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A New Risk Management Tool for Crop Producers

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A NEW CROP insurance product, "Margin Protection," was introduced by the USDA this fall. The product provides corn and soybean producers in Iowa (and rice and wheat producers in selected states) with a margin guarantee. The product was developed by economists at Iowa State and Watts and Associates in Bozeman, Montana. The sales closing date for MP in Iowa is September 30.

Table 1. Margin protection actuarial data

Value Type	Values
Projected crop price	See Price Discovery Section
Expected county yield	179.9
Expected revenue per acre	$716.00
Expected costs per acre	$319.17
Expected margin per acre	$396.83
Trigger at 80% coverage level	$317.47
Total premium at 80% coverage level	$39.89
Producer premium at 80% coverage level	$17.95

How it works

The expected margin is calculated in September of the year prior to the year the crop will be grown. Expected revenue is calculated much like existing revenue products—expected costs are calculated based on ISU extension crop budgets for corn and soybeans and input prices (such as fertilizer) are taken from the relevant futures markets. Once the expected margin is calculated, the producer chooses a coverage level and this is multiplied by the expected margin to arrive at the trigger margin. Producers will be indemnified for any yield or price reduction, or input cost increase, that causes actual margins to fall below the trigger margin.

Why was it developed?

In the period after the crop price boom that started in 2006, crop producers became interested in obtaining a higher level of coverage than could be offered under traditional products. This was needed because land rents increased as a proportion to total costs. Existing products sometimes did not offer enough protection to ensure that cash rents plus operating costs were covered. Margin Protection is a response to this need.

To see why MP provides higher coverage, consider this simplified example. A producer expects a revenue of $1,000 per acre and has non-land production costs of $500 per acre. A traditional Revenue Protection (RP) policy with a 75 percent coverage level will provide a guarantee of $750. This $750 will cover production costs of $500 plus an additional $250 to pay for land costs. A 75 percent MP policy will guarantee the $500 production costs and provide additional coverage of $375 (75 percent of the expected $500 margin) to cover land costs.

Now suppose that corn prices fall by 10 percent in the example described above. This will not trigger an indemnity on RP even at the maximum 85 percent level, but it will generate a 5 percent indemnity on an 85 percent MP policy. This is true because a 10 percent reduction in prices will cause the expected margin to fall by 20 percent.

In order to protect against moral hazard at these extreme coverage levels, and to ensure affordable premium rates, MP margins and indemnities are calculated at the county level. If the product design stopped at the county level, producers would be exposed to yield damage that impacted their operation but does not cause a reduction in county revenues. MP gets around this problem by allowing the producer to purchase an individual insurance policy such as RP. If both MP and RP policies result in a claim, the RP indemnity is paid in full and this amount is subtracted from the MP indemnity. The MP premium rates are, of course, adjusted to reflect this possible reduction in the MP indemnity.

How much does it cost?

The quote shown in Table 1 is an actual MP quote for corn in Calhoun County in 2015. This quote assumes that MP is purchased as a stand-alone

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product and it does not include the MP premium reduction that the producer will receive if they also purchase an individual insurance product such as RP. The quote of $17.95 per acre is for 80 percent coverage. The premium quote increases to $33.12 at 90 percent MP coverage and falls to $10.25 at 70 percent MP coverage.

The premium quote for soybeans in Calhoun is shown in Table 2. The $6.52 per acre quote is for an 80 percent trigger margin. The premium falls to $2.92 at 70 percent coverage and increases to $14.39 at 90 percent coverage.

The $39.89 soybean "Total Premium" quote is the amount that this MP policy can be expected to pay out on average. This means that the producer is paying $17.95 to buy an expected payout of $39.89. This $20.94 difference is due to a government subsidy.

Table 2. Margin protection actuarial data

Value Type	Values
Projected crop price	See Price Discovery Section
Expected county yield	49.8
Expected revenue per acre	$435.75
Expected costs per acre	$163.99
Expected margin per acre	$271.76
Trigger at 80% coverage level	$217.41
Total premium at 80% coverage level	$14.48
Producer premium at 80% coverage level	$6.52

Who should buy this product?

Producers who sign new leases in late summer of the year prior to planting and are concerned about increases in input costs or reductions in output revenue between September of one year and October of the following year will find MP to be a useful risk management tool. This will be particularly true for producers who lock in a cash rent that is close to the expected margin. Producers who farm in many parts of the county and who can reasonably expect their whole farm yield to mirror the county yield will also find the product to be of value.

Should producers add a supplemental policy?

The six month time lag between when MP is sold in September and RP is sold in March gives the producer a chance to decide on whether to purchase a supplemental RP policy. If market prices have fallen by March, then the MP policy will be "in the money" and any further reductions in yields or prices will add to expected indemnities. The high likelihood of an MP indemnity should reduce the need to purchase an additional individual policy. If, however, prices have rallied, then the MP policy will be "out of the money" and the producer will need to decide if they need to upgrade their revenue protection level with a March policy.

Further Information

The USDA offers a detailed description here *http://www.rma.usda.gov/policies/mp/*

Developers of the product have built a premium estimator that is available here. *http://marginprotection.com/*

A PowerPoint presentation is available from the author at *dhayes@iastate.edu*. ■

Inside this issue

The Unintended Consequences of Household Phosphate Bans*

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IN 2010, seventeen US states implemented mandatory bans on the sale of phosphates in automatic dishwasher detergent, due to concern over the adverse effects that arise from excess phosphorus loads to our lakes, rivers, and streams.[1] Excess phosphorus can lead to harmful algal blooms, excessive aquatic plant growth, and alterations to the composition of aquatic species, among other changes. Accordingly, the US EPA considers nutrient pollution to be one of the most important environmental challenges we face in the twenty-first century (USEPA 2009). Effectively and efficiently addressing this challenge requires a sound understanding of phosphorus control policies. We find that the effectiveness of these bans to reduce phosphorus pollution is highly dependent upon regulations that are in place at wastewater treatment facilities and that pre-existing regulations at certain wastewater treatment facilities render these bans ineffective precisely in the areas in which phosphorus pollution is most problematic.

When a household runs its dishwasher, that waste travels through a sewer system to a wastewater treatment facility (as influent) where it is treated before being discharged into the environment (as effluent) (see Figure 1). The Clean Water Act requires that wastewater treatment facilities meet a basic level of treatment known as secondary treatment. However, where water quality fails to support state-designated uses of waterways, additional stringent effluent standards (limits) may be placed on particular pollutants such as phosphorus. With a fairly simple theoretical model of wastewater treatment behavior, it is easy to show that these "limit facilities" have little incentive to deviate from their current phosphorus effluent levels. The basic intuition is as follows: Removing phosphorus from wastewater treatment effluent is expensive. Wastewater treatment facilities find it in their own best interest to minimize costs of treating phosphorus subject to meeting regulated limits. Although the phosphorus ban lowers the amount of phosphorus entering a wastewater treatment facility, that facility faces no incentive to pass through these reductions. Instead, the bans provide a cost savings to the facility by lowering the amount of phosphorus influent it must treat to meet its limit. Consequently, in areas served by limit facilities, we expect that these bans will have little-to-no effect on phosphorus entering the rivers, streams, and lakes in which these facilities discharge.

Figure 1. Wastewater Treatment

Using detailed data on effluent at wastewater treatment facilities in states with mandatory phosphate bans, this is exactly what we find. We examine the difference in phosphorus effluent before and after the 2010 bans took place at limit versus no-limit facilities. We find that phosphorus effluent dropped 18 percentage points more at facilities without limits compared to facilities with limits after the bans were implemented—consistent with engineering estimates attributing

Note: This article is based on a working paper by Alex Cohen and David Keiser, "The Effectiveness of Overlapping Pollution Regulation: Evidence from the Ban on Phosphates in Automatic Dishwasher Detergent" https://sites.google.com/site/dkeiserecon/home/papers. Cohen is a Postdoctoral Associate in the School of Management at Yale University (alex.w.cohen@yale.edu). Keiser is an Assistant Professor in the Department of Economics and an affiliated faculty member in the Center for Agricultural and Rural Development at Iowa State University (dkeiser@iastate.edu). We thank Becky Olson for providing graphics for Figure 1.

[1]These states are Illinois, Indiana, Maryland, Massachusetts, Michigan, Minnesota, Montana, New Hampshire, New York, Ohio, Oregon, Pennsylvania, Utah, Vermont, Virginia, Washington, and Wisconsin.

from 9 to 34 percent of phosphorus influent to automatic dishwasher detergent. We show that phosphorus effluent at limit and no-limit facilities had very similar trends prior to the bans taking hold in 2010. This gives us confidence in attributing the differential drop in phosphorus at limit facilities as arising from these facilities reacting differently to the ban.

To provide further evidence of this predicted behavior, we use a unique dataset from the state of Minnesota that records both phosphorus influent as well as phosphorus effluent. We use these data for three main purposes. First, by observing phosphorus influent at wastewater treatment facilities, we show that the differential drop in phosphorus effluent at limit versus no-limit facilities over the ban period is not due to a differential drop in phosphorus influent over that time period. In other words, these data provide further evidence that the differential change in effluent is due to differences in behavior at limit and no-limit facilities, not a differential change in the amount of phosphorus entering these facilities.

Second, we use the Minnesota data to estimate what we term the elasticity of phosphorus effluent with respect to influent. This elasticity is the percentage change in phosphorus effluent with respect to a percentage change in phosphorus influent. These estimates tell us how responsive these types of facilities are to *any* influent policy, not just bans. Our estimates place a lower bound of 0.5 on this elasticity at no-limit facilities. For limit facilities, the magnitude is approximately 0.1 and insignificant, suggesting that, as expected, effluent from limit facilities responds very little to changes in influent.

Finally, we use the Minnesota data to quantify how effective these bans are at reducing phosphorus effluent. Using our econometric estimates and theoretical predictions, we bound elasticity at no-limit facilities between 0.5 and 1.0 and elasticity at limit facilities between 0 and 0.1. Using the share of influent at limit and no-limit wastewater treatment facilities in Minnesota, we find that for every one percent decrease in phosphorus influent, phosphorus effluent across all facilities falls by 0.41 to 0.76 percent. However, when we examine waterways that were impaired by nutrients in 2014, for every one percent decrease in phosphorus influent, phosphorus effluent falls by only 0.18 to 0.21 percent. If Minnesota is representative of other ban states, these results imply that phosphate bans in aggregate yield 41 to 76 percent of the expected effluent reductions. More striking is the fact that these bans yield only 20 percent of the expected effluent reductions in the most polluted waterways. This occurs because limits to control phosphorus effluent have already been implemented in many impaired waterways.

Finding efficient and effective solutions to phosphorus pollution is not easy—the US has struggled with cultural eutrophication for several decades. At first blush, banning phosphates in automatic dishwasher detergent may appear to be a clear solution to this problem. Common intuition is that banning a pollutant leads to an improvement in environmental quality. This was the case when phosphates in household laundry detergent were banned in the 1970s. However, since that time, phosphorus limits have been introduced at many wastewater treatment facilities. The effectiveness of phosphate bans is now tempered by regulations in place at wastewater treatment facilities. If the goal of the bans is as stated—to reduce phosphate entering US waters—we argue that these bans are misplaced.

Economists have argued for several decades that market-based approaches to pollution management have many advantages over command-and-control policies. Indeed, in our setting, our theory suggests that a tax on phosphorous effluent would incentivize wastewater treatment facilities to pass through influent reductions, avoiding the unintended consequences that we find. Yet, water quality policy in the US remains largely reliant on command-and-control policies such as effluent standards, technology standards, and bans. Part of this reason is that these policies are often thought to provide a guaranteed means to improve the environment. However, when there are overlapping policies, even this advantage of command-and-control policies is muted. Even if the adoption of market-based approaches remains limited, at the very least, policymakers ought to take into account how pre-existing regulations might mitigate the effect of potential policies. ■

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The Commonalities and Differences between Chinese and US Agriculture

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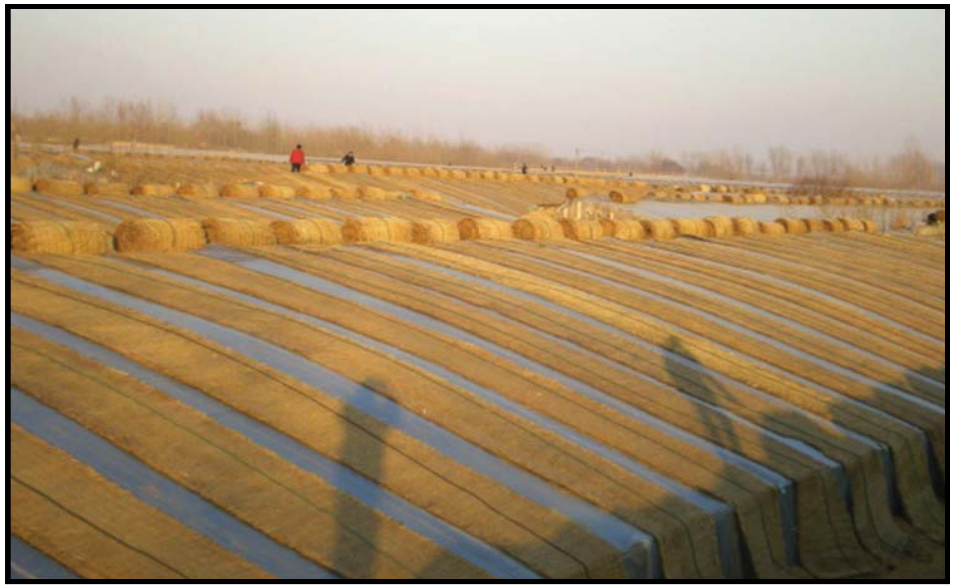
WITH ONE in four rows of soybeans planted in Iowa exported to China, it is almost impossible to overstate the importance of the Chinese economy and its consumers have for US agricultural producers and the farm sector in general. However, there is a lack of understanding of China's agricultural industry and, in particular, the life and work of a typical Chinese agricultural producer. Having been born and raised in a rural Chinese county, I want to share some of my observations regarding the commonalities and differences between Chinese and US agriculture.

China and the US have a lot in common when it comes to agriculture. First, agriculture is a multi-billion dollar industry in both countries, as shown in Table 1, despite various forms of government policies and distortions, market prices remain the key signal both Chinese and US producers respond to when making production decisions, and individual producers in both countries are free to choose whatever crops and inputs they wish.

Second, the agricultural sectors in both countries face similar challenges and opportunities: farmers in both countries are aging; farm succession and access to land are common concerns; phosphorus-induced algal blooms occur in both the United States and China—in fact, as shown in Table 2, Chinese farmers apply more fertilizers and pesticides than their US counterparts. However, innovations, such as the big-data revolution, GPS, the internent, and unmanned aerial vehicles are providing US and Chinese farmers with new opportunities to combine technology and agriculture.



Vegetable greenhouses are partially covered with rice straw to aid in temperature control.

Third, the agricultural industries in both countries are heavily involved in international trade. In that sense, the well-being of the countries are interconnected—the United States is the leading supplier of many commodities in China, especially soybean and pork, and US imports of vegetables and fruits from China more than doubled from 2000 to 2010.

Due to historical and political reasons, you could easily find many sharp contrasts for the agricultural industries in the United States and China, the four major differences are:

First, natural conditions for agriculture are better in the United States. As shown in Table 3, the population of agricultural producers in China is 75 times larger than the United States, but China has less than half the arable land available for farming. A typical US farm of 400–500 acres is equivalent to the total farmland for a 200-household village in China.

Second, there are key differences in the paramount objectives of agricultural policies in the United States and China. Supporting and maintaining net farm income for a rural household is arguably the most important goal of US farm policy, however, the Chinese government views the national food security as a much more important goal in making agricultural policy decisions. In other words, China pays much more attention to the total acreage of cropland, as opposed to the well-being of the farmers.

Third, the support system for Chinese agricultural producers is not nearly as well-structured or effective as the American system. Since the start of communist rule in 1949, farmers have been marginalized in China's economic and political system. Before China opened up to a market economy in the late 1970s, a sizeable portion of agricultural proceeds were taken from farmers to support the development of heavy industries. Despite the rapid growth in agricultural subsidies recently, China only abolished its agricultural tax system in 2003. The average government payment per farm Chinese farmers receive is only $113, compared to $9,925 for an American farm, as shown in Table 4. Chinese farmers are far behind their American counterparts in terms of both educational achievements and access to resources, such as machinery and internet, as shown in Table 5. In addition, China lacks a strong extension program that helps farmers, especially those in poorer areas, to improve yields, mitigate environmental impacts, and master modern agricultural technologies. The best agricultural universities in China are often located in mega-cities such as Beijing, Shanghai, and Nanjing, as opposed to Ames, IA, College Station, TX, Ithaca, NY, and Urbana-Champaign, IL.

Fourth, agriculture is far more volatile in China than it is in the United States. In the foreseeable future—within 10 years—China expects to see another 100 million agricultural producers move to cities in the largest urbanization movement in the history of the world. China has recently enacted several policies and pilot trials for rural land reform aimed at encouraging consolidation of small plots and improving productivity. China is learning from the United States and Europe about setting up massive agricultural subsidy, crop insurance, and agri-environmental conservation programs. With the development of the Internet and Alibaba—a Chinese e-commerce company that has a sales portal larger than Amazon and eBay combined—more and more rural youths are opening online shops to sell agricultural and non-agricultural products. While the US agricultural industry is much more mature and stable, things could change very quickly for Chinese agriculture, as is true in almost every industry in China.

As one Chinese saying goes, ‘bread always comes first,’ and the well-being of

Table 1. Summary statistics of the agricultural sector in China and the United States

	China	US
Total Population	1350.4 million	318.9 million
Gross agricultural production	555.2 billion $	232.4 billion $
Share of Agriculture in Total GDP	10.0%	1.3%
Share of Agriculture in Employment	35.0%	2.0%

Table 2. Fertilizer and pesticide use in China and the United States

	China	US
Herbicide consumption (2007)	228.4 million lbs.	531 million lbs.
Insecticide consumption (2007)	241.6 million lbs.	93 million lbs.
Fungicide consumption (2007)	169.42 million lbs.	70 million lbs.
Total pesticide consumption (2007)	2,040 million lbs.	1,133 million lbs.
Pesticide application rate per farm	5.01 lbs.	1.24 lbs
Nitrogen fertilizer consumption	47,884 million lbs.	23,568 million lbs.
Phosphorus fertilizer consumption	16,612 million lbs.	7,936 million lbs.
Potash fertilizer consumption	12,548 million lbs.	8,480 million lbs.
Total fertilizer consumption	118,238 million lbs.	39,984 million lbs.
Fertilizer application rates per farm	290.7 lbs.	43.7 lbs.

Table 3. Summary statistics of the agricultural sector in China and the United States

	China	US
Number of Farmers	241.7 million	3.2 million
Number of Farms	200.2 million	2.1 million
Total Farmland Area	406.8 million acres	914.5 million acres
Corn Production Area	89.7 million acres	87.4 million acres
Soybean Production Area	16.9 million acres	76.3 million acres
Wheat Production Area	59.6 million acres	45.3 million acres
Total Size of Vegetable/Herb Greenhouses	83.6 million sq.ft.	61.8 sq.ft
Average Farm Size	2.0 acres	433.6 acres

Table 4. Government programs and machinery use in Chinese and American agriculture

	China	US
Net cash income from farm	$4,954.30	$37,241.00
Average government payments per farm	$113.00	$9,925.00
Total enrollment in crop insurance programs	181.2 million acres	282 million acres
Cropland in crop insurance programs	67.9%	84.0%
Average machinery value per farm	$10,622.50	$115,706.00
Average farm house in 2006	1,378.0 sq.ft.	2,169.0 sq.ft.
Number of trucks	17.52 million	3.30 million
Number of tractors	5.27 million	4.18 million
Number of combines	1.42 million	0.35 million

Table 5. Demographic characteristics for Chinese and American farmers

	China	US
Percent of women farmers	53.2%	30.9%
Farmers completed high degree or above	15.6%	91%
Farmers with Bachelor's degree or above	0.2%	25.7%
Farmers with Internet Access	2.2%	69.6%
Age - Under 34 (US); Under 30 (China)	20.2%	5.4%
Age - 35-54 (US); 31-50 (China)	47.3%	37.8%
Age - 55 or above (US); 51 or above (China)	32.5%	56.8%

The Journey from a Farm in Shandong Province China to Ames Iowa

by Nathan Cook, CARD Editor

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As is typical of many Midwesterners, Wendong Zhang grew up with family ties to agriculture. In some ways, his grandfather's farm in Shandong province in Northeastern China would be similar to an Iowa farm. Located in the western portion of the province most of the family-run farms rotated crops between wheat and corn. The farming methods in the province, where, Wendong says, economic development lagged behind the rest of the country, lagged far behind the United States. "Back then, machinery was not widely adopted as it was cost-prohibitive for farmers," he said. "I remember as a kid riding a very small tractor and grinding wheat because there was no large machinery that could do both."

In his lifetime, the farms around his village started going through major changes. "Over the last 20 years there have been large changes in which crops are grown and the way in which they are grown," he said. Wendong said farmers in his village switched from grains like wheat and corn to consumption grapes, which later gave way to using small greenhouses to grow produce like honeydew melons, cucumbers, and tomatoes. There was an economic rationale for switching—at first, consumers were willing to pay premiums for exotic varieties of grapes, making them more lucrative than grains, then eventually farmers realized they could use the land more intensively to grow larger amounts of vegetables in greenhouses. "The limiting constraint now is labor, not land. As long as you put in the labor you'll have a good crop," Wendong said.

The changes in agricultural practices had a positive economic effect in Shandong province—the average annual income of a farmer in Wendong's hometown has risen from about $1,500 to $10,500, outpacing the rate of overall inflation in China.

As Wendong watched the culture of farming change in Shandong Province, he became not only interested in the positive effects, but the negative effects as well. "I studied environmental science in college and I was interested in the massive problems that come along with economic development. Gradually, I became more interested in the human aspects of environmental problems," he said.

His interest in economic development and environmental science took him from Fudan University in Shanghai, which only admitted 40 students out of 750,000 high-school graduates in Shandong provinces, to Ohio State University. Wendong earned his master's in economics in 2012, then through the advice of his academic advisor, he entered the environmental science graduate program and earned his PhD in agricultural, environmental, and developmental economics in 2015. "Looking back, I feel a complete arc—I still feel very connected to my agricultural and environmental background," he said.

Wendong came to Iowa State University in August of 2015 as an assistant professor of economics and an extension economist, leading the Iowa Land Value Survey and the Soil Management and Land Valuation Conference – the longest running conference at ISU. The goal of his research and extension program, he says, is to promote the long-term sustainability of the agro-ecosystem. He has also taken an interest in the similarities and differences in agricultural and environmental problems faced by the US and China. "Because of the different political and social systems, they could take very different approaches, but I think China has already learned a lot and are learning from Europe and the US," he said. ■

farm households and the farm sector are of perennial significance in China and the United States. Despite significant differences and even disputes, Chinese and US agricultural industries have a lot in common and most importantly have a lot to learn from each other. As China's president Xi puts it: the Pacific Ocean is vast enough to embrace both China and the United States.

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China's Importance in US Ag Markets

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THERE'S BEEN a lot of news about China in the last few weeks, from their currency devaluation to significant stock market fluctuations to recent agricultural purchase agreements. Many of these news stories try to address the question of the importance of China to the US economy and assess the impact of Chinese economic shifts on the United States. For agriculture, the importance of the Chinese market has grown significantly over the past decade; however, the impact is targeted at specific sectors within agriculture.

Figure 1 shows the tremendous growth in the value of our agricultural exports to China. Since 2000, China's share of our agricultural exports has increased from two percent to roughly 16 percent in 2014. The shift has been swift and powerful. China has become one of our strongest agricultural trading partners, rivalling Canada, Mexico, and Japan. The growth is even more dramatic when you consider the overall growth in agricultural trade. In 2000, the United States exported $51 billion of agricultural products—in 2014, that value had tripled to $150 billion.

China's prominence in US agricultural markets is also highly product-specific, with a strong concentration in oilseeds, livestock feed products, and cotton. Table 1 breaks down the US-China agriculture trade relationship by product. As can be seen, China dominates the international trade picture for several products. Nearly 90 percent of US sorghum exports were shipped to China last year and utilized as livestock feed. Animal hides from our livestock sector are frequently shipped to China. For Iowa, the main trade product is soybeans. Roughly 60 percent of US soybean exports (or put another way, 25 percent of the total US soybean crop) finds its way to China.

Table 1. China's Share of US Ag Exports in 2014 by Product

Product	Percentage
Total	16.1%
Grain Sorghum	88.6%
Sheep & Lambskins	71.9%
Cattle Hides, Parts	64.1%
Cattle Hides, Whole	63.9%
Corn Oilcake & Meal	61.3%
Soybeans	60.7%
Hog Sausage Casings	41.1%
Wool	39.4%
Whey	25.3%
Cotton	25.2%
Tobacco	19.9%
Variety Meats, Pork	18.9%
Soybean Oil	16.2%
Grains & Feeds	10.9%
Livestock & Meats	10.6%
Dairy & Products	9.8%
Turkey Meat	6.7%
Pork, Fresh, Chilled, or Frozen	4.8%
Corn	0.8%
Egg and Egg Products	0.3%

Source: USDA-FAS

There have been significant swings in the US-China agriculture trade over the past few years. The cotton market has experienced the largest shifts over the past five years, as China's share of the market has been cut in half, as shown in Figure 2. Tobacco exports have roughly doubled over the same time. Grain and feed trade to China has also doubled in the last five years. Livestock and meat exports have been relatively steady, while dairy exports are slowly increasing.

Concentrating on Iowa agricultural products, the Chinese pork market has long been a sought-after market; and while inroads have been made, the largest shares of US-China pork trade are for variety meats, and not for larger pork cuts. This pattern is true across the livestock complex. Roughly 10 percent of US turkey exports are shipped to China, but the egg market has yet to develop, as less than one percent of US egg exports travel across the Pacific as shown in Figure 3. Meanwhile, for the Iowa crop sector, China is the major market for one of our staple crops. China has been the largest, and most consistent, buyer of soybeans for several years. That trend continues today as evidenced by the recent visit and purchase by Chinese President Xi Jinping. While China does purchase some processed soybean products (oil and meal), the vast majority of their soybean trade is for the bean itself. On the other hand, in the corn market, China prefers to purchase the processed corn products, instead of the corn directly. As Figure 4 shows, China has been a relatively small (compared to the soybean market) and inconsistent buyer of US corn. However, the Chinese market has been the major outlet for corn oilcake and meal and dried distillers grains from our ethanol plants.

The patterns within US-China agriculture trade are strongly influenced by the productive capabilities and the government policies of both countries. Chinese agriculture is geared towards a policy of self-sufficiency in a few key commodities: wheat, corn, rice, and pork. For the most part, over the past couple of decades, China has been self-sufficient in those commodities; however, in order to achieve that, China has ceded the production of other commodities to the rest of the world and relied on agricultural trade to obtain their agricultural requirements. The US soybean market has been a major beneficiary of that.

Looking forward, it is expected that agricultural trade between China and the United States will continue to grow as the Chinese economy evolves. One of the largest driving factors has been, and is expected to be in the future, the growth in China's meat demand. Chinese meat consumption has been growing quickly over the past decade and that is projected to continue. That growth should provide increased opportunities for Iowa crop and livestock products in China. ■

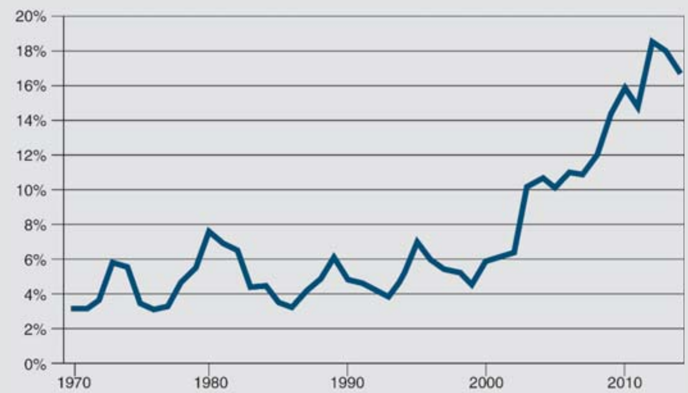

Figure 1. China's Share of US Agricultural Exports by Value
Source: USDA-FAS

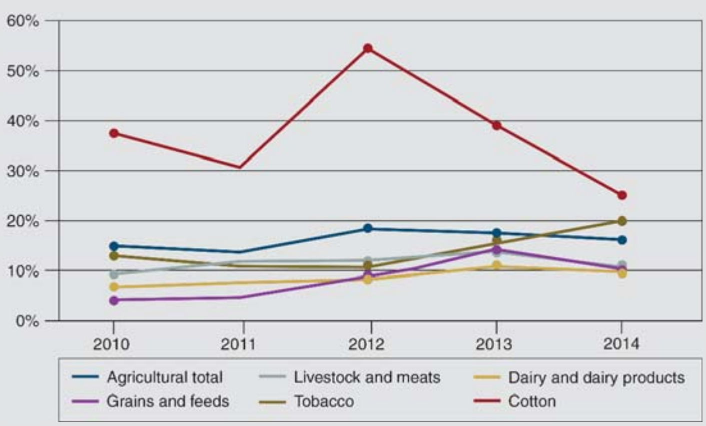

Figure 2. China's Share of US Agricultural Exports, 2010-14
Source: USDA-FAS

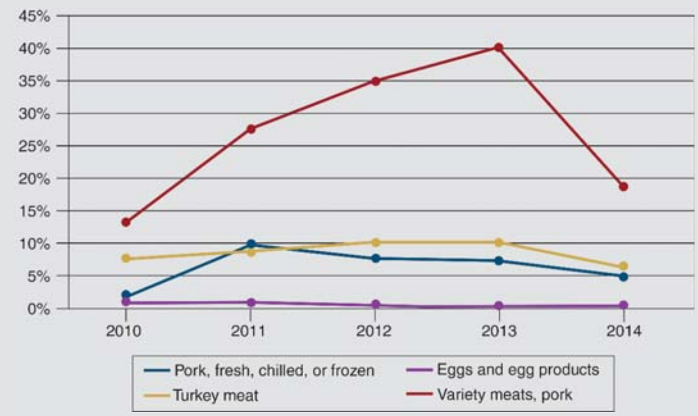

Figure 3. Key Iowa Livestock Exports to China
Source: USDA-FAS

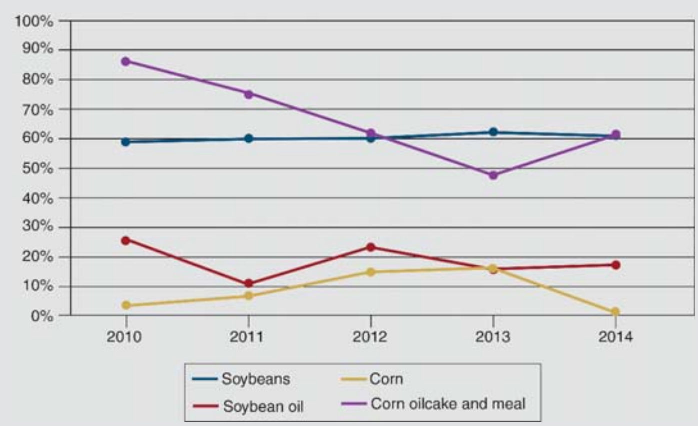

Figure 4. Key Iowa Crop Exports to China
Source: USDA-FAS

Degraded Water Quality in Lakes: Consequences for Use

by Hocheol Jeon, Catherine L. Kling, and Yongjie Ji
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IOWA, LIKE many states in the Midwest, suffers from poor water quality. Excess nutrients in the state's lakes and streams contribute to odor, limited clarity, excess algae and plant growth, and can contribute to a number of other undesirable changes to habitat and water quality. These changes, in turn, can reduce the usage and enjoyment of lakes and streams. Likewise, improvements in water quality brought about by reduced nutrient pollution or lake improvement projects can increase the number of visitors and their enjoyment of natural environments. To better understand what Iowans value about their natural environment and how changes in water quality and other factors alter that value, the Center for Agricultural and Rural Development (CARD), with funding from the Iowa Department of Natural Resources and the US Environmental Protection Agency, initiated a set of household surveys in 2002.

Surveys were conducted each year from 2002 to 2005, then again in 2009, and most recently in 2014. The information collected in the most recent household level survey is the subject of this review. Specifically, we consider how the current usage of Iowa's lakes compares to usage in previous years.

The 2014 survey was mailed to nearly 7,000 Iowa households, about half of whom had responded to prior surveys and the remainder came from households who were not included in earlier surveys. Over 50 percent of surveys were returned, with the majority of respondents between the ages of 35 and 75. This response rate is similar to the rates from the previous years' surveys.

Approximately 60 percent of respondents reported that their household visited a lake at least once during the year and about 20 percent reported taking at least one trip where they stayed overnight at a lake. This large usage rate of lakes is consistent with previous surveys, indicating that a majority of Iowa households continue to use and enjoy these natural areas. The average number of single-day trips by all respondents was more than 8. The estimates of 2014 Iowa lake visits are slightly lower than the average from the visitation rates over the five previous surveys (2002–2005 and 2009), while the numbers are greater than 2009 Iowa lake usage estimates. This is likely due to the 2008–2009 economic downturn and associated change in travel and expenditure patterns. It is important to recognize however that while the overall usage of Iowa's lakes is relatively stable over the set of surveyed years, there are increases and declines on an individual annual basis across lakes.

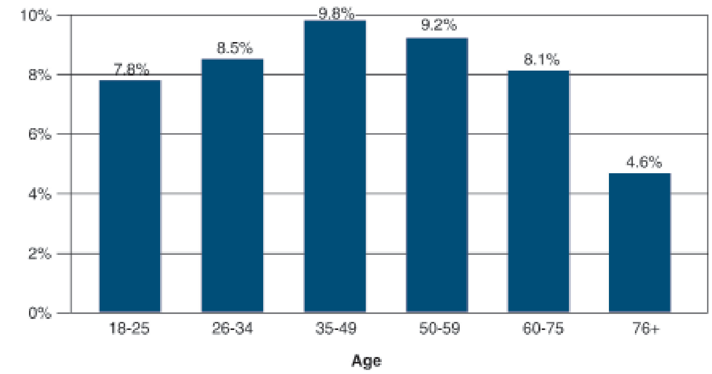

Figure 1. Average number of single-day trips by age

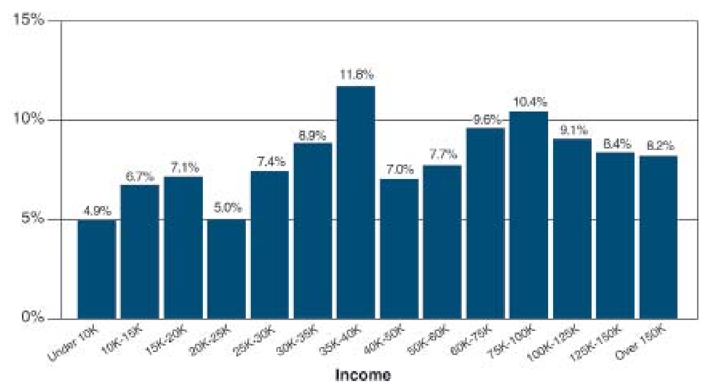

Figure 2. Average number of single-day trips by income

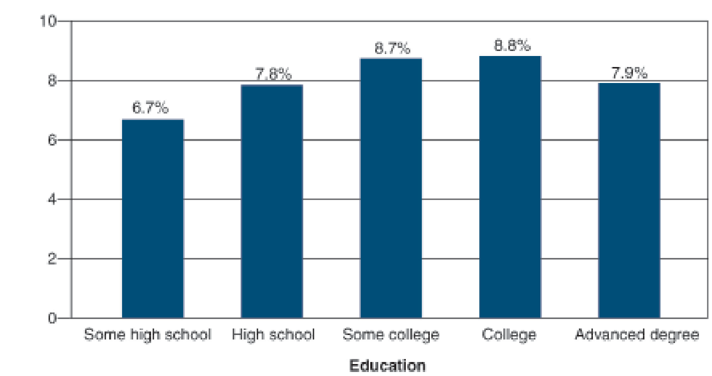

Figure 3. Average number of single-day trips by education

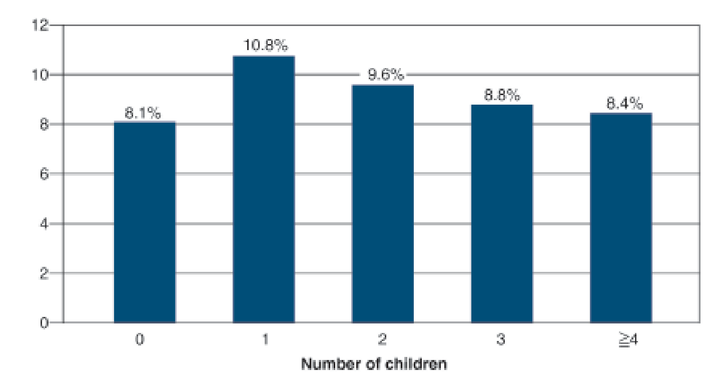

Figure 4. Average number of single-day trips by number of children in family

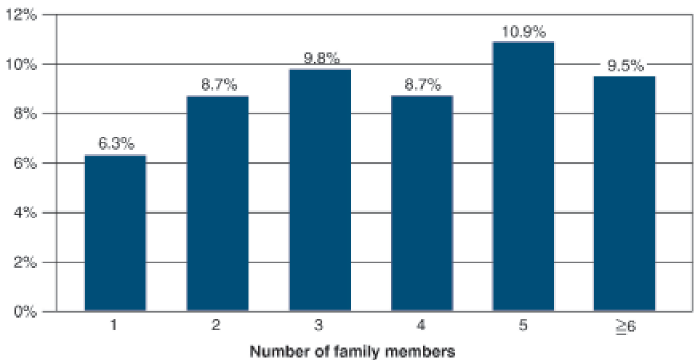

Figure 5. Average number of single-day trips by total number of household members

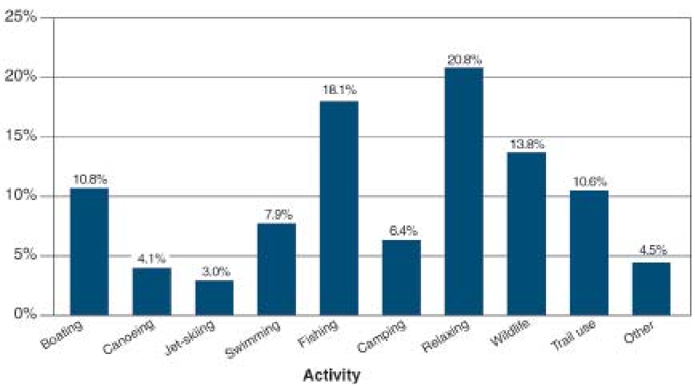

Figure 6. Most popular activities in all Iowa lakes

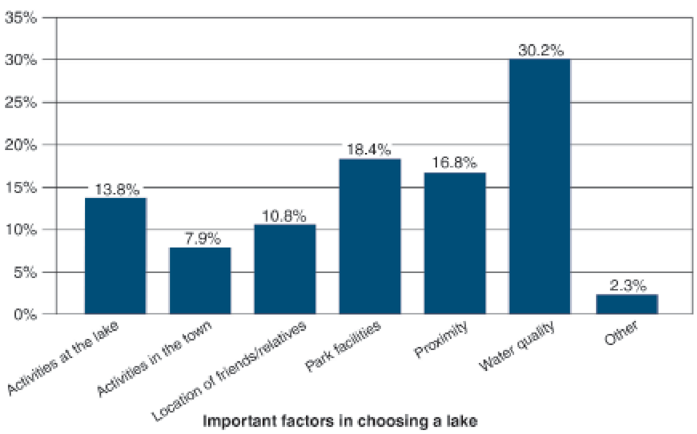

Figure 7. Important characteristics when choosing a lake for recreation

Table 1. Ten Most Visited Iowa Lakes in 2014

Ranking	Lake	Estimates
1	Saylorville Lake	620,000
2	Clear Lake	436,000
3	West Okoboji Lake	336,000
4	Grays Lake	359,000
5	Big Creek Lake	376,000
6	Lake Macbride	335,000
7	Coralville Lake	331,000
8	Red Rock Lake	269,000
9	East Okoboji Lake	251,000
10	Big Spirit Lake	233,000

The number of visits to Iowa lakes varies with household characteristics such as age, income, education, number of children, and number of persons in a family. Middle age households (35–49 and 50–59) visit more than younger and older age households, as shown in Figure 1. Moreover, there are some difference in the number of visits between low-, mid-, and high-income households, as detailed in Figure 2. There are also observable differences in lake visitations based on education, with college educated households visiting lakes more often, as shown in Figure 3. As shown in Figures 4 and 5, lake visitation patterns also differ based on the number of children in a family, and the total number of persons in a family—families with only one child visit lakes most frequently, as do families with a total of five members. While the data indicate that there are differences in visitation rates across these household characteristics, it is perhaps most striking how relatively small these differences are. The data suggests that these natural assets are used by low- and high-income families, households of all age and education categories, and households with and without children at home.

Figure 6 shows the distribution of the most popular activities. The top three activities selected by respondents were relaxing and/or picnicking, fishing, and nature/wildlife watching, respectively. When choosing a lake for recreation, respondents considered several factors to be important. As shown in Figure 7, water quality is by far considered the most important, with park facilities and proximity to home second and third, respectively.

Table 1 shows the 10 most popular lakes and estimated annual household trips. Saylorville Lake was the most visited lake in 2014 with over a half-million visitors. The survey results show that many of the most popular lakes are located in urban areas (e.g., Saylorville Lake, Clear Lake, Gray Lake, and Big Creek Lake are all located in urban areas).

While not a measure of the value of these lakes for their enjoyment and addition to the quality of life experienced by Iowans, it is worth noting that visitors to these lakes bring economic activity in the form of spending in retail and service sectors such as fuel costs and food. Based on estimated single-day household trips, we estimate that recreational trips to the 139 surveyed lakes was accompanied by over $800 million of local spending.

The number of Iowans that utilize the state's lakes (60 percent) for various forms of recreation, and the economic impact of those trips ($800 million annually), is undoubtedly reflective of the importance of studying and understanding the usage of Iowa's lakes. The data provided by this study can help ensure proper management of the state's natural resources, which will benefit all Iowans. ■

An interactive usage map for each surveyed lake is available on the CARD website at http://bit.ly/IowaLakesUsage.

www.card.iastate.edu

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