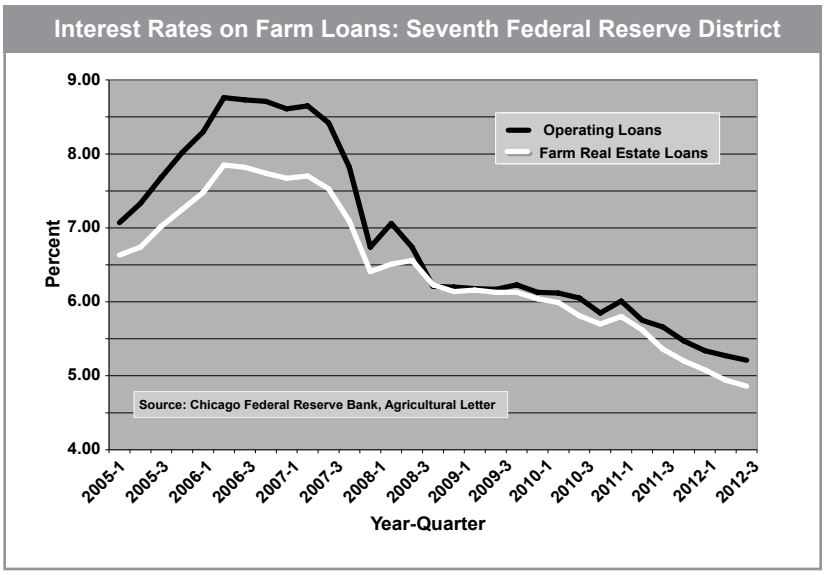
Agricultural Credit Conditions: Seventh Federal Reserve District



1. The Chicago Federal Reserve Bank (Seventh District) covers all or most of the states of Minnesota, Iowa, Wisconsin, Michigan and Illinois.

wars that drove land prices to unrealistic levels. While this could be happening, it is highly unlikely. Banking regulators are still wary of the problems that arose in the last decade when easy credit policies created a bubble in the housing market. They'll be watching carefully to ensure that farm lenders do not get carried away and start loaning excessive amounts of money to heavily leveraged land buyers.

Despite reported reductions in loanable funds, interest rates on both operating loans and real estate loans have continued to decline. Real estate loan interest rates in the Seventh Federal Reserve District are reported to have dropped below 5 percent, and the rates on operating loans were down to about 5.25 percent. These favorable trends in interest rates—at least from the perspective of farmers —are largely the result of the expansionary monetary policies that have employed by the Federal Reserve Board the last couple of years to stimulate the economy (see macroeconomics and trade section). Eventually these easy money policies will have to end. But until then, interest rates on nearly all loans are likely to be relatively low.



Dairy

Mark Stephenson (890-3755) and Bob Cropp (262-9483)

Current Dairy Situation

For dairy producers, 2010 and 2011 were recovery years following the recession and low milk prices of 2009. The 2012 average U.S. milk price was $18.30/cwt, down $1.84 per hundredweight from the all-time high average price of $20.14 in 2011. The milk price for Wisconsin averaged higher at $19.23, about a dollar below the $20.32 record set in 2012. But prices alone don't describe a farmer's year. In fact, producers might characterize 2012 as "disastrous" or "middling," depending on their business model or their geographic location. Strong milk production in New Zealand and widespread drought in the U.S. have really defined this year for the U.S. dairy industry and Wisconsin producers.

Global, U.S., and Wisconsin Milk Supplies

The related, but very different, weather patterns of La Niña and El Niño were both a part of the 2012 story. We have had a couple of years of La Niña, which is a colder body of water in the equatorial Pacific. When La Niña forms, it tends to create warmer and drier weather in the central United States. As described earlier in this issue, the 2012 drought was widespread and one of the nation's worst, causing significant loss of crops throughout the central portion of the country. Producers in the lower half of Wisconsin were not spared. Some had total crop loss, while others saw their yields greatly reduced. While all dairy farms have been affected by higher purchased feed costs, for those whose business model calls for purchasing concentrates and forages, the milk price may not have been adequate to cover variable costs of production.

The other part of the La Niña story plays out on the other side of the Pacific, where it brought higher-than-normal rains to Oceania. New Zealand has benefited from excellent pastures for the past two seasons. Dairy operations there increased milk production by more than 10 percent in 2011 and are on track to boost it nearly 5 percent this year. New Zealand production is important to the U.S. dairy industry because farmers there compete for the same export markets. New Zealand production impacts U.S. milk prices, and vice versa.

El Niño is a warmer-than-normal body of water that can form in the equatorial Pacific Ocean, and when it does, it typically brings greater quantities of rain to the western U.S. and drier weather conditions to Oceania. El Niño was expected to form in 2012, which would have brought rains to relieve the U.S. drought would likely have worsened the pasture conditions in New

U.S. Milk Production: 2011 and Preliminary 2012

	2011	*2012*	*Percent Change*
United States:			
Average number of milk cows (1,000)	9,194	9,235	+0.5%
Milk per cow (pounds)	21,346	21,640	+1.4%
Total milk production (billion lbs.)	196.25	199.8	+1.9%
Wisconsin:			
Average number of milk cows (1,000)	1,265	1,270	+0.4%
Milk per cow (pounds)	20,645	21,383	+3.6%
Total milk production (billion lbs.)	26.1	27.2	+4.1%

Source: 2011 - USDA, NASS; 2012 - Author's estimates

Zealand. However, El Niño did not form, and the National Oceanic and Atmospheric Administration does not expect it to do so in the year ahead.

U.S. milk production increased significantly during the first half of 2012, up more than 4 percent in the first quarter and 2.1 percent for the second quarter. As production rose, milk prices fell. The average U.S. milk price fell from $19 per hundredweight in January to $16.20 in May.

The combination of much lower milk prices and rising feed costs cut into margins (returns over feed costs), bringing two effects. First, producers fed less grain and concentrate, which dampened increases in milk production per cow. Milk per cow was up less than 1 percent over 2011 in June, dropped in both August and September and grew only slightly in each of the remaining months. Second, low margins sparked a trimming of the national dairy herd. U.S. milk cow numbers, which had been rising since October 2010, peaked in April and began a slow decline in May that continued until November. As a result of fewer cows and stalled growth in milk per cow, month-to-month increases in total milk production slowed and were negative by the third quarter.

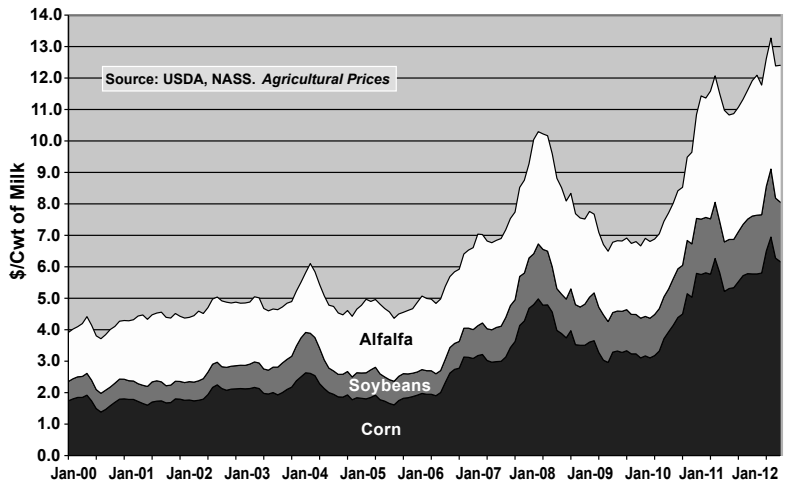
Following a fourth-quarter rebound, milk production for the year did increase by about 2 percent. That was just enough to break the annual milk production milestone of 200 billion pounds. As growth in milk production slowed in the last half of the year, milk prices improved. The November average milk price of $22.00 per hundredweight was the high for the year and the highest November U.S. all-milk price on record.

In 2008, high oil prices impacted dairy feed values. Demand for corn to produce ethanol doubled the ration value for a very short time. Although feed values retreated somewhat during 2010, the impacts of the drought have taken the value of dairy ration to new highs.

Western dairy operations typically follow a business model that entails purchasing all feeds, and their feed costs are relatively high because the components have to be transported longer distances. Consequently, record-high feed prices hit western dairies disproportionately hard. This showed up in milk production reports in the last quarter of 2012. Milk production in California declined by 3.9 percent in September, 3.5 percent in October and 2.3 percent in November.

In contrast, much of Wisconsin's milk is produced on farms that grow at least their forage base, and although about 80 percent of the state endured some level of drought during the year, the state was able to increase production by 3.5 percent

NASS Dairy Ration Value



in September, 4.1 percent in October and 4.7 percent in November. Although crop yields were impacted, the quality of homegrown Wisconsin feeds was quite good, and many farms have carryover stocks of feed to last well into the new year.

Wisconsin will set a new milk production record in 2012 at about 27.2 billion pounds—an increase over 2011 of more than 1 billion pounds. The increase comes from 0.4 percent more cows and a surprising 3.6 percent increase in milk per cow, the largest increase since 2005.

The 2012 increase in Wisconsin milk production continues a turnaround that began eight years ago. The state's milk production bottomed out in 2004 at 22.1 billion pounds and has increased each year since for a total increase of 5.1 billion pounds, or 19 percent. Milk cow numbers started to increase beginning with 2006 and have grown by 34,000 head since then.

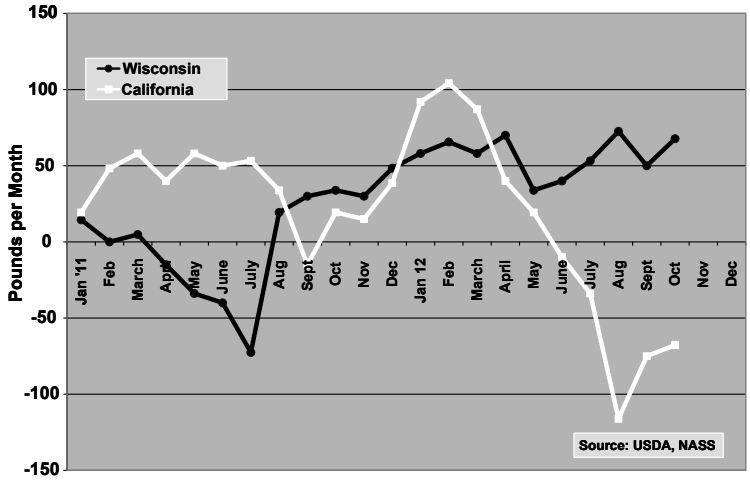
Dairy Product Demand

Unemployment has remained stubbornly high following the recession in 2008–2009. However, there has been some evidence of optimism on the part of consumers, evidenced by increases in the purchase of durable goods and other indicators of consumer sentiment. Retail dairy prices have increased, but no more rapidly than other foods. Per capita consumption of most dairy products has increased, with yogurt being a particularly bright spot. The exception is beverage milk, which dropped below a threshold of 20 gallons per capita in 2012.

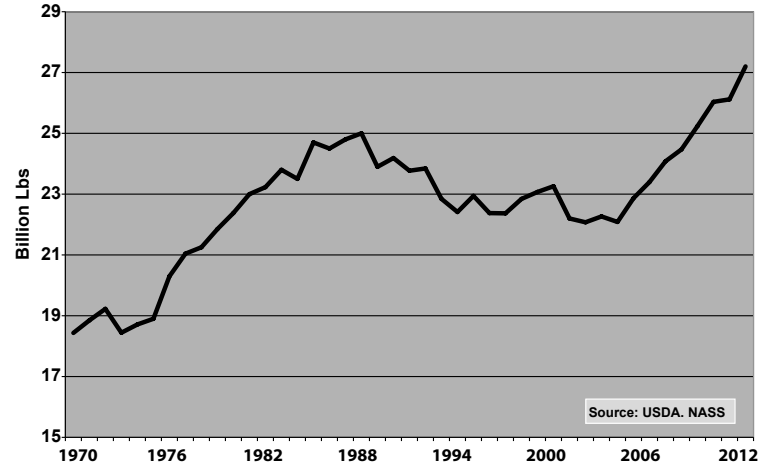
Dairy Exports

The U.S. continues to solidify its relatively new position as a major dairy product exporter. The European Union and New Zealand are essentially tied with 35 percent and 34 percent shares of global trade

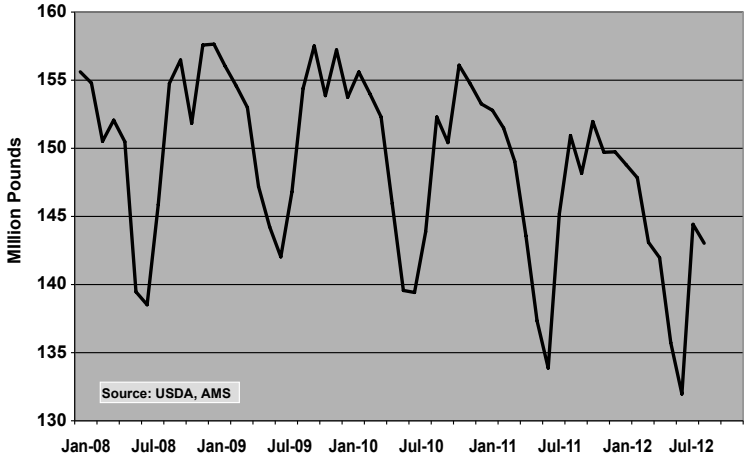
Year-Over-Year Change in Milk per Cow

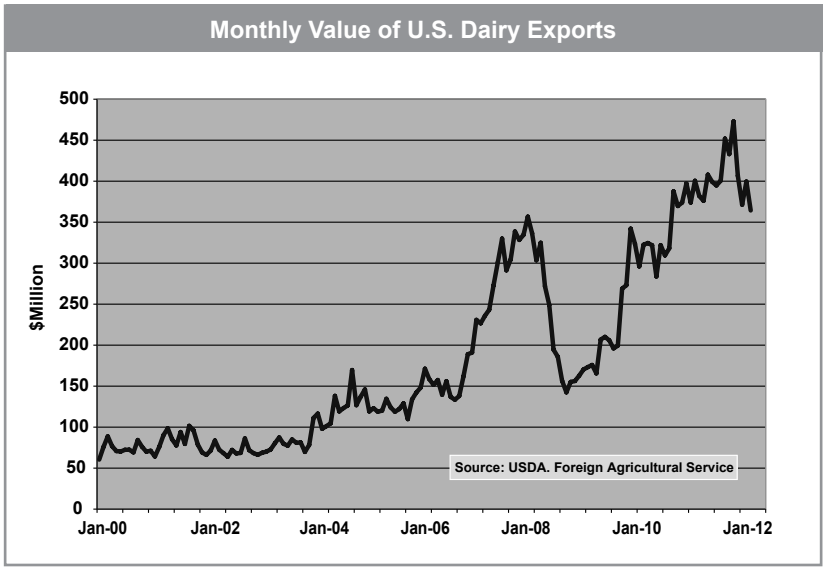


Wilsconsin Milk Prodcution



U.S. Average Daily Sales of Fluid Milk





respectively. The U.S. comes in third with about a 19 percent share of world exports. Australia ranks fourth with 7 percent of the trade.

Nonfat dry milk or skim milk powder accounts for the largest volume of U.S. exports, followed closely by dry whey products. Lactose, cheese and butter round out the remaining bulk of export products in 2012. From January through October, the U.S. exported about 13.5 percent of the milk solids it produced.

Dairy Stocks

Strong U.S. milk output in the first half of the year has given way to almost flat production or even modest declines in some months. Both domestic and export demand have remained strong enough to take all of dairy products produced. And depending on the product, stocks were normal to tight in the third quarter. Butter and whey stocks were in a normal range, but stocks of cheese and, to a lesser extent, nonfat dry milk, were tight.

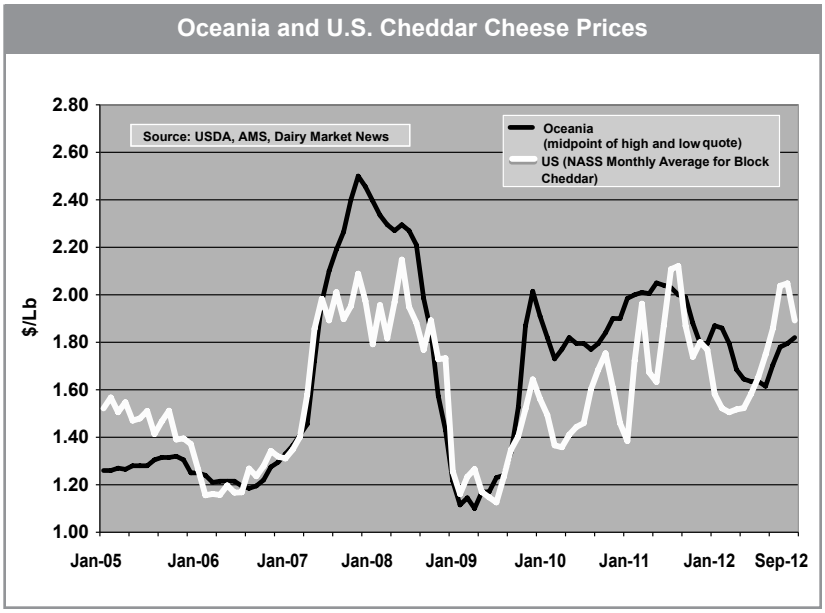
2013 Dairy Outlook

Short inventories of dairy products would normally suggest strong prices for milk and dairy products. But in fact, product prices have fallen precipitously in spot markets in the last quarter. This points out another complexity of our emerging dependence on export markets.

The chart that follows shows the monthly simple average of high and low prices for Oceania and the NASS/AMS monthly prices for cheddar cheese. U.S. products normally trade at a discount relative to Oceania's in world markets. Since September of 2012, U.S. cheese and butter prices have been substantially higher than Oceania's. U.S. stocks are not at burdensome levels and would normally indicate strengthening prices, but when our products sell for more than our competitors', it erodes our ability to compete. That is likely the reason that domestic spot prices and futures market opinions have fallen.

Oceania has very seasonal milk production—farms there produce very little May through June—and cows there are now several months past their peak lactation. World markets have absorbed the products during their flush, which signals a robust world demand for dairy products. It is likely that U.S. prices will not have much further to fall, but rather that world prices will come up to meet our own.

We are projecting the Wisconsin all-milk price to average about $20.15 in 2013, up about 90 cents from 2012. Moreover, the futures markets indicate a continual decline in soybean meal prices from now



through the next harvest season, amounting to a $70-per-ton drop. Corn prices are expected to remain at current high levels until next harvest season when futures markets anticipate a decline of about $1 per bushel. The combination of higher milk prices and an easing of feed prices would improve farm margins significantly in the year ahead.

U.S. milk cow numbers will probably continue to decline through at least the first half of 2013 and average 0.5–1 percent lower than last year. Milk per cow may average 1–1.5 percent higher, resulting in little or no increase in total U.S. milk production.

There is always uncertainty surrounding any forecast, but there may be more of it in 2013. Two-thirds of the nation is still designated as being under some level of drought, and soil moisture ranges from marginal to inadequate across much of the country. If drought persists into the 2013 growing season and feed prices remain high, we would expect milk production to tighten further. And, if more normal weather returns to New Zealand pastures, it will be hard for Oceania to maintain its dramatic production increases. With continued strength in world demand for dairy products, we could see milk prices exceed our forecast in the second half of the year.

2013 Milk Price Forecasts

	Quarter			
	Jan-Mar	***Apr-Jun***	***Jul-Sep***	***Oct-Dec***
Class III	$18.40±0.10	$18.70±0.10	$18.90±0.15	$18.20±0.35
Class IV	$18.65±0.30	$18.50±0.30	$18.00±0.15	$17.70±0.10
WI All Milk	$19.95±0.10	$20.25±0.10	$20.40±0.10	$19.75±0.30

Dairy Policy

About every five years Congress passes legislation referred to as the Farm Bill. The policy it lays out is usually temporary—it terminates on a certain date unless it is renewed. There were a few items in Title I of the 2008 Farm Bill that pertain to dairy. Most significant was a continuation of the Milk Income Loss Contract (MILC) program, with a few changes from the previous bill. The 2008 bill also created the Dairy Product Price Support Program, which altered the previous Dairy Price Support Program by delinking prices for dairy products purchased by the government to maintain a farm milk safety net from a specific milk price, most recently $9.90 per hundredweight. The 2008 Farm Bill called for the MILC program to terminate on September 30, 2012. The Dairy Product Price Support program was to end on December 31.

Farm Bills are large, complex and often controversial. The Senate managed to pass its version of a 2012 Farm Bill last June. The House reported its version out of the ag committee but, finding insufficient support for the package, Speaker Boehner never brought it to the floor for a vote. It is not unusual for a Farm Bill to expire without a new one in place. The usual remedy is to pass an extension of the previous bill to give Congress time to work out the problems. However, Congress did not do that this year.

If a farm bill expires without new legislation or extension, dairy policy reverts to permanent legislation passed decades ago. The old version of the dairy price support program, passed in 1949, instructs the Secretary of Agriculture to set a milk price goal between 75-90 percent of parity. At the 75 percent level, the price goal would have been over $38 per hundredweight—about double the current farm value of milk. This would have obligated USDA to purchase cheddar cheese, butter and nonfat dry milk at prices well above current market prices, providing an incentive for manufacturers to divert product from commercial outlets to government storage. Such aggressive market intervention would have been very disruptive to dairy markets. The prospect of invoking the permanent legislation on January 1, 2013, became known as the "Dairy Cliff."

Congress avoided the Dairy Cliff by extending the 2008 Farm Bill through September 2013. As of this writing, there are still details to be determined, but the Dairy Product Price Support Program was renewed at prices well below current market levels and the MILC program was revived at payment levels authorized prior to September 1, 2012—higher than what applied later.

The newly seated Congress will have to address a new Farm Bill in 2013. It will have to address the same issues as last year, but the political environment will likely be less favorable from a spending perspective. In March, the Congressional Budget Office will issue a new baseline against which fiscal spending will be measured. Nobody expects the new baseline to look more optimistic, so the Farm Bill process will have to begin again and find greater cuts to spending than called for in the previous versions.

Livestock and Poultry

Pat Luby (608) 265-8137

2012 in Review

Meat Production Down a Bit

Meat production was essentially flat in 2012. The industry was hindered by high and volatile feed prices, multi-year regional droughts and a relatively sluggish economy, but it was supported by continued favorable export markets. Total meat production of 92.4 billion pounds in 2012 was about 1.6 percent below the recent record of 93.9 billion set in 2008.

Pork output of about 23.2 billion pounds in 2012 was up 1.8 percent for the year, close to the all-time record high reached in 2008. Since 1975, pork production has risen 106 percent from 11.3 billion pounds.

Beef shows a different trend. After increasing 275 percent over 24 years, from 9.3 billion pounds in 1952 to 25.7 billion pounds in 1976, beef production has trended sidewise. The industry produced a record of 27.1 billion pounds in 2002. In 2012 it produced 25.6 billion pounds, down 1.2 percent from 2011 and down almost 6 percent from a decade earlier.

Broiler output, which tripled from 1952 to 1976 and tripled again from 1976 to 2005, has slowed considerably in recent years. Output in 2012 was down 0.7 percent from 2011. It had risen for 33 consecutive years, from 1975 to 2008, but has increased less than 4 percent in the last 7 years.

Turkey production in 2012 was up 3.3 percent from a year earlier. After rising 138 percent from 2.6 billion pounds in 1984 to a record 6.2 billion pounds in 2008, it has fallen a little more than 4 percent in the last four years.

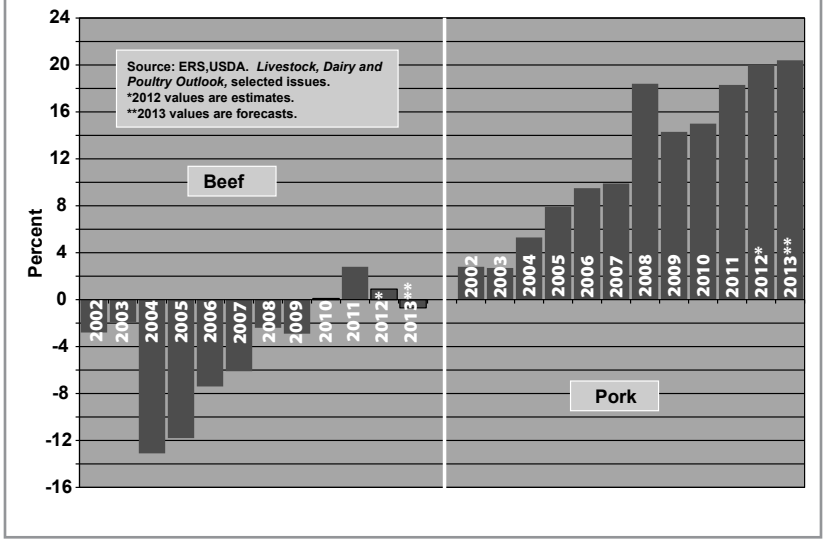
Exports Continue Strong

Exports continue to be the bright spot in the meat business. For many decades, the U.S. imported 5–10 percent of the beef it consumed. But during the last six years, there has been a near balance between beef exports and imports.

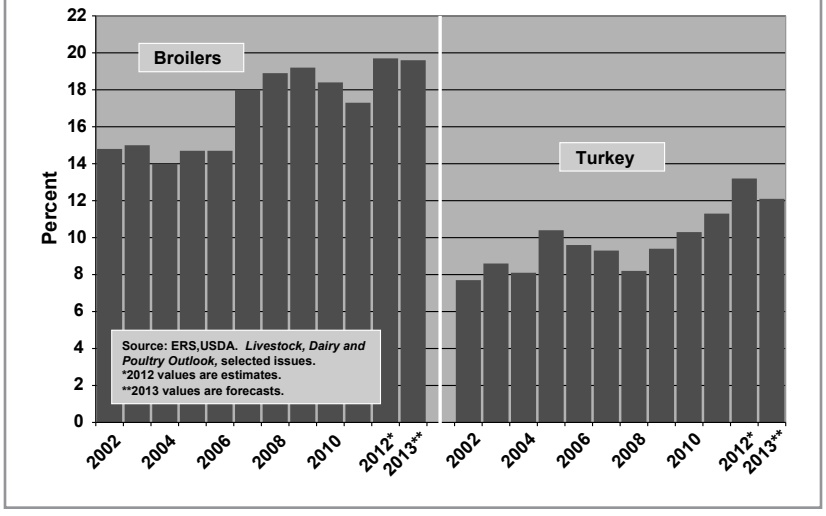
Until 1995, the U.S. imported slightly more pork than it exported. Exports slightly exceeded imports from 1996 through 2003. Since 2004, pork exports have grown rapidly. More than 20 percent of U.S. pork is now exported, far exceeding the 2–4 percent we import.

Broiler and turkey exports slightly exceeded imports for many years, but exports of both began to expand in the 1990s. Exports now account for about 20 percent of broiler production and for more than 10 percent of turkey output.

U.S. Foreign Trade Balance (Exports minus Imports) as a Percent of Production: Beef and Pork



U.S. Foreign Trade Balance (Exports minus Imports) as a Percent of Production: Broilers and Turkey



Per Capita Meat Consumption Continued to Slip

From 2004 to 2007, U.S. meat consumption per capita peaked at between 221.0 and 221.6 pounds per person each of the four years. It has trended downwards since then in the face of rising U.S. exports. Overseas buyers have bid meat away from U.S. consumers. In 2012 meat consumption fell to 202.2 pounds per person, down 9 percent in the last 5 years—the lowest level in 22 years.

Consumption of beef per person peaked at 94.4 pounds in 1976, but in 2012 it had fallen to 57.5 pounds. This is the lowest level in more than a half a century, amounting to a decline of 39 percent in 36 years.

Pork consumption per person was 45.5 pounds in 2012. That's down less than 1 percent from the previous year, but 14 percent below its recent peak of 53.1 pounds in 1994. An earlier peak of 60.6 pounds was reached in 1971.

Broiler consumption per person rose rapidly over the decades to a high of 86.5 pounds in 2006. It fell 3 percent in 2012 to 80.4 pounds, down 7 percent in 6 years.

Turkey consumption per person rose rapidly from 4.5 pounds in 1965 to a high of 18.5 pound in 1995 before leveling off. It rose 3 percent in 2012, but was still 11 percent below its high reached 17 years earlier.

2013 Forecast

Meat Production Down Again in 2013

Meat production is expected to decline again in 2013. Annual output of each of the four major meats is likely to fall—an extremely rare event. Beef and turkey production is expected to drop 3–5 percent. This would be the smallest beef output in nine years. Pork and broiler output is expected to be down 1–2 percent.

Cattle Industry Contracting a Bit More in 2013

The cattle industry continues to contract. The number of cattle and calves on U.S. farms peaked in 1975 at nearly 132 million head. It since has fallen to about 90 million head. The 2012 calf crop is estimated to have been the smallest in 63 years.

A modest decline in the numbers of cattle and calves is expected again in 2013. It is a tribute to the cattle industry's long history of productivity increases that beef production has fallen so little relative to cattle numbers over time.

Despite an increase of more than 45 percent in the annual price of choice cattle during the past three years, choice cattle prices should average a little higher in 2013, due largely to reduced beef output and reduced competition from other meats.

The average annual price of feeder cattle has risen more than 50 percent from 2009 to 2012. As always, corn prices will be a very important factor in 2013 but feeder cattle prices have a chance of matching the record set in 2012.

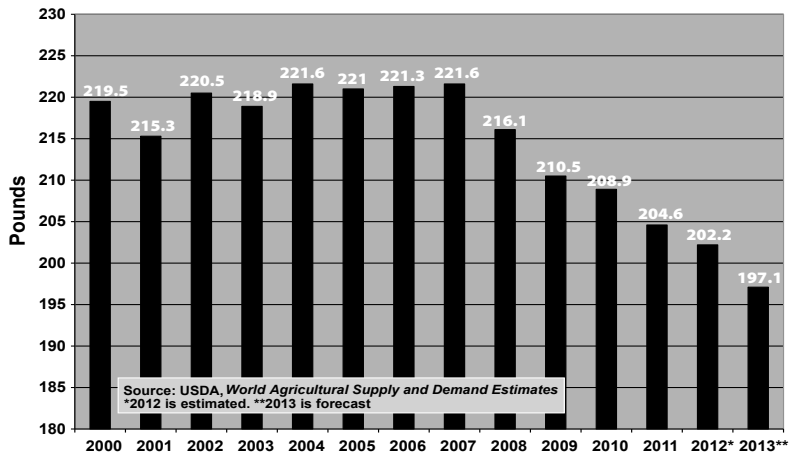
Average cow prices have been strong for the last three years, increasing about 65 percent during that time. It is unlikely that that pace can continue in 2013 but little price decline is anticipated.

Cow slaughter was down about 4 percent during 2012 (up about 4 percent for dairy cows and down about 12 percent for beef cows). The number of cows slaughtered had been up in five of the preceding six years, reaching the highest level in 15 years in 2011.

Hog Prices May Rise a Bit in 2013

Hog prices fell about 8 percent in 2012 after rising more than 60 percent from 2009 to 2011. With the production of competitive meats being muted a bit, annual prices could average a bit higher in 2013.

Total U.S. Per Capita Meat Consumption



Changes in Production and Prices for Livestock Products

Livestock Species/ Product	Production in Million Pounds			Production in Cents per Pound		
	2009	2012 Forecast	% Change	2009	2012 Forecast	% Change
Choice Steers	25,963*	25,872*	-0.4%	83.25	122.85	48%
Lambs	171	156	-8.8%	90.10	113.55	26%
Barrows and Gilts	22,993*	23,178	0.8%	41.24	61.10	48%
Broilers	35,511	36,939	4.0%	77.6	86.8	12%
Turkey	5,663	5,981	5.6%	79.50	105.7	33%
Eggs**	6,485	5,981	3.0%	103.00	118.0	15%

*Total production of beef and pork

**Volume in million dozen and price in cents/dozen. See source for pricing points.

Source: USDA, Livestock, Dairy and Poultry Outlook, December 2011 and December 2012.

Hog breeding stock has trended sidewise for the last 11 quarters around 5.7–5.8 million head, far below the 7.7 million head counted in 1979. Meanwhile, pork consumption per person in 2012 at 46 pounds was little changed from that of the late 1970s, despite large increases in pork exports and domestic population. Again, this reflects the significant productivity increases attained by the pork industry.

Broiler Prices Up Slightly in 2013

Broiler production is expected to be down 1–2 percent in 2013. Average annual prices have averaged between $76.40 and $84.20 per cwt. during the past six years and could break out on the upside of that range in 2013.

Turkey Prices in 2013 Could Exceed 2012 Record

The average price of turkeys rose 3 percent to a record high in 2012 despite an increase in output. Another modest increase in production in 2013 may not prevent a new record high annual price in 2013.

Lamb Production Down in 2013, Prices May Be Down, Too

Lamb production rose in 2012 for the first time in a decade driving down annual prices about 20 percent. A 6–8 percent drop in production is forecast for 2013. Lamb prices were very depressed late in 2012 and will need an impressive recovery to average higher in 2013.

Egg Output Little Changed, Prices May Reach a New High in 2013

While egg production has risen very slowly in recent years, prices have risen about 15 percent in the last three years to a record high. Output should be little changed in 2013 and prices may well set a new high.

Exports Should Continue Strong

Net beef exports have recovered nicely since the problems related to BSE in 2003. Exports have nearly matched beef imports in recent years and are expected to do so again in 2013. Pork exports tell an even better story. In the 1980s, pork imports exceeded exports by a little over one billion pounds per year. During each of the last past two years, pork exports exceeded pork imports by well over four billion pounds and are expected to do so again in 2013.

Per Capita Meat Consumption Will Decline Again in 2013

We'll see another drop in per capita meat consumption in 2013. This is due to continued strength in the export markets, a moderate rise in population and a small dip in meat production caused largely by adverse weather in major cow/calf production areas and severe heat and drought in the Midwest in 2012. Meat consumption is expected to fall about 2 percent in 2013 to about 197 pounds per person, a decline of about 11 percent in six years.

Retail Meat Prices Moderately Higher in 2013

Retail meat prices are expected to rise a bit more in 2013. The headwinds of higher feed costs and weather problems will mean slightly lower meat production. Exports are expected to remain firm and be a significant demand factor for meat. The strength of domestic consumer demand and employment remains a question. A repeat of moderately higher meat prices in 2013 is likely. As we close out 2012, the CPI for meat prices is a bit over 2 per cent more than a year ago. All retail food prices are up a little less than 2 percent and the average price of all items is up a little more than 2 percent. Similar price changes are likely in 2013.

Corn and Soybeans

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2012 in Review

In January 2012, grain and soy prices seemed to be in a long-term downtrend. Most market observers thought the corn market would shift from a situation of very tight stocks to one of increased supply in the face of decreased demand and higher-than-expected yields. These forecasts were based on expectations of normal growing weather in South America and expanded corn and soybean acreage in the U.S.

The corn market fluctuated early in the year, but by May it was trending downward in reaction to the fast pace of planting and favorable crop prospects. Soybean prices were headed in the other direction; they reached a milestone with the July contract above $15 per bushel, a price that had not been seen since July 2008. The first-quarter soybean rally reflected decreased production in South America (due to hot, dry conditions there) and increased imports by China.

In late May and early June, prospects for the U.S. corn cop were among the best ever. Only once since 1990 had a higher percentage of the nation's corn acreage been rated as either good or excellent. USDA projected an average yield of 166 bushels per acre. Growing conditions for soybeans were also among the best ever, with a projected average yield of 43.9 bushels per acre.

But within seven weeks, prospects for both crops went from near-best-ever to among the worst on record. By August, the nearby corn futures contract had reached a peak of $8.31 per bushel. There was growing concern about the already short supply as yield estimates continued on a downward trend with no let-up in demand. There were strident calls to remove the ethanol mandate. A slight improvement in weather brought hope to soybean producers.

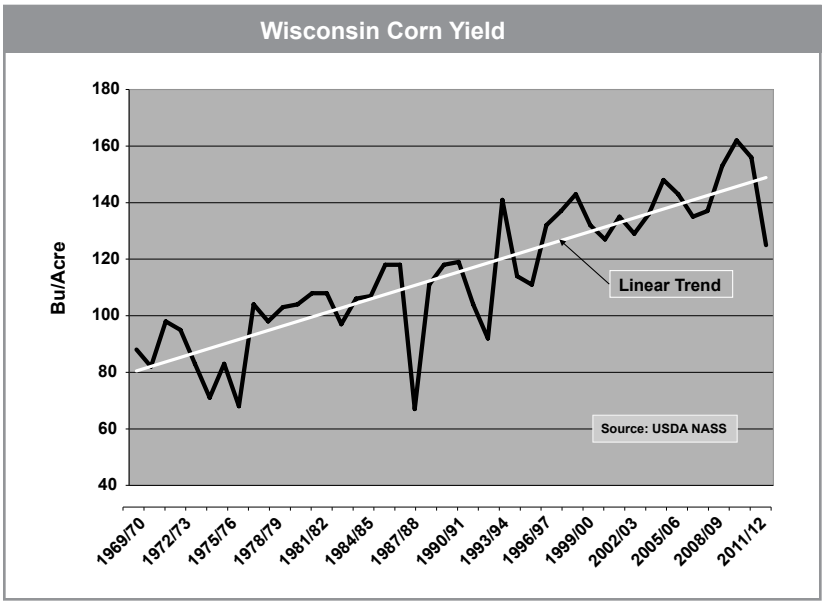
Early harvest brought low yields for both crops, although soybeans were not as far below the historical trend line. U.S. corn yields averaged 122.3 bushels per acre, while soybean yields averaged 39.3 bushels per acre.

Extremely low inventory and volatile prices will be huge factors in the corn market in 2013. Corn prices have dropped by almost $1 since peaking last August. In the past, extreme drought years have typically been followed by favorable growing conditions, but this year begins with a soil moisture deficit and projections for below-average precipitation. This situation may motivate farmers to plant a large corn acreage. If 2013 growing conditions return to normal, there is potential for a large crop. Combined with a decrease in demand due to lower feed use and stable ethanol use, that would suggest lower corn prices in the 2013/2014 marketing year.

Although soybean prices have dropped almost $3 per bushel from the summer peak, they are now rising due to an uptick in exports and high domestic consumption. If both South American and U.S. production returns to normal, stocks will rebound and prices will move lower in the 2013/2014 marketing year.

Corn

U.S. corn supplies are down 12.6 percent due to the combination of a small carryover (only 988 million bushels) from the 2011/12 marketing year and a 2012 U.S. corn harvest that was more than 13 percent below the previous year's. U.S. 2012 corn production is forecast at 10.7 billion bushels, the lowest since 2006—although still the eighth-largest crop on record. There were 96.9 million acres planted, but the average U.S. yield was only 122.3 bushel per acre, down 24.9 bushels from 2011. Wisconsin growers produced 431 million bushels,



1. Brenda Boetel is an associate professor and extension agricultural marketing specialist in the Department of Agricultural Economics, College of Food, Agriculture and Environmental Sciences, UW-River Falls.

U.S. Corn Balance Sheet (Sep–Aug)								
Marketing Year	***05/06***	***06/07***	***07/08***	***08/09***	***09/10***	***10/11***	***11/12****	***12/13*****
	Million Bushels *(Except as Noted)*							
Beg. Stocks	2,114	1,967	1,304	1,624	1,674	1,708	1,128	988
Imports	9	12	20	14	10	28	29	100
Acres Planted (Mil.)	81.5	78.3	93.5	86.0	86.5	88.2	91.9	96.9
Acres Hvst. (Mil.)	75.1	70.6	86.5	78.6	79.6	81.4	84.0	87.7
% Harvested	92.1	90.2	92.5	91.4	92.0	92.2	91.4	90.5
Yield (Bu./A.)	148	149.1	150.7	153.9	164.7	152.8	147.2	122.3
Production	11,114	10,535	13,038	12,101	13,110	12,447	12,358	10,725
Total Supply	13,237	12,514	14,362	13,739	14,792	14,262	13,515	11,814
Feed & Residual	6,155	5,595	5,913	5,254	5,159	4,792	4,547	4,150
Food/Seed/Industrial	2,981	3,490	4,387	4,953	5,938	6,428	6,437	5,867
Ethanol	1,603	2,119	3,049	3,677	4,568	5,021	5,011	4,500
Exports	2,134	2,125	2,437	1,858	1,987	1,835	1,543	1,150
Total Demand	11,270	11,210	12,737	12,065	13,084	13,054	12,527	11,167
Ending Stocks	1,967	1,304	1,624	1,674	1,708	1,128	988	647
Stocks to Use (%)	17.45	11.63	12.75	13.87	12.95	8.64	7.9	5.8
Average Farm Price ($/Bu.)	$2.00	$3.04	$4.20	$4.06	$3.55	$5.18	$6.22	$6.80–$8.00

Source: USDA, *World Agricultural Supply and Demand Estimates*
*USDA Estimate as of December 2012
**USDA Forecast as of December 2012

with a below-trend yield of 125 bushels per acre and only 3.4 million acres harvested of 4.4 million planted.

Total usage of corn declined by 4 percent in 2011/12 and is projected to drop another 10.9 percent for 2012/13. There were decreases in each of the three main usage categories: feed and residual, ethanol and exports. Ethanol was the largest use category for the second year in a row. Although demand for corn for ethanol use decreased slightly overall (0.16 percent relative to 2010/2011), there was a considerable drop-off in demand in the latter part of the marketing year.

Demand for corn from the ethanol industry is unlikely to weaken further as long as the federal Renewable Fuels Standard (RFS) remains in place. In late summer of 2012, livestock producers and some corn processors began calling for a waiver of the RFS due to concerns about the short supply of corn. Debate continued for several months on what, if any, impact this would have on the price of corn.

In November, the Environmental Protection Agency (EPA) announced that it would not waive the RFS and would maintain the 13.2 billion gallon renewable fuel target for 2012 and the 13.8 billion gallon target for 2013. However, the availability of nearly 3.5 billion gallons worth of E11 Renewable Identification Numbers (RINs), which could be applied against the 13.2 billion gallon target for 2012, allowed for a decrease in ethanol blending use and ethanol production in 2012.[1] Remaining RINs will allow for continued decrease of corn usage for ethanol in 2013. Corn used for ethanol is projected at 4,500 million bushels in 2012/13, a drop of more than 10 percent from 2011/12 levels.

Corn exports fell by 16 percent in 2011/12. The pace of weekly corn exports slowed considerably in October and November 2012.

1. RINS represent a type of currency to the EPA with regards to the renewable fuels program. Excess RINS indicate that blending requirements have been met, and may be "stored" to meet future requirements.

Exports in those months averaged about 13.5 million bushels per week, down 58 percent from the average of 32.1 million bushels per week during the same period a year ago. The USDA projects that U.S. corn exports will dip to 1.15 billion bushels in 2012/13, a 25 percent decrease from 2011/12. However, based on a declining export trend that began in October and November 2012, there will likely be further downward revisions to the export projections, possibly to below 1 billion bushels.

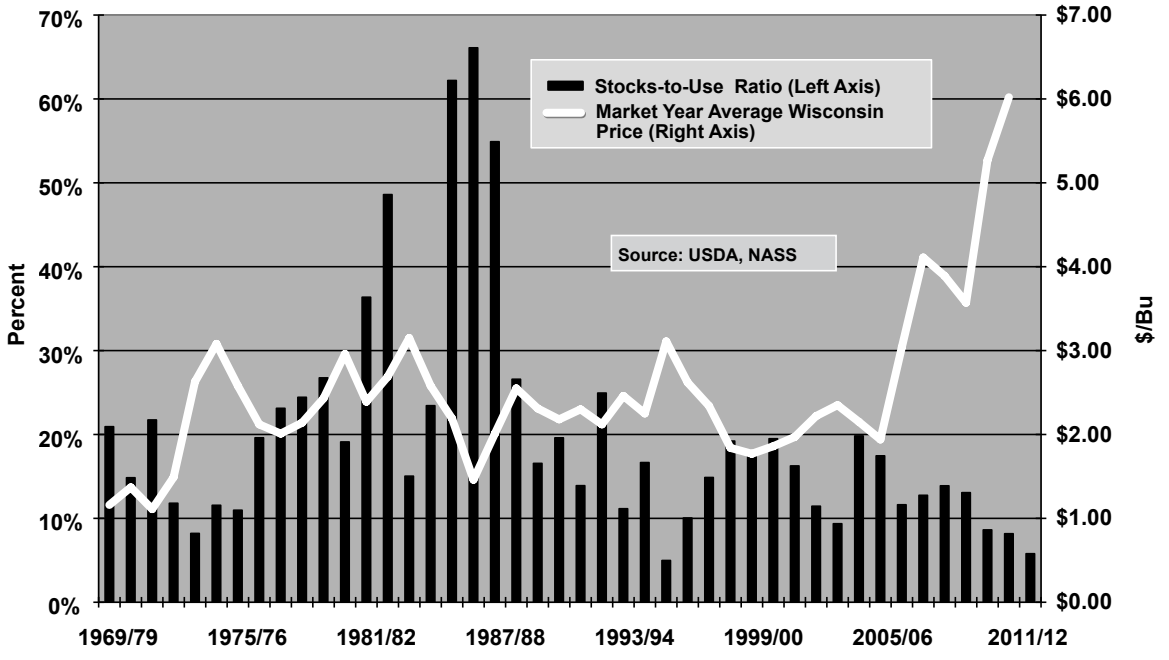
Feed and residual demand was down 5.2 percent in 2011/12, primarily due to significant liquidation of the nation's cattle herd, decreased hog inventories and reductions in cattle feeding. Demand for corn for feed is projected to drop an additional 8.7 percent in 2012/13 for the same reasons. This number may be revised slightly upward due to the expected decrease in export demand.

Although demand for corn is projected to be down 10.9 percent, supply is expected to drop even more—by 12.6 percent. Ending stocks are forecast at 646 million bushels, close to the smallest on record (the smallest was 426 million bushels in 1995/1996). The very small 2012/13 carryover translates to an ending stocks-to-use ratio of only 5.8 percent. Over the last 40 years, ending stocks have only been this tight in the mid-1970s and 1996. In the mid-1970s ending stocks were tight for two years before demand fell off. Although demand has started to decline, prices remain high and additional rationing will likely be seen in early 2013.

USDA projects a record average U.S. corn price between $6.80 and $8.00 for the 2012/13 marketing year, eclipsing the previous record of $6.22 set in 2011/12. The average cash price received in Wisconsin for the 2011/12 marketing year was $6.02; that should increase in 2012/13 by an amount near the projected U.S. price increase.

The futures market is signaling a premium of only 2 cents per bushel for storage into July 2013. This is not enough to cover the cost of either commercial storage or on-farm storage. Basis is likely to be stronger than normal in 2012/13. In November, many parts of the nation had local cash corn prices higher than the nearby December 2012 futures contract. The Omaha basis was +23 cents in November 2012, but has averaged -12 cents between 2006-2011. Given the strong basis levels and the minimal carry, storing grain will be riskier this year. With attractive futures prices and a larger-than-normal downside risk in prices, it makes sense to have your 2012 production sold and look to lock in bids for the 2013 production.

Wisconsin Corn Price v. U.S. Stocks-to-Use Ratio



Soybeans

Soybean prices were high in 2011/12, but they did not keep pace with the skyrocketing corn prices. The U.S. soybean price averaged $12.50 in 2011/12. The average soybean price received in Wisconsin was $13.17. In September 2012 it seemed as if $17 beans might be possible for the 2012/13 marketing year, but prices have dropped dramatically since then. Barring weather issues, the U.S. average price in the 2012/13 marketing year will likely be close to $15.

U.S. soybean production for 2012/13 is projected at 2.97 billion bushels, with Wisconsin producing 66.3 million bushels. The average U.S. soybean yield of 39.3 bushels per acre is down from 2011/12's average of 41.9 bushels. Wisconsin's 2012/13 yield is 39 bushels per acre, compared to 46.5 bushels last year.

U.S. soybean crush will decrease due to reduced hog and poultry production in 2013. Soybean oil usage will likely decline, although slightly more biodiesel production is expected. Soybean oil exports have started the marketing year unexpectedly high, but these levels will not be maintained throughout 2013 due to strong domestic demand and reduced production. Additionally, ample supplies of competing oils are available to offset the reduction of soybean oil production in the U.S. Soybean oil prices will likely remain similar to last year, in the 52-cents-per-pound range.

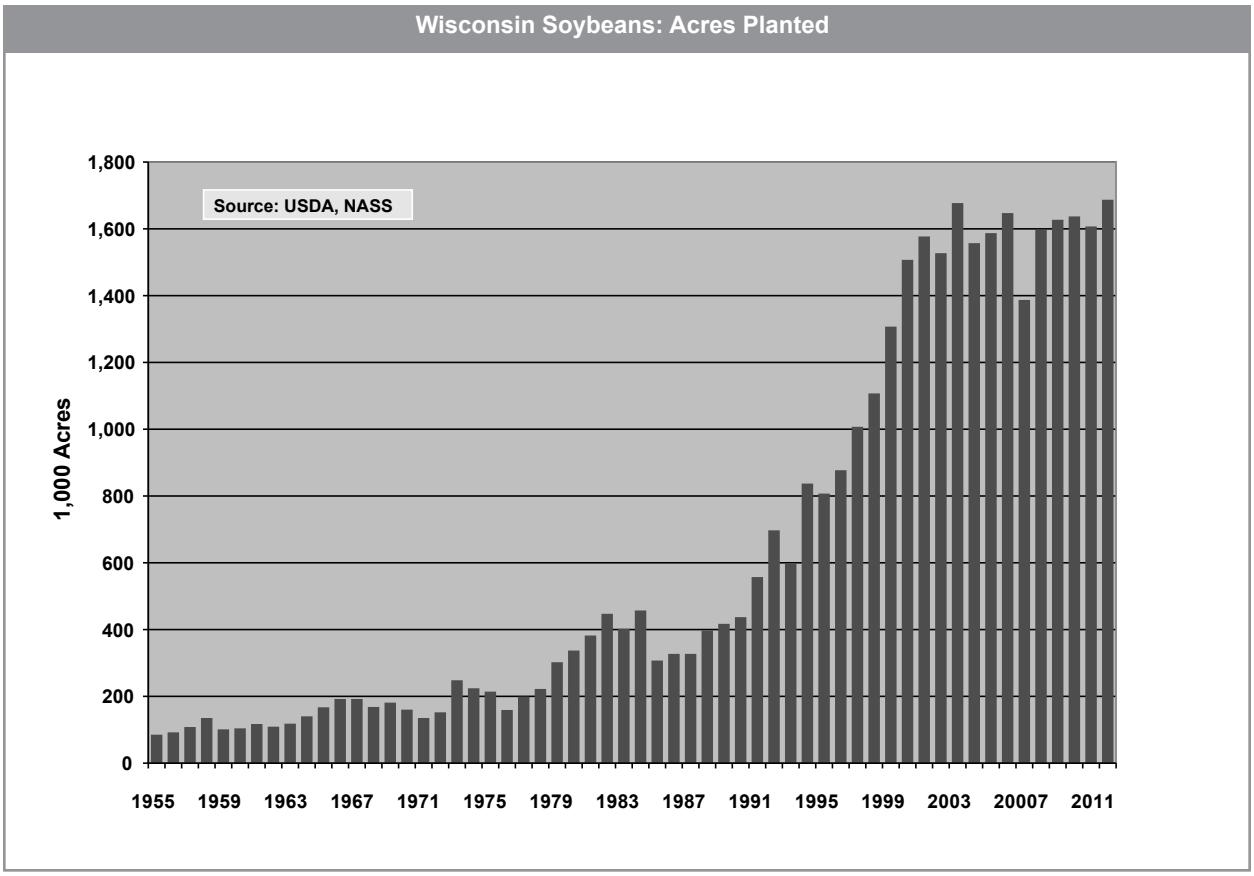
Soybean exports were 9.2 percent lower in 2011/12 than in 2010/11, and although the USDA currently projects the 2012/13 exports to be about 1 percent lower than the 2011/12 levels, the USDA will likely revise these levels in early 2013. Through December 1, 2012 (25 percent of the marketing year) export shipments and commitments were 77.5 percent of the projected export totals for 2012/13). Although U.S. soybean exports typically slow when exportable South American supplies become available, it is highly unlikely that U.S. exports will slow enough to match USDA's current forecast.

Soybean prices will be volatile in 2013, but they are likely to fall if weather conditions return to normal in South America and in the United States. But any unexpected weather event in South America or the U.S.

U.S.Soybean Balance Sheet (Sep–Aug)

Marketing Year	*05/06*	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12**	*12/13***
				Million Bushels *(Except as Noted)*				
Beg. Stocks	256	449	574	205	138	151	215	169
Imports	3	9	10	13	15	14	16	20
Acres Planted (Mil.)	72.0	75.5	64.7	75.7	77.5	77.4	75.0	77.2
Acres Harvested (Mil.)	71.3	74.6	64.1	74.7	76.4	76.6	73.8	75.7
% Harvested	99.0	98.5	99.0	98.7	98.5	99.0	98.4	98.1
Yield (Bu/A)	43	42.7	41.7	39.7	44	43.5	41.9	39.3
Production	3,063	3,188	2,677	2,967	3,359	3,329	3,094	2,971
Total Supply	3,322	3,647	3,261	3,185	3,512	3,495	3,325	3,160
Crush Sep/Aug	1,739	1,808	1,803	1,662	1,752	1,648	1,703	1570
Exports	940	1,116	1,159	1,283	1,501	1,501	1,362	1,345
F/S/R	194	149	93	101	108	130	91	115
Total Demand	2,873	3,073	3,056	3,047	3,361	3,280	3,156	3,031
Ending Stocks	449	574	205	138	151	215	145	130
Stocks to Use (%)	15.62	18.28	6.71	4.53	7.01	6.55	5.4	4.3
Average Farm Price ($/Bu.)	$5.66	$6.43	$10.10	$9.97	$9.59	$11.30	$12.50	$13.55–$15.55

Source: USDA, *World Agricultural Supply and Demand Estimates*
*USDA Estimate as of December 2012
**USDA Forecast as of December 2012



could dramatically affect prices. The USDA projects record yields and production in Brazil and Argentina, and U.S. soybean producers will likely plant 80 million acres, up 3 million from 2012. The jump in soybean acres will be the result of less corn following corn acres, and a continued concern about drought in the Western Corn Belt. If the U.S. returns to trend yields, the nation could produce a record-high 3.4 billion bushels of soybeans in 2013.

Summary

Marketing corn and soybeans was a challenge in 2012. Production was impacted by drought, and prices were volatile and will remain so in 2013. Extremely tight ending stocks means even small changes in underlying fundamentals can cause prices to change quickly and dramatically.

An old saying goes "short crops peak early and have long tails," meaning when stocks are tight, the highest seasonal prices are historically observed during August through January and prices decline until the following harvest. High prices ration demand and typically lead to lower prices. Whether corn has been rationed sufficiently is yet to be determined.

Producers won't find it easy to make decisions in this volatile marketing environment, and a carefully considered marketing plan is essential for 2013. Most producers have sold a substantial amount of their 2012 corn crop but also have soybeans in storage. Based on recent soybean price seasonality patterns, seasonal highs typically occur in July and August, but a secondary seasonal peak comes just ahead of the South American harvest. If they haven't already sold their 2012 production, corn and soybean producers should be looking to do so sooner rather than later. Moreover, 2013 will likely be a year when it pays to have a large percentage of your marketing done early.

Producers should consider their financial position and how much downside price risk they can tolerate. When fundamentals change, prices are typically pushed down sharply as supplies exceed demand. Margins will probably improve some in 2013. Although land costs will remain high, fertilizer prices will probably soften. Fertilizer prices follow corn prices (not the other way around), and if growing conditions return to normal, corn prices will decrease, paving the way for decreased fertilizer prices.

Fruits and Vegetables

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Synopsis

As detailed earlier in this publication, drought, heat and other weather events had a significant impact on the state's vegetable producers, both those who supply the processing industry and those who grow for the fresh market. Non-irrigated processing vegetable operations saw yields reduced 50–80 percent, and many fields that would have been planted in June weren't planted at all due to poor soil moisture. Irrigated fields were impacted by extreme summer heat that negatively affected pollination. Later-planted processing vegetable crops did reach record level yields with excellent quality, however, allowing the processing companies to meet production plans for the year. Many fresh market farms could not provide enough water to keep up with crop needs. Heat and dry weather negatively affected pollination of vine crops, tomato, pepper, eggplant and other crops. Much of the produce could not be sold.

Fruit growers were challenged by both record-breaking spring temperatures and drought throughout most of the season. Spring frost had the biggest impact. Many orchards and vineyards saw significant damage when high March temperatures that triggered early bud break were followed by low temperatures in April. At the other end of the season, trees and vines that were not irrigated were drought-stressed going into dormancy, raising concerns about losses due to winter damage, which bodes poorly for the 2013 season.

U.S. Fall Potato Statistics

Year	Harvested Acres (1,000)	Yield (Cwt/A)	Prod. (Mil. Cwt)	Season Avg. Price ($/cwt)	Value ($Mil.)
			United States		
2003	1,093	376	411	5.22	2,142
2004	1,024	401	411	5.12	2,092
2005	952	403	384	6.53	2,511
2006	983	406	399	6.67	2,669
2007	992	410	407	7.04	2,872
2008	921	411	379	8.49	3,221
2009	917	429	394	7.62	2,997
2010	881	416	367	8.79	3,230
2011	940	416	391	8.87	3,436
2012	992	425	422	NA	NA
			Wisconsin		
2003	80.0	410	32.80	5.80	190.2
2004	70.0	435	30.50	5.80	176.6
2005	68.0	410	27.88	7.80	217.5
2006	66.0	445	29.37	7.80	229.1
2007	64.0	440	28.16	7.80	219.6
2008	62.0	415	25.73	11.30	290.7
2009	63.0	460	28.98	8.85	256.5
2010	61.5	395	24.29	10.60	257.5
2011	62.5	415	25.94	10.30	267.2
2012	63.0	455	28.67	NA	NA

Source: USDA/NASS

Vegetables

Potatoes

Wisconsin potato acreage increased 500 acres to a total of 63,000 harvested acres in 2012. Potato acreage in the state has hovered between 60,000 and 70,000 acres in Wisconsin since 2003, when 80,000 acres were harvested. At 455 hundredweight per acre, Wisconsin's potato yield was the second highest on record, generating the largest crop since 2009.

National supply management had improved wholesale fresh market potato prices over the last several years. However, 2012's national fall potato production was up 50,000 acres from 2011. The combination of higher acreage, and like Wisconsin, the second-highest yield on record resulted in the largest national crop harvested since 2000.

1. AJ Bussan is a professor in the Department of Horticulture, UW-Madison, and a vegetable crop production system specialist, Cooperative Extension, UW-Extension. Rebecca Harbut is an assistant professor in the Department of Horticulture, UW-Madison, and a fruit crops specialist, Cooperative Extension, UW-Extension.

Wisconsin Potatoes (all uses) and Vegetables for Processing 2011

Crop	Production (1,000 tons) Wisconsin	United States	Wisconsin as % of U.S
Fall potatoes	1,430	19,550	7.3
Sweet corn	595.8	2,627	22.7
Snap beans	301.2	680.9	44.2
Carrots	92.4	338.6	27.3
Green peas	72.7	294.9	24.6
Cucumbers	30.7	482.0	6.3
Onions (fresh)	0.56	73.9	0.8

Source: Wisconsin Ag Statistics, 2012

The value of the fall crop is tightly linked to total production. The large fall crops in 2009 and 2007 had the lowest total raw product value, and the large crop in 2012 is projected to bring prices similar to those years. Low current prices to growers reflect this.

Wisconsin fresh market potato growers have received $1 to $1.50 more per hundredweight than growers from the other states.

The Wisconsin potato crop would have been even larger if all planted acres had been harvested. Several hundred acres of potatoes were not harvested due to filled contracts, filled storage facilities and no market for the crop. The very mild spring allowed for planting of potatoes as early as March 10, with planting completed by May 1 with the exception of some seed and muck crops. The crop emerged in many regions by the first week of May and set tubers by May 20 across much of Central Wisconsin. The very warm late May and June quickly promoted crop growth, causing late potato bulking to begin by late June, about 10 to 20 days earlier than normal. Through all of July and much of August the potato crop bulked about 10 to 12 hundredweight per acre per day. This led to much higher yields in 2012 compared to previous years. The heat—especially the warm night time temperatures—did cause some reduction in solids content in some potatoes. However, growers were able to provide uniform irrigation for much of the crop, leading to decent quality for chip and processed potatoes.

Despite the lack of rain, most potato production regions had problems with late blight, which can increase management costs significantly as growers are forced to apply protective fungicides. To date, the crop appears to be storing with little disease issues. High sugars have led to dark fry color in some processing potatoes, but the chip crop has had decent quality to date. The warm summer has led to short dormancy in potatoes leading to premature sprouting in numerous storages. This greatly threatens long-term storage of Wisconsin potatoes.

The Wisconsin potato crop is used for all major market classes. The Wisconsin Potato and Vegetable Growers Association currently estimates that the state's crop will be used as follows: Seed Potatoes, 2,750,000 cwt. (9.5 percent); Chip Potatoes, 6,650,000 cwt. (23 percent); Frozen/Fry, 6,800,000 cwt. (23.5 percent); and Fresh Potatoes, 12,800,000 cwt. (44 percent).

Forecasts for 2013 suggest that national potato acreage will be reduced in favor of grain crops. However, this is highly dependent on the planting plans of farms in Idaho and Washington, and early indications are that the shift from potatoes to grain will be smaller than predicted. Wisconsin potato acreage in 2013 should be comparable to 2012, with a slight reduction of 500–2,000 acres. Most of the Wisconsin crop is marketed prior to planting, promoting consistent production over the past 5–7 years.

Processed vegetables

USDA/NASS acreage estimates for 2012 Wisconsin processing vegetable crops were not available at this writing. Estimated contracted volumes were reported in September 2012. Wisconsin production relative to the total U.S. production for 2011 is reported in the table below. Competition for acres with grain and forage crops has been a challenge for processors. In general, contracted acreage has declined, but the decrease in acreage has been offset by increased yield per acre, leaving production fairly constant.

Sweet Corn

Wisconsin sweet corn contracted volume was 532,100 tons, about 10 percent less than in 2011. Acres planted to sweet corn have trended downward from 2009, but yields have trended upward for the past 5–10 years. New hybrids have performed well in Wisconsin compared to those from 5–10 years ago. Heat and drought reduced yields in non-irrigated production 30–100 percent depending on planting date. However, optimal production conditions through August and September resulted in yields above 10 tons/acre under irrigation, allowing for harvest at or near that contracted by Wisconsin processors.

Snap Beans

Contracted Wisconsin snap bean production was 309,000 tons on fewer acres in 2012. Early yields were poor under both irrigated and non-irrigated conditions due to poor pollination. Late summer production of snap beans was minimal in many areas of the state, but irrigated production yielded more than 10 tons per acre. Yields in some UW research plots exceeded 15 tons per acre. Good growing conditions and ample sunlight in August and September likely contributed to excellent production. Even though harvested acres were down, the exceptional production under irrigation late in the summer allowed processors to meet contract goals.

Green Peas

Wisconsin farmers planted fewer acres of green peas in 2012 to meet a contracted production goal that was 8 percent lower than in 2011. Heat in early summer led to very poor production of peas under non-irrigated production, and many fields weren't harvested. Irrigated production fared little better due to exceptional heat and poor pollination and pod set.

Onions

Wisconsin farmers harvested 1,800 acres of onion in 2012, up several hundred acres from 2011. Average yield was estimated at 290 hundredweight, which is down substantially from 2011. Heavy rains in late April (the last rain of the summer in many cases) caused flooding in fields north of Wisconsin Highway 60, resulting in poor crop stands and poor production. Prices and market demand has been good so far with rapid movement of the current crop.

Fresh Market Vegetable Production

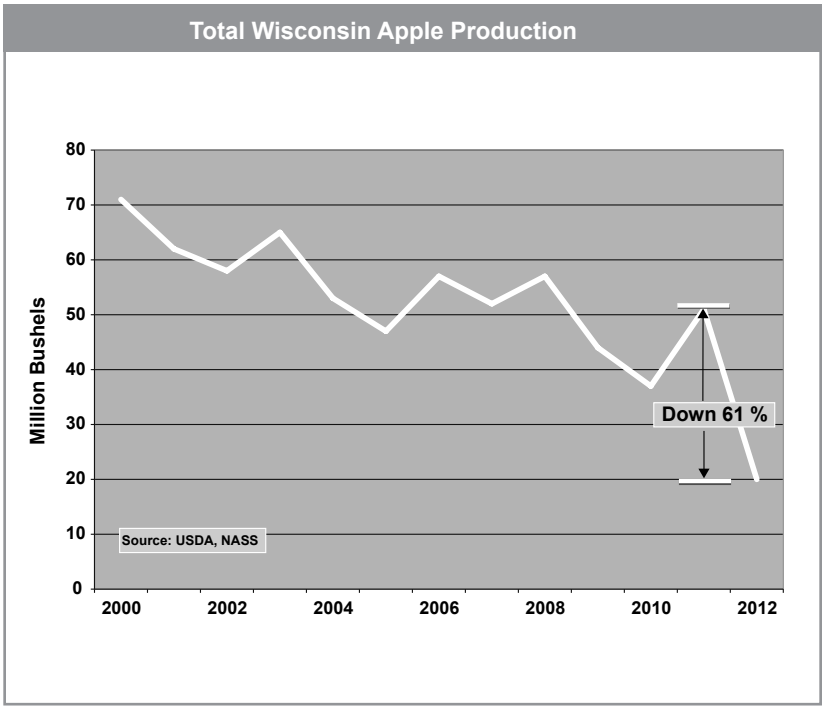
The number of fresh market vegetable farms in Wisconsin has expanded over recent past. This is in part due to increasing demand for fresh and locally grown produce. In addition, Wisconsin residents with small acreages are using that land as a business opportunity and producing vegetables for local sale and marketing. Wisconsin has an estimated 2,500 fresh market vegetable farms.

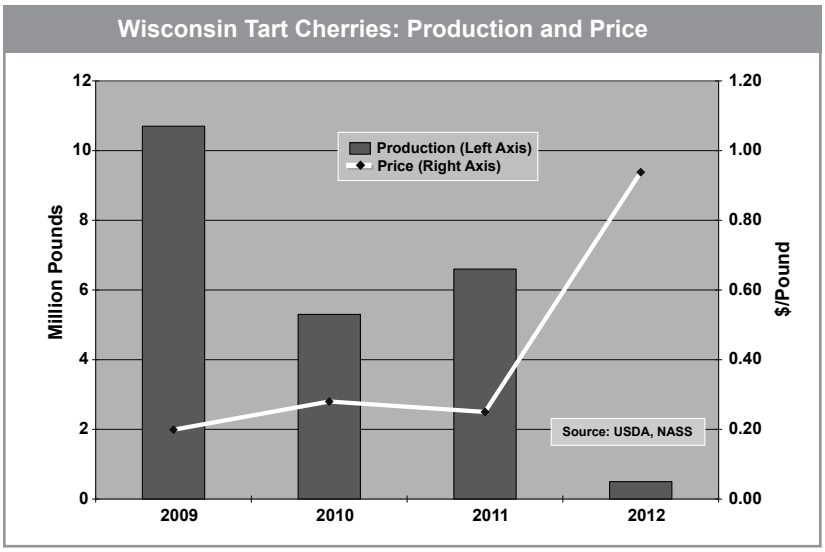
Fruit Crops

Like their counterparts elsewhere in the Midwest, Wisconsin fruit growers had a challenging year, with record-breaking spring temperatures and drought throughout most of the season. For fruit crops, the greatest yield losses were due to frost damage that occurred in early spring. High temperatures in March led to early bud break, and the low temperatures that followed in April led to significant yield loss in many apple and cherry orchards and vineyards. Tress and vines that were not irrigated underwent significant drought stress going into dormancy. This may reduce their winter hardiness and further increase losses due to winter damage, which would affect the 2013 season as well.

Apples

State production of apples in 2012 was 60 percent below 2011 levels. Yields were variable across the state. Some growers had an exceptional crop with high yield and high quality due to the long season and warm temperatures; others had devastating losses of up to 90 percent. The variability was primarily due to the impact of microclimates and cold air movement during the frost events. Most apple growers saw 40–80 percent crop loss primarily due to the spring frost, although the drought contributed to some of the loss in non-irrigated orchards. Many orchards did not open their retail stores, which typically generate significant income from the direct sale of apples and value-added apple products.





Cherries

Spring frost reduced the Wisconsin tart cherry crop by 90 percent. Processing facilities in the region either operated at very low capacity or did not open at all. As a result, sales were handed primarily through direct market. Non-irrigated orchards also saw significant drought stress symptoms on the trees, which may lead to reduced winter hardiness.

Grapes

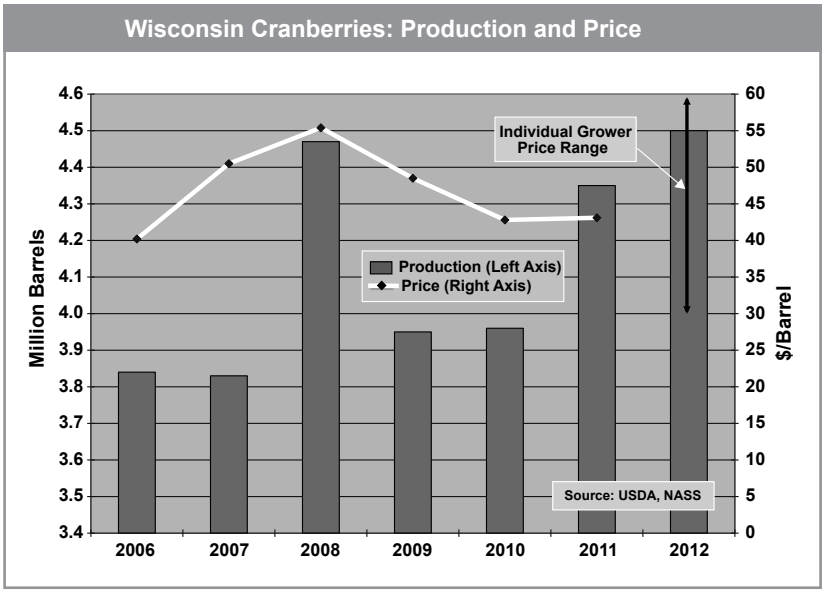
Overall, yields were below average (20–40 percent) due to frost and drought, but quality was generally better than previous years. The improved grape quality (Brix, TA, pH) can be attributed to a reduced crop load and greater heat unit accumulation. Most cold-climate grape varieties were harvested approximately two weeks ahead of schedule. Disease pressure was lower than normal because the drought reduced the fungal infection periods. Flea beetle damage was greater than normal, due to the extended period of early bud stage coupled with early emergence of the beetles. Some areas also experienced heavy Japanese beetle pressure. The grape and wine industry continues to expand in Wisconsin; there are now 90 bonded wineries, which are generating large demand for locally grown, cold hardy grapes.

Cranberries

Despite the spring conditions, growers were able to protect their crop from frost damage by flooding and irrigating the beds. The 2012 crop in Wisconsin was up 2 percent compared to 2011 and fruit quality was good. The drought reduced levels in water reservoirs and growers implemented various measures to reduce water use. Growers were concerned about water levels as the need to put on the winter flood approached. The cranberry market is unsettled, evidenced by the extremely variable prices—differing by up to two-fold in some cases—being paid by different handlers again this season.

Raspberries and Strawberries

Strawberries yields were negatively affected by an early and heavy populations of thrips that caused significant damage to fruit that rendered it unmarketable. Raspberry growers, particularly those producing fall-bearing raspberries, were hurt by the emergence of a new pest to Wisconsin—spotted winged drosophila. Several weeks of yield were lost due to the infestation and the difficulty in controlling this new pest. In plantings where infestations were heavy, the crop was unmarketable.



III. Special Article:
Positioning Wisconsin Agriculture to Meet Global Needs:
Challenges and opportunities for feeding the next generation

by John Shutske and Jessica Newman[1]

The 2012 drought in Wisconsin and throughout much of the United States has focused the nation's attention on the fragile and highly weather-dependent nature of agriculture. The impacts will be manifested in many ways, including feed shortages, high commodity prices, higher costs for livestock and dairy producers, and hindrance of river transportation. The drought has brought a renewed sense of urgency about a massive, looming global concern: the challenge and opportunity of feeding and fueling a world population that will exceed nine billion by the year 2050.

What follows is an overview of facts and findings that indicate that production of food, fiber and plant-based fuel must double within the next 30 to 40 years in order to mitigate worldwide hunger and meet growing energy needs. We present an outline of the difficult and complex challenges to accomplishing this. These have to do with availability of land and water, climate change and increased weather variability, and the potential for pathogens to cross the interface between human and animals. Related to all these is the critical need for continued funding, public/private partnerships, and university engagement and research to address these critical issues.

At the end we look at the unique role that Wisconsin—a leader in both agriculture production and research—can play in addressing these challenges. This includes the roles that must be played by the UW-Madison College of Agricultural and Life Sciences, UW-Extension and their partner institutions.

The Need to Double Global Agricultural Production

The world's population is projected to climb from 7 billion to an estimated 9.6 billion by 2050—an increase of 35 percent. The fastest growth is expected in the least-developed areas of the world—notably in Niger, Somalia, Burundi, Mali, Angola, Democratic Republic of Congo, Zambia, Afghanistan, Uganda and Burkina Faso. This disproportionately high population growth in least-developed countries will occur despite the high infant mortality rates in these countries—up to 72 deaths per 1,000 live births, compared to 5 deaths per 1,000 live births in more developed nations.

The fastest-growing nations are also in areas with the greatest food insecurity, a determination that takes into account food availability, access and stability of local food supplies and the health and nutritional status of the residents.[2,3,4] Not coincidentally, most of the most food-insecure nations have seen substantial armed conflict and social and political instability in the past decade.[5] Food, peace and worldwide homeland security are intricately intertwined.

Growing Global Affluence Will Drive up Protein Demands

As the economies of developing nations grow, so will their demand for high-quality protein in the form of meat, dairy products and eggs.[6] The FAO projects that by 2050, we'll see a 173 percent increase in meat

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2. "Food Security in 75% of African Countries at High or Extreme Risk - Maplecroft Global Index," Maplecroft, October 10, 2012, accessed December 14, 2012, http://maplecroft.com/about/news/food_security_risk_index_2013.html.

3. Food and Agriculture Organization of the United Nations, "FAO: Food Security Indicators," 2012, accessed December 12, 2012, http://www.fao.org/publications/sofi/food-security-indicators/en/.

4. Klaus von Grebmer, 2012 global hunger index: the challenge of hunger: ensuring sustainable food security under land, water, and energy stresses (International Food Policy Research Institute, 2012), accessed December 1, 2012, http://www.ifpri.org/publication/2012-global-hunger-index.

5. "Food Security in 75% of African Countries at High or Extreme Risk - Maplecroft Global Index."

6. Mike J. Boland et al., "The Future Supply of Animal-derived Protein for Human Consumption," Trends in Food Science & Technology, accessed November 13, 2012, doi:10.1016/j.tifs.2012.07.002.

consumption—much of it poultry and beef—and a 173 percent increase in consumption of dairy products. Meat consumption in developing countries will increase 219 percent (poultry meat consumption will rise by 279 percent), while their dairy product consumption will climb by 216 percent.[7]

There are advantages to animal-derived protein. Animal production provides economic opportunity for the more than one billion people involved in food production worldwide. And livestock products are a means to solve nutritional deficiencies by providing quality sources of essential amino acids and micronutrients. But there are efficiency and environmental issues associated with animal agriculture that must be tackled through research and new production practices. A recent Scientific American article notes that it takes 30 kilograms of grain to produce one kilogram of beef.[8] USDA and other federal and international agency research continue to address feed efficiency needs.[9,10] The unique digestive capability of ruminant animals make it possible to produce quality protein on lands that otherwise lack significant production potential—one reason for the growth potential for ruminant production.[11]

As with nearly any system that converts energy from one form to another, intensified animal production can challenge water, air and other natural resource bases.[12] All agricultural systems use significant quantities of water. Seventy percent of fresh water use goes toward irrigation.[13] Dairy and other livestock producers face challenges associated with appropriate nutrient cycling. Water and environmental regulations and other concerns are primary limiters of agriculture's potential in some parts of this country.

Bio-Based Renewables Play a Larger Role in our Global Energy Portfolio

As developing nations advance, so does their appetite for energy. Global energy demand will climb by an estimated 53 percent from 2008 to 2035.[14] Once again, a very large part of the new demand will likely come from the less-developed nations that are outside the Organization for Economic Cooperation and Development (OECD). Energy demands in developing areas will grow by more than 85 percent, as compared to 18 percent in OECD countries. During next quarter-century, we will see modest shifts away from energy derived from oil and other non-biofuel liquid fuels as well as coal.[15] The share of energy in the U.S. derived from oil and non-biofuel liquid fuels will drop from 37 percent of the total in 2010 to 32 percent in 2035. Coal's share will see a more modest decline, from 21 percent to 20 percent. In the same timeframe, the share of U.S. energy coming from liquid biofuels such as ethanol and biodiesel will increase from 1 percent to 4 percent. This will put pressure on global agriculture as food and fuel compete for some of the same feedstocks. The share of energy coming from wind, solar and other renewable sources will increase from 7 percent to 11 percent in the same period.

But while some of the renewable energy will come from plant-based biomass feedstocks, not all of it will compete with food and feed. A recent analysis[16] in Wisconsin found that the largest potential sources of bio-based renewable energy are wood residues, corn stover and manure; totaling more than 10.1 million dry tons per year. There is enough available energy in the state's dairy cow manure alone to replace a large-scale coal plant.

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7. "World Livestock 2011 - Livestock in Food Security," accessed December 14, 2012, http://www.fao.org/docrep/014/i2373e/i2373e00.htm.

8. Jonathan A. Foley, "Can We Feed the World & Sustain the Planet?," Scientific American 305, no. 5 (October 18, 2011): 60–65, accessed December 17, 2012, doi:10.1038/scientificamerican1111-60.

9. USDA NIFA, "USDA Awards Grants to Improve Cattle Production and Health," accessed December 17, 2012, http://www.csrees.usda.gov/newsroom/news/2011news/04152_cattle_missouri.html.

10. "National Program for Genetic Improvement of Feed Efficiency in Beef Cattle," accessed December 14, 2012, http://www.beefefficiency.org/

11. Boland et al., "The Future Supply of Animal-derived Protein for Human Consumption."

12. "National Program for Genetic Improvement of Feed Efficiency in Beef Cattle"

13. Foley, "Can We Feed the World & Sustain the Planet?"

14. "International Energy Outlook 2011 - Energy Information Administration," accessed November 2, 2012, http://www.eia.gov/forecasts/ieo/.

15. Howard Gruenspecht, "The U.S. Energy Future - EIA" (Hilton Head, South Carolina, April 26, 2012), accessed December 1, 2012, http://www.eia.gov/pressroom/presentations/howard_04262012.pdf.

16. G. Radloff et al., Wisconsin Strategic Bioenergy Feedstock Assessment (Wisconsin Bioenergy Initiative), accessed December 17, 2012, http://www.wbi.wisc.edu/wp-content/uploads/2010/02/WI_Strategic_Biomass_Assessment_WEB.pdf.

On a global and long-term scale, the growth of bioenergy crops will depend on a number of factors[17] including:

- other food system changes (e.g., demand, technology innovations)
- worldwide and regional political stability and investment security
- policies related to carbon and deforestation
- improvements in energy crop yields

Hurdles to Doubling Global Production

The increasing global demand for food, protein and biofuel offers huge opportunities for the United States and for states like Wisconsin that have significant comparative and competitive advantages in producing and processing agricultural products. Wisconsin is blessed with a large, high-quality natural resource base, a culture that values jobs and industries connected to food, and an infrastructure that supports them through research and innovation focused on processed and value-added food products.

However, to realize these opportunities we must address pressing challenges. These challenges in turn present opportunities for students and young scientists to make discoveries and develop new practices, improved genetics, new information technologies and other innovations to mitigate risks and overcome barriers to increased production.

Land

The earth's land resources are limited. An estimated 38 percent of all land not covered by ice is used for agriculture.[18,19] Much of the remaining land can't be farmed—it consists of urban areas, mountains, desert and tundra. A small amount of agricultural land area has been added in the past few decades (about 3 percent), but this came at the expense of tropical lands and rainforests. According to the USDA's Economic Research Service (ERS), total U.S. cropland declined from 1949 through 1964, increased from 1964 to 1978, and has been decreasing since then. From 2002 and 2007, total cropland decreased by 34 million acres and is now at the lowest level since 1945.[20]

Farmland loss is a concern in Wisconsin as well. Between the last two agricultural censuses, the state's farmland decreased by 3 percent, from 15.74 million acres to 15.19 million. Because land is a limiting resource, doubling agricultural production will require significant increases in production per land unit, with considerable attention to areas of the world that are producing well below their potential. This is the focus of agencies such as USAID and should be priority of universities with international agricultural programs.

Climate Change and Increased Variability

There is a growing body of evidence that our climate is changing, including increasing global temperatures and increasingly frequent extreme weather events. There will continue to be debate on the contributing factors, but there's no doubt that these changes will have an impact on global agriculture.

Data from the U.S. Global Change Research Program[21] indicate that global temperatures will increase in the coming decades. There is a wide range of predicted temperature increase—somewhere between 2° and 11.5°F by the end of this century. An increase at the low end of this range might seem like something that Wisconsin farmers can adjust to fairly easily. But a couple of degrees makes a big difference. In 2012, with much of Wisconsin seeing drought conditions and significant prolonged heat in July, average statewide temperatures were up only 2°F from June through September. An increase toward the upper end of the predicted range (11.5°F versus 2 °F) could dramatically alter the state's landscape. An analysis by the Wisconsin Initiative on Climate Change Impacts (WICCI) suggests that Wisconsin could warm by 4–9°F by the mid-century[22] with greatest warming happening in the northern part of the state and the least in areas adjacent to Lake Michigan. Observations documented by the Climate Wisconsin

17. Karl-Heinz Erb, Helmut Haberl, and Christoph Plutzar, "Dependency of global primary bioenergy crop potentials in 2050 on food systems, yields, biodiversity conservation and political stability," Energy Policy 47 (August 2012): 260–269, accessed December 14, 2012, doi:10.1016/j.enpol.2012.04.066.

18. Foley, "Can We Feed the World & Sustain the Planet?".

19. Jonathan A. Foley et al., "Solutions for a Cultivated Planet," Nature 478, no. 7369 (October 20, 2011): 337–342, accessed December 14, 2012, doi:10.1038/nature10452.

20. C. Nickerson et al., "Major Uses of Land in the United States, 2007," USDA Economic Information Bulletin No.(EIB-89) 57 (2011).

21. "United States Global Change Research Program," accessed December 17, 2012, http://www.globalchange.gov/.

22. Wisconsin Initiative on Climate Change Impacts, "Maps of Recent and Projected Climate Change in Wisconsin" (Nelson Institute for Environmental Studies, University of Wisconsin-Madison and the Wisconsin Department of Natural Resources, Madison, Wisconsin), accessed December 14, 2012, http://www.wicci.wisc.edu/resources/wicci_climate_change_maps.pdf.

Project of the Educational Communications Board[23] suggest that changes are already occurring here, including some affecting plant growth and seasonal cycles of wildlife, ice cover on lakes, and forests.

While these data might be controversial, there are clear signs that projected trends are real and should be of concern. The U.S. Office of Oceanic and Atmospheric Research (NOAA) has documented[24] the following recent phenomena:

- The global average surface air temperature has increased by about 1.0 ± 0.4°F (0.6 ± 0.2°C) since the late 19th century.
- The 1990s was likely the warmest decade in the instrumental record (which began in 1861).
- On average, from 1950 to 1993 nighttime daily minimum air temperatures over land increased by about 0.2°C per decade. This has lengthened the freeze-free season in many mid- and high-latitude regions.

The USDA's Economic Research Service (ERS) mentions numerous likely impacts on agricultural production over the coming decades.[25] Many involve water availability. Shifting precipitation patterns will likely lead to increased water scarcity in some parts of the world. Other areas will see increases in soil-moisture availability that could bring increased opportunities for agricultural production.

The WICCI study details positive, negative and indirect impacts associated with a changing climate in Wisconsin. For example, longer frost-free periods and growing seasons might mean greater yield potential for many types of crops in ideal years. More precipitation and higher dew point temperatures could reduce plant stress. On the other hand, higher temperatures and longer growing seasons are likely to make things more hospitable for diseases and insect pests. Drought, heavy early-season rains and other volatile weather swings are likely to mean additional expenses for replanting and field maintenance, loss of soil productivity and yields, livestock stress, and higher costs to irrigate crops and bring feed and water to livestock.

Water (Too Little, Too Much, Wrong Time, Wrong Place)

Water has always been a limiting factor for food production. The challenge continues to be to provide enough water while using agricultural practices that protect water quality from runoff of nutrients, sediment and chemicals. In recent years, water *quantity* has also become a significant challenge in Wisconsin, particularly in the highly productive Central Sands, one of the best places in the world to grow processing vegetables and other crops. The ongoing impacts to agriculture of the 2012 drought offer stark reminders that adequate water is not something we can take for granted.

Changes in the earth's atmospheric energy balances will bring an increase in weather extremes in coming decades. Drier summers and wetter winters are projected for much of the world, leading to greater risk of droughts and floods.[26] A recent article in the Journal of Soil and Water Conservation suggests that the 2012 drought is an extension of the extreme drought that curtailed agricultural production and led to intense wildfires in southwestern states in 2011. Droughts "of this duration, extent, and severity will be a common occurrence throughout the 21st century and beyond. These droughts may be occasionally interrupted by seasons of excessive rains and widespread inundation…," the article's authors state.[27]

Health Issues at the Human-Animal Interface

Satisfying the growing global demand for protein will require more livestock (along with the possible development of new non-animal protein[28]). Since land is a finite resource, adding animals will require denser and more management-intensive livestock production practices. This means that we will need to bolster efforts to maintain animal health and to better understand and manage

23. Samuel Pratsch, "Farming | Climate Wisconsin," 2012, accessed December 1, 2012, http://climatewisconsin.org/story/farming.

24. NOAA's Office of Oceanic and Atmospheric Research, "Observing Climate Variability and Change OAR Climate Research Programs," NOAA Research, March 17, 2011, http://www.research.noaa.gov/climate/t_observing.html.

25. Scott Malcolm et al., Agricultural Adaptation to a Changing Climate: Economic and Environmental Implications Vary by U.S. Region (USDA Economic Research Services, July 2012), http://www.ers.usda.gov/publications/err-economic-research-report/err136.aspx.

26. U.S. Global Change Research Program, Global Climate Change Impacts in the United States : a State of Knowledge Report from the U.S. Global Change Research Program (Cambridge ; New York: Cambridge University Press, 2009), http://forward.library.wisconsin.edu/catalog/ocn428024323.

27. Rattan Lal et al., "Adapting Agriculture to Drought and Extreme Events.," Journal of Soil & Water Conservation 67, no. 6 (November 2012): 162A–166A.

28. Boland et al., "The Future Supply of Animal-derived Protein for Human Consumption."

health risks that occur at the human/animal interface. The American Veterinary Medical Association (AVMA) reports that the majority of the 1,461 diseases in humans "are due to multi-host pathogens characterized by their movement across species lines."[29] AVMA says that approximately 75 percent of new emerging human infectious diseases have been zoonotic—naturally transmitted between animals and humans. These include pandemic and seasonal influenzas and other respiratory illnesses that originate from animal species. They also include common food pathogens such as *E. coli O157:H7* and salmonella, which are often traced to animals. The World Health Organization (WHO) notes that areas of the developing world are especially vulnerable, and the most dramatic impacts are on the poorest segments of society. WHO points out that many zoonotic infections are transmitted to "humans through food (brucellosis, tuberculosis), through bites from infected mammals (rabies) and insects (Rift Valley Fever) or via parasitic contamination (e.g., tapeworms) related to animals."[30]

Decreased Investment in Agricultural Research

The Land Grant University (LGU) system has been meeting "practical, roll-up-your-sleeves demands of a growing, industrializing nation" since 1862, notes a July 2012 Chronicle of Higher Education article.[31] But today, despite the formidable challenges of feeding and fueling a rapidly growing global population, we're seeing decreased real public investment in research and higher education. The Congressional Research Service traced the ups and downs of federal ag research funding: a steady increase beginning in the 1950s, stagnation through the 80s, slight growth in the 1990s and increases in the new millenium, peaking in FY2010. But over the past two years, agricultural research funding has been declining due to federal spending cuts.[32] At the same time, land grants are seeing big cuts in state support as state governments wrestle with economic challenges and budget deficits. The University of Wisconsin System received a $250 million biennial cut in 2011, followed by an additional $65.6 million "lapse" in state funding.[33]

Fortunately, the private sector has ramped up investment in agricultural research and development. The Economic Research Service (ERS) of USDA reports that global private-sector investment in R&D related to improving agricultural inputs reached $11 billion in 2010, up from $5.6 billion in 1994.[34] This amounts to more than 7 percent of total sales for companies that produce pesticides, seed and animal inputs including genetics and animal health products. But while the private sector has boosted investment, it is challenged to find employees at all levels, including entry-level scientists and front-line workers in labs and fields. The issue of a talent pipeline in agriculture is complex. Land grant funding may play a role, but a bigger issue may be the false perception that agricultural careers are limited in scope and potential.[35]

Clearly, more work is needed to communicate to young people the fact that agricultural fields offer ample opportunities for good pay, interesting work and a chance to make real difference in the global future.

Wisconsin's Role as a State in Tackling These Important Challenges

What are the right way to address the confounding challenges and considerable opportunities laid out in this paper? Numerous agencies and organizations are actively engaged in discussion about the most effective policies, priorities and the roles that the public and private sectors must play. Federal agencies like USAID have developed highly targeted strategies to build capacity in "under-performing" nations where we are likely to see the largest return on investment.[36] USDA has been

29. American Veterinary Medical Association, "One Health: A New Professional Imperative," One Health Initiative Task Force Final Report (2008).

30. World Health Organization, "WHO | Zoonoses and Food Safety," World Health Organization, accessed December 15, 2012, http://www.who.int/foodsafety/zoonoses/en/.

31. Christopher P. Loss, "Why the Morrill Land-Grant Colleges Act Still Matters," The Chronicle of Higher Education, July 16, 2012, sec. Commentary, accessed December 1, 2012, http://chronicle.com/article/article-content/132877/.

32. Mike J. Boland et al., "The Future Supply of Animal-derived Protein for Human Consumption," Trends in Food Science & Technology, accessed November 13, 2012, doi:10.1016/j.tifs.2012.07.002.

33. "UW System Statement About 2011-13 Budget Lapse," October 18, 2011, accessed December 14, 2012, http://www.wisconsin.edu/news/2011/r111018.htm.

34. Keith Fuglie et al., "Private Industry Investing Heavily, and Globally, in Research To Improve Agricultural Productivity," Amber Waves | Economic Research Service, June 2012, http://www.ers.usda.gov/amber-waves/2012-june/private-industry.aspx.

35. Terence Loose, "College Majors That Are Useless - Yahoo! Education," Yahoo! Education, accessed December 15, 2012, http://education.yahoo.net/articles/most_useless_degrees.htm?kid=1LFZ5.

36. U.S. Goverment's Global Hunger and Food Security Initiative, "Feed the Future," accessed December 18, 2012, http://www.feedthefuture.gov /.

developing science "roadmaps" that focus on key issues of food security and development of new biofuel feedstocks. Obviously, Wisconsin has a crucial role to play.

Wisconsin's Agricultural Economy

Wisconsin has a long history of agricultural versatility and productivity dating back to the mid-1800s.[37] Since then, far-sighted innovators found ways to add value to milk through various processing techniques, building the foundation of world-renowned dairy production and processing industry that in 2007 contributed more than $26 billion to the state's economy.[38]

Wisconsin ranks 9th among states in value of agricultural products sold. It is a diverse agricultural sector—Wisconsin ranks first in cheese and dry whey production, second in milk production and among the top ten states in production of cattle and calves, milk cows, milk goats, trout, mink, honey, corn for grain and silage, oats, forage, potatoes, tart cherries, strawberries, maple syrup, cranberries, mint, onions, cabbage, sweet corn, carrots, green peas, snap beans and cucumbers.[39]

Wisconsin generates nearly $60 billion in total agricultural business sales and employs more than 350,000 people in crop and livestock production and processing and agricultural services.[40] Given the state's strengths in agricultural and food infrastructure, Wisconsin is positioned to play a key role in meeting the challenges and embracing the opportunities of feeding and fueling nine million people—both by meeting needs for quality protein and by creating bioenergy through wood products and forest industries and producing "biogas" from manure and other waste (including food waste) feedstocks.

The Wisconsin agricultural economic impact study by Deller and Williams also includes a detailed "cluster" analysis of specific areas in Wisconsin agriculture that offer potential growth and development.[41] The authors calculated location quotients, or LQs —the ratio of local economic activity divided by comparable national average activity. For example, the LQ for dairy cattle and milk production in Wisconsin was 5.46, meaning the percentage of the state's total employment attributed to the dairy sector is 5.46 times the national average.

Here's a partial list of other Wisconsin ag industries with LQ's over 1.0:

- potato farming (4.11)
- berry farming excluding strawberry (2.85)
- poultry production not including eggs or turkeys (2.45)
- corn farming (1.85)
- all other animal production (1.70)
- floriculture (1.16)

Deller and Williams also looked at growth trends in LQ's in both 2001 and 2009. A location quotient that's over 1.0 and increasing is a sign of an industry with both strength and growth potential—a logical place for the state to concentrate. The growing areas connected to food and fuel with LQs greater than 1 included dairy cattle and milk production and poultry production. Obviously these aren't the only key areas. Potato, berry and corn production are also strong in Wisconsin even though their longer-term growth doesn't show up in this analysis. It will be important in the future to continue to look carefully at location quotients, but a longer period of analysis is needed to more reliably establish real growth trends.

The food processing economic clusters generally complement the industries above with strong LQ's. These include dairy products (especially cheese manufacturing), frozen specialty food manufacturing and fruit and vegetable canning and freezing.

The University of Wisconsin

It is interesting to line up these clusters of strength with the corresponding strengths within the UW-Madison College of Agricultural and Life Sciences. CALS is among the best colleges of its type in the nation; it holds the top position in some rankings of research output and scientific impact.[42] Ranking academic departments

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37. Jerold W. Apps, The People Came First : a History of Wisconsin Cooperative Extension (Madison, WI: Wisconsin Epsilon Sigma Phi Alpha Sigma Chapter, n.d.), http://forward.library.wisconsin.edu/catalog/ocm50785485.

38. Steven Deller and David Williams, "The Economic Impacts of Agriculture in Wisconsin Counties" (University of Wisconsin Extension, July 2009), accessed December 1, 2012, http://www.uwex.edu/ces/ag/wisag/.

39. United States. National Agricultural Statistics Service, 2012 Wisconsin Agricultural Statistics - Growing Wisconsin (NASS - National Agricultural Statistics Service), accessed December 15, 2012, http://www.nass.usda.gov/.

40. Steven Deller and David Williams, "The Economic Impacts of Agriculture in Wisconsin Counties."

41. Ibid.

42. "CALS Facts > Rankings," College of Agricultural and Life Sciences - University of Wisconsin-Madison, accessed December 15, 2012, http://www.cals.wisc.edu/about-cals/cals-facts/rankings/.

within colleges is complicated. One oft-cited measure is the National Research Council (NRC)[43] 2005-06 ranking of more than 5000 doctoral programs at 212 universities. Six CALS academic programs were in the NRC's top five:

- Forest and Wildlife Ecology (important as it relates to bioenergy in the future) - #1
- Food Science - #1
- Nutritional Sciences - #1
- Agricultural and Applied Economics - #2
- Entomology - #2
- Dairy Science - #5

Wisconsin's areas of strength in agriculture and in agricultural education and research must be nurtured to their full potential—for the sakes of both the state's economic growth and global food security. Our expertise in areas such as food science and nutritional sciences will be critical as we combine the ingenuity in production agriculture with the science of developing and distributing new food products. Life sciences departments are also critical. CALS has top-ranked graduate programs in bacteriology (third among all universities, first among publics), biochemistry (sixth) and genetics (eleventh), according to the most recent U.S. News and World Report rankings." Scientists in these departments are actively involved in crop and animal genetics and genomics, development of compounds and processes that have direct agricultural impacts (for example, converting cellulose into biofuels), and understanding pathogens that affect food safety and quality.[44]

In addition, UW-Extension/Cooperative Extension is focused on the delivery of new knowledge via transformational education, applied research and innovation. UW-Extension faculty at CALS, UW-River Falls and UW-Platteville are conducting applied research and education related to:

- Growing a vibrant local and state agricultural economy
- Creating and supporting healthy and safe food systems
- Protecting our valued natural resources for sustained and optimized use

Other Signs of Hope

There is finally strong recognition that these are important issues that will impact future generations. Work done today will create a legacy for the nine billion people who will inhabit our planet in 2050 and beyond. A 2011 report prepared on behalf of the 12 North Central States and their land-grant agricultural colleges notes that the solutions to many of humankind's greatest and most pressing challenges are rooted in modern agriculture and ag bioscience. "[N]o other arena of economic activity, or field of science and innovation … so directly addresses human survival and quality of life, global economic development, and prospects for an environmentally sustainable future," the report says.[45]

USAID, USDA and other groups use research-based criteria to identify parts of the world that offer the greatest potential return on investment in efforts to address food insecurity. USAID in particular offers a good model for this approach. It targets 20 countries, using such criteria as food-security-based need, opportunities to partner and leverage resources, potential to increase production , opportunity to achieve regional, multi-country synergies and availability of resources (including natural resources).

USAID and other agencies are also beginning to target initiatives that focus on the role of women.[46] In their landmark publication titled "Women, Food Security, and Agriculture in the Global Marketplace," Mehra and Rojas point out that women in rural areas produce half of the world's food and, in developing parts of the world they are primarily responsible for 60 to 80 percent of food crop production. These authors cite 40 years worth of research and examples from multiple continents showing that "[w]ith similar access to resources and inputs as men, women stand to achieve equal or higher yields than men." They emphasize the need to empower and engage women worldwide in efforts to grow global

43. The National Academies, "A Data-Based Assessment of Research-Doctorate Programs in the United States," 2011, accessed December 17, 2012, http://www.nap.edu/rdp/.

44. Jill Sakai, "Bacteria Found in Cow Rumens Could Be Harnessed to Process Biofuel," CALS News, accessed December 18, 2012, http://news.cals.wisc.edu/energy/2012/12/03/bacteria-found-in-cow-rumens-could-be-harnessed-to-process-biofuel/.

45. Battelle Memorial Institute. and North Central Cooperative Extension Association., "Power & promise agbioscience in the North Central United States : the importance of North Central experiment stations, extension services and their land-grant universities in the global bioscience economy," 2011, accessed December 17, 2012, http://nccea.org/documents/powerand-promiseweb.pdf.

46. U. S. Government's Global Hunger and Food Security Initiative, "Approach | Gender Intergration," Feed the Future, accessed December 15, 2012, http://www.feedthefuture.gov/approach/Gender—Integration#focus-areas.

food production.[47] Land grant universities can play a role in educating women who can work with others around the world to educate, engage and make a difference. USDA cites that in 2012, undergraduate women enrolled in land grant agricultural programs outnumbered undergraduate men by more than 2,900 students.[48] Within UW-Madison CALS, undergraduate enrollment in 2012 for all majors was 60 percent female and 40 percent male. Among departments that focus on ag production, more than 50 percent of faculty hired in the past five years with U-Extension appointments were women. Hires of UW-Extension faculty at the county level show a similar trend.

A Few Critical Questions

Complex problems don't lend themselves to simple solutions. That certainly applies to problems facing agriculture, whether the immediate challenges related to the 2012 drought or the long-term challenges of feeding nine billion people. There are no silver bullets. But we can begin by laying out the key questions that we need to address in Wisconsin and other places that offer significant potential to contribute to solutions. These are offered as starting points for discussion among agricultural and food industry leaders, policy makers, academics, farmers and their families, and students. Continued conversations and discussion will be important. But, we will need to act. We will need understanding, commitment, and the will to embrace these challenges and to act together. The next 40 years will be exciting for people engaged in agriculture, food, human health, nutrition, and all of the sciences connected. We can rise to the occasion, and we will.

• How (and how much) will we invest in research and other efforts to develop new knowledge to mitigate the barriers and challenges to future food security?

• How can we better engage young people and leaders in addressing these critical questions?

• How can we continue to engage young people in programs that have been proven to be effective pathways careers in science, technology, engineering and mathematics?

• How can we prioritize and optimize economic development around key areas in agriculture with significant potential at the national, regional and state levels? How can we employ strategic priority-setting like those embodied in USAID's "Feed the Future" initiative, or cluster analysis techniques?

• How do we best create partnerships that leverage the resources of private enterprise with public sector education and research?

• How do we engage non-farmers in these discussions in ways that overcome apathy and engender necessary public support?

• How do we have the conversations, both within the agricultural community and beyond, about the issues and the barriers that hinder doubling agricultural production? How can we talk about things like climate change, availability and quality of water, animal and human health, and economic development in productive and non-polarizing ways?

47. R. Mehra and M. H. Rojas, "Women, Food Security and Agriculture in a Global Marketplace," International Center for Research on Women, Washington, DC, USA (2008).

48. United States Department of Agriculture, "USDA Blog » Study: Undergraduate Women Outnumber Men in Land-Grant Ag Programs," July 24, 2012, http://blogs.usda.gov/2012/07/24/study-undergraduate-women-outnumber-men-in-land-grant-ag-programs/.