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Lessons from Previous U.S.-China Trade Disputes

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TRADE ISSUES have recently erupted between the United States and China and the battle over newly announced tariffs has escalated quickly. At the beginning of 2018, the United States imposed tariffs on imported solar panels and washing machines, and China responded by initiating an anti-dumping investigation into US sorghum. In early March, President Trump announced steel and aluminum tariffs with China being one of the primary targets. Within two weeks, China responded by announcing a list of 128 US products that are the targets of retaliatory tariffs effective on April 2, 2018. The list included pork products and ethanol, which are of critical importance to the US Midwest. As those tariffs went into effect, the US Trade Representative announced 25 percent tariffs on $50 billion worth of Chinese imports, along with investment restrictions, and the submission of a case to the World Trade Organization (WTO) over China's trade practices (Trump 2018; United States Trade Representative 2018). The Chinese government responded immediately with its own tariff package, targeting roughly $50 billion of US imports, including the largest agricultural import, soybeans. For both the United States and China, the $50 billion tariffs are scheduled to take effect in a couple of months. The volleying may continue as President Trump has mentioned the possibility of another round of proposed tariffs on a list of Chinese imports with $100 billion in value (Davis 2018).

Photo credit: Thomas Hawk

The United States exports over $24 billion worth of agricultural and related products to China every year (USDA FAS GATS 2018) and has an approximate $13.6 billion trade surplus in agriculture. Therefore, it is difficult to overestimate the importance of the US-China agricultural trade relationship. Stakeholders in the US agricultural industry are nervously speculating China's next move, fearing that the already announced tariffs will be put in place, as has happened for sorghum and pork, and that additional tariffs or other trade barriers will be erected.

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China's Previous Agricultural Trade Retaliations

Tires vs. Chicken 2009: In April 2009, a trade union filed a complaint against China with the United States International Trade Commission (USITC). The USITC determined that some tires from China were being imported in quantities or under conditions that were causing market disruption for domestic producers (USITC 2009). In September 2009, President Obama announced a tariff increase on tires from China, which at the time were valued at $2.1 billion annually (Andrews 2009).

China filed a WTO complaint, which it ultimately lost, and initiated its own anti-dumping investigations into US broiler chicken products (The Chinese Ministry of Commerce 2009). China's Ministry of Commerce (MOC) began their investigation days after the US announcement, and a year later announced that China would impose an anti-dumping tariff on US broiler products (AP 2010). The value of broiler products exported from the United States to China was $800 million in

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the previous year, which constitutes a smaller, but somewhat comparable, trade flow to the Chinese tires targeted by the United States.

The US tariff against Chinese tires was effective in limiting Chinese exports. However, China's tariff on US broilers was even more effective—the value of US broiler exports to China dropped 83 percent from 2009 to 2010 ($660 million). Soon after, a further round of sanctions would decrease US broiler exports to China to almost zero. The cost to China was rather small. About half of the chicken exported to China was in the form of chicken feet, which although popular in China, is not essential for Chinese consumers. Furthermore, China was able to shift imports from the United States to other countries. Figure 1 shows that the $511 million decrease in imports from the United States was accompanied by a $636 million increase in imports from other countries.

Solar panels and washing machines vs. sorghum: In January 2018, after a three-month anti-dumping investigation, President Trump approved tariffs on solar panels and washing machines. Within two weeks, China responded by initiating an anti-dumping investigation on US sorghum (The Chinese Ministry of Commerce 2018). As with chickens, China responded proportionally by choosing a commodity with a smaller, yet comparable, trade value ($837 million) relative to the US targets ($1.4 billion for solar panels and $0.2 billion for washing machines) (UN Comtrade 2018). If China does impose an import tariff on US sorghum, it is expected be significant—38 percent of the sorghum produced in the United States and 81 percent of total US sorghum exports go to China. Although China heavily relies on US sorghum (82 percent of imports and 51 percent of domestic consumption), it is mainly used for livestock feed, so there are plenty of substitutes such as other

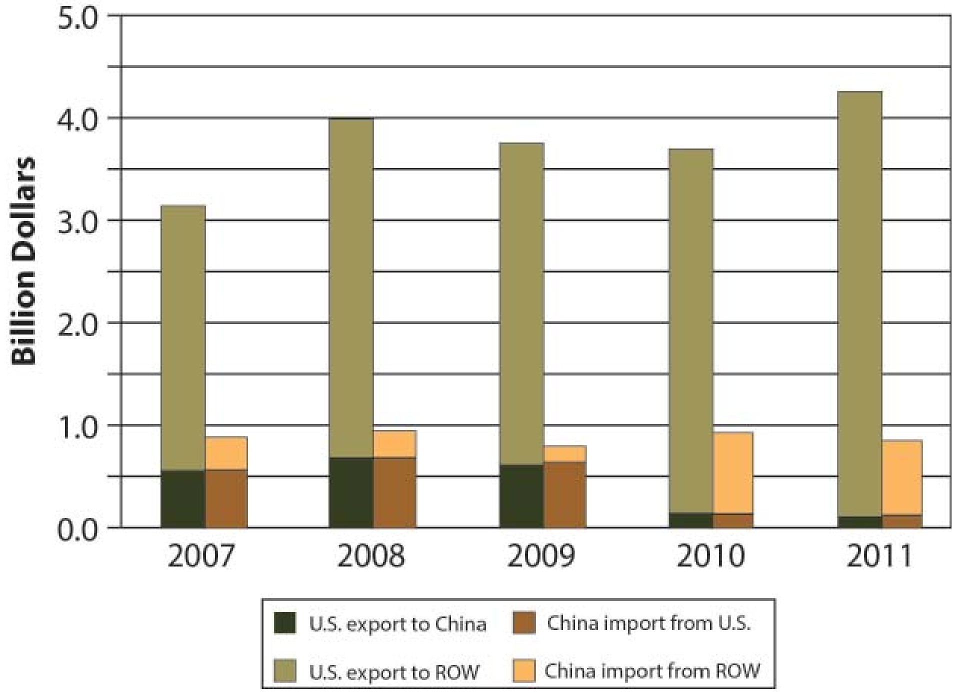

Figure 1. Chicken trade between the US, China, and the rest of the world (ROW).

Sources: USDA FAS GATS, 2018; USDA PSD, 2018; and UN Comtrade, 2018.

Table 1. Summary of Two Chinese Retaliation Cases on US Agricultural Exports

	Case 1	Case 2
US target products	**Solar panels, Washing machines**	**Certain tires**
US target trade value	$1.6 billion	$2.19 billion
US investigation start date	09/19/2017	04/29/2009
US decision announcement date	01/22/2018	09/17/2009
China's target products	**Sorghum**	**Broiler products**
China's target trade value	$0.84 billion	$0.79 billion
China announcement date	02/04/2018	09/27/2009
US % in China's import (quantity)	82%	69%
US% in China's consumption (quantity)	52%	7%
China's import in world's total export (quantity)	72%	11%
China's import in world's total production (quantity)	10%	1%

Source: Author calculations from USDA FAS GATS, 2018 and UN Comtrade, 2018.

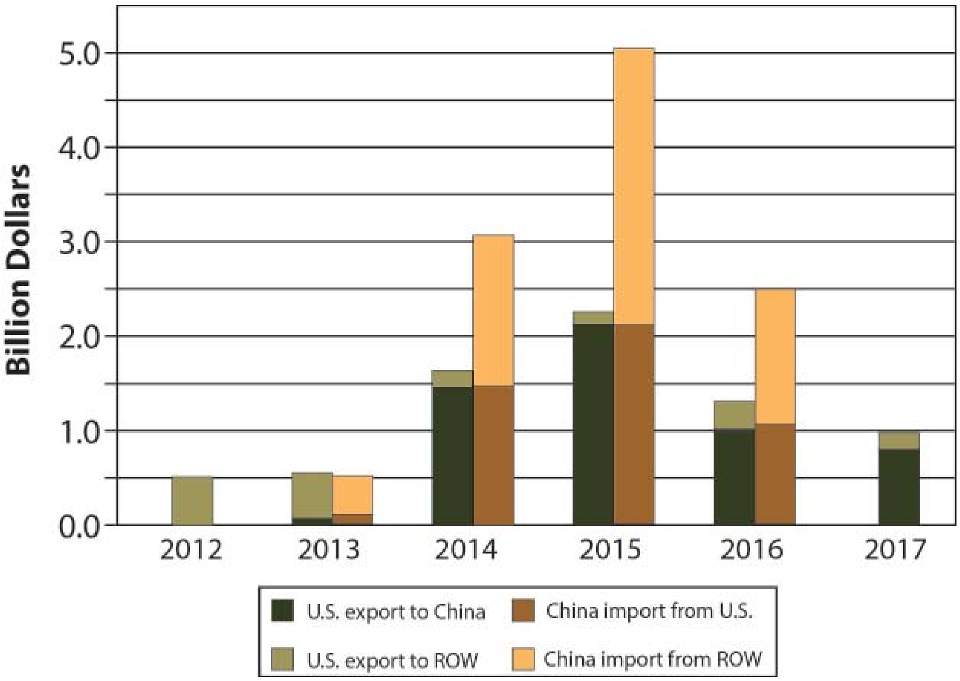

Figure 2. Sorghum trade between the US, China, and the rest of the world (ROW).

Source: USDA FAS GATS, 2018; USDA PSD, 2018; and UN Comtrade, 2018.

coarse grains and corn (Reidy 2018). Therefore, the domestic cost to China is likely to be small.

What Lessons Can Be Learned from China's Previous Retaliations?

As the two cases above demonstrate, China's approach to trade disputes can be summarized in the following three principles: First, China tends to target agricultural commodities with trade flows comparable to US targets in order to send a clear message. At the same time, China has carefully avoided escalation by choosing targets with a smaller trade value. Second, China choses commodities that are easily substitutable across products and across sources. The Chinese government actively pursues substitutability across sources by diversifying the sources of agricultural imports. Third, China uses retaliatory tariffs to inflict economic loss on politically influential interest groups, in hopes that they will in turn put political pressure on the government to ease the trade restrictions. China has chosen agricultural products as they see the affected US producers to be politically powerful.

Understanding China's Recent Trade Moves

The three principles discussed above do help shed light on China's potential moves. The fact that China did not target soybeans as the target of retaliation for the steel and aluminum tariff is not surprising in light of the "proportional response" principle: while China exports $2.8 billion of steel and aluminum products to the United States, it imports more than $12 billion in soybeans from the United States. Choosing soybeans at that point would have been a dramatic escalation and deviation from China's past strategy.

However, for the Trump administration's proposed tariffs on $50 billion of Chinese imports, a retaliation on soybeans had to be on the table as far as proportional response is concerned. In fact, the total value of US agricultural exports to China (including related products) is $21 billion. Currently, China relies on soybeans from Brazil and the United States to supply about 90 percent of its soybean consumption, predominately for feed. The sheer volume of the exports makes it more difficult to displace than other products. However, if need be, China could shift some significant share of imports to other countries such as Brazil and Argentina, and look to replace soybeans with other products.

Trade relations worldwide are in a period of flux right now. The trade-dependent US agriculture system has been dragged into the trade drama before, and unfortunately is being targeted again. The tariffs that have been imposed and threatened have already impacted agricultural markets, driving prices lower on the prospects of reduced trade flows. However, with the delayed implementation of the tariffs from the $50 billion announcements on both sides, there is some time for trade negotiations to reduce or eliminate these tariffs. But both sides will need to step up to the negotiating table.

References

Andrews, E. L. 2009. "U.S. Adds Tariffs on Chinese Tires." *New York Times*. Available at *http://www.nytimes.com/2009/09/12/business/global/12tires.html*.

The Associated Press. 2010. "China Imposes Tariff on US Chicken." *CBS News Moneywatch*. Available at *https://www.cbsnews.com/news/china-imposes-tariff-on-us-chicken/*.

China, People's Republic of, Ministry of Commerce (MOC). 2009. "Public announcement no. 74, 2009: Announcement for initiating anti-dumping investigation into imported U.S. poultry products." Available at *http://www.mofcom.gov.cn/article/b/g/200911/20091106600585.shtml.*

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Environmental Regulation of Hog Feeding Operations

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THE US livestock industry has experienced drastic structural changes over the last two decades. The industry has shifted towards greater specialization across production phases, increased reliance on off-farm inputs such as feed, and increased use of production contracts (McBride and Key 2013). One trend that is particularly relevant to Iowa policymakers, farmers, and rural Iowans is the increased prevalence, size, and regional intensity of large, enclosed hog feeding operations. Where many of the largest hog-producing states have seen modest increases or even declines in total hog inventories over time, Iowa has seen a steady increase in inventories since 1982 (Figure 1a). Within Iowa, production concentrates in north-central and northwestern counties (Figure 1b).

These trends are driven by scale economies and higher productivity of larger, specialized operations. Larger facilities, however, can create greater environmental risk for nearby communities. For example, larger operations generate more manure and less available nearby cropland on which to spread it. As such, the largest feeding operations, known as Concentrated Animal Feeding Operations (CAFOs), are regulated by the Environmental Protection Agency (EPA). In general, a hog feeding operation is classified as a CAFO if it has at least 2,500 hogs, though some smaller operations may also be regulated if they are nearby water bodies (EPA 2012). As with any environmental regulation, tradeoffs exist between the cost of these regulations to producers and the benefit to society of reduced pollution. In this article, we review the relevant regulations facing hog producers in Iowa and discuss future research of our own that will explore the costs and benefits of these regulations.

Iowa's Hog Industry

Iowa's hog industry provides tremendous economic benefits to the state. Hog sales in Iowa exceeded $6.8 billion in 2012, and hog inventories in that year were more than double those in the second-largest producing state, North Carolina (Figure 1a). Not surprisingly, Iowa is also the leading state in the number of CAFOs. In 2017, Iowa had around 7,800 feeding operations that raised at least 100 hogs. Nearly half of those operations (about 3,000) were CAFOs. (Iowa Geodata database https://geodata.iowa.gov).

As Iowa's industry has grown over, the size composition of producers has also shifted. Figure 2 shows that despite the large growth in hog inventories, the number of hog farmers has steadily declined since 1992. Meanwhile, the proportion of large operations increased. In 1982, around 80 percent of the state's hogs were on farms with less than 500 head, and only a tiny fraction of producers had more than 2,000 head. Fast forward to 2012, and these statistics show a very different story. Just under 30 percent of hog inventories in Iowa are on farms with

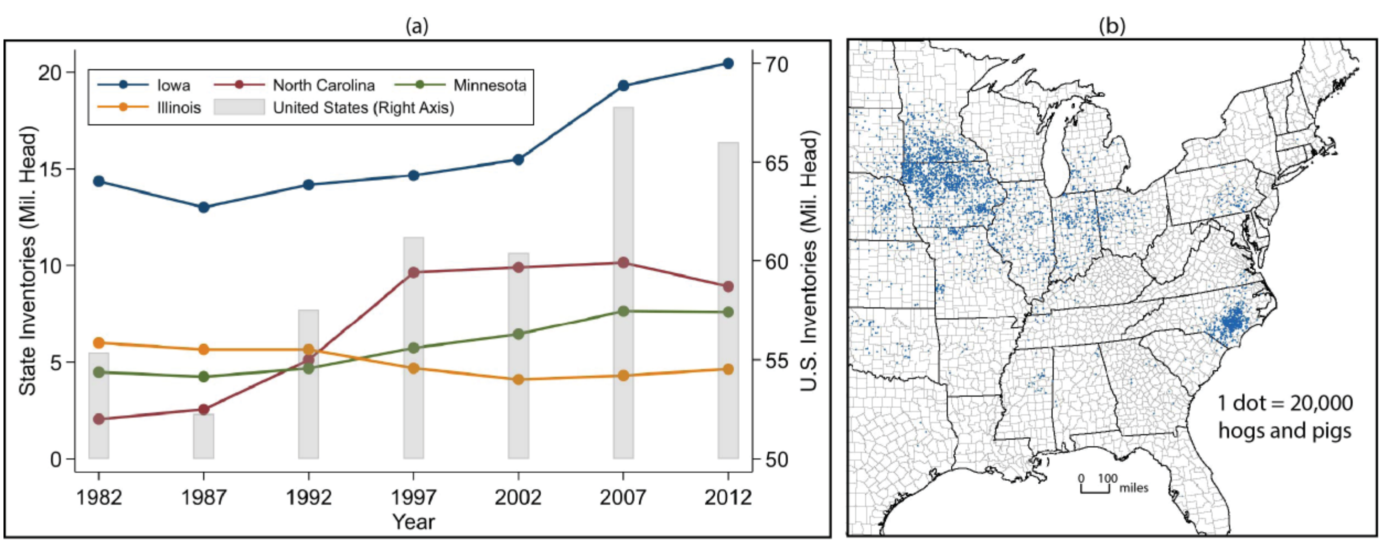

Figure 1: Hog inventories over time and regional concentration

Source: USDA Census of Agriculture, 1982–2012

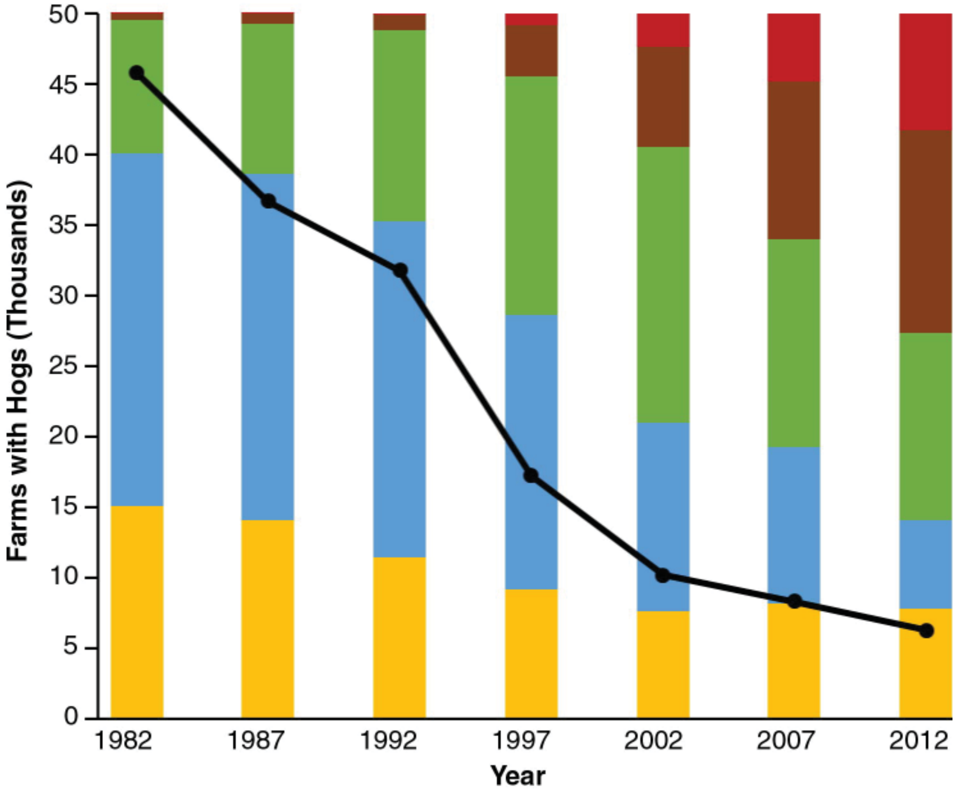

Figure 2: Iowa Farms with Hogs and Hog-operation Size

Source: USDA Census of Agriculture, 1982–2012

less than 500 head, while over 40 percent of inventories are on farms with more than 2,000 head. This shift in industry structure is largely driven by scale economies (McBride and Key 2013). Larger, specialized operations can producer more hogs at lower costs.

Larger operations naturally generate more waste and can contribute to local environmental pollution. In 2003, the EPA estimated that AFOs in the United States produced more than 500 million tons of manure. When applied inappropriately to local lands, manure can increase nitrate pollution in surface waterways and groundwater. Large feeding operations also produce local air pollution, emitting ammonia, methane, and particulate matter that may pose health risks to nearby populations (Hribar 2010). Further, animal feeding operations emit greenhouse gases (including methane, a particularly potent greenhouse gas), and produce odors that may be unpleasant to local and downwind communities.

Due to these issues, the expansion of the hog industry in Iowa has some raised concerns from local communities and environmental groups who seek better regulations to limit adverse impacts of the industry.

Federal Regulation of Animal Feeding Operation

CAFOs are regulated by the US Environmental Protection Agency (EPA) under the Clean Water Act (CWA). The most recent regulations were passed in 2003 and 2008, which updated and strengthened previous CAFOs rules. The 2003/2008 CAFO rules are examples of what economists refer to as 'size-based' regulation. In general, the CAFO rules apply only to animal feeding operations that exceed a certain size. When an AFO exceeds this threshold, they are officially designated as a CAFO and are subject to stringent pollution control and permitting requirements.

While regulatory authority over CAFOs ultimately resides with the EPA, much of the design and enforcement activities of AFOs are delegated to states. In Iowa, the Department Natural Resources (DNR) enforces most AFO standards. Iowa DNR categorizes AFOs into two types: confinements (totally roofed) and open feedlots. Most hog operations in the state are confined. The DNR requires all hog feeding operations with greater than 500 animal units (roughly 1,250 hogs) to develop a manure management plan (MMP) and submit annual updates.

The DNR also created the Master Matrix, a scoring system to evaluate the siting of confinement AFOs. Proposed operations in nearly every county in Iowa must submit a Master Matrix. The form scores proposals based on their location (e.g., distance from water sources), practices (e.g., covered liquid manure storage structures), and size. Producers may commit to different site characteristics and manure management practices to earn points. The more points a proposed project receives, the fewer impacts the operations will be evaluated to have on nearby communities as well as water and air quality. A proposed site is approved for construction only if it scores at least 50 percent of the full score available and at least 25 percent for each of three subcategories (water, air, and community impact).

While the master matrix and MMPs apply to all but the smallest AFO in the state, AFOs face especially stringent rules when they fall under the purview of the CAFO rules. CAFOs are designated as point-source polluters under the CWA. As such, these facilities must obtain discharge permits, submit comprehensive nutrient management plans, and may be required to invest in many more mitigating practices to ensure they will have limited impacts on the local environment.

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Current Situation for Iowa's Major Ag Commodities

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THERE IS a lot of uncertainty in agriculture right now, from the delayed onset of spring and the delayed planting that goes with it, to the ongoing trade disputes and trade agreement renegotiations, agricultural producers are adjusting production plans to deal with the uncertainty. Below is a quick summary of the current situation for Iowa's major agricultural commodities, based on the latest reports and surveys from USDA. The majority of the information for the USDA reports was gathered before the latest rounds in the US-China trade dispute. However, the outlook highlights the importance of trade in agriculture and shows the avenues where trade will influence production and consumption decisions.

Hog Prospects Dim

A double whammy of rising feed prices and falling hog prices point to tighter hog margins than were expected earlier this year. Projected 2018 profits in ISU's farrow-to-finish model dipped from the $11 per head forecast in December to losses of $4 per head in April. Carcass weight prices in 2018 are now expected to average near $63 per cwt compared to about $66.50 last year. News of the Chinese government imposing an additional 25 percent duty on imports of US pork and pork variety meat adds additional volatility to the market.

The national breeding herd is 1.7 percent larger than a year ago based on early March producer surveys for USDA's Hogs and Pigs Report (Table 1). Breeding herd additions totaled 21,000 head from December to March. For the March through May quarter, US producers intend to farrow 3.078 million sows. Intended farrowings for June through August, 2018, are up 1.4 percent from 2017. A big question is if producers back off on farrowings given the change in the profitability outlook. A March uptick in sow slaughter suggests they might.

Growing pork export demand had enabled the US industry to continue expanding in recent years. In 2016 and 2017, rising exports required an average annual increase in US production of only 2.2 percent per year. In 2018, USDA expects pork exports for the year to be up 5.2 percent. However, news of the Chinese import tariff hike puts a negative tilt on export growth in 2018. Chinese market uncertainty makes expanding and diversifying export destinations for pork crucial. New and emerging markets in countries such as Colombia, the Dominican Republic, and Chile, and mainstay markets such as Mexico, Japan, and South Korea were strong in 2017 and will be counted on again this year. With over 40 percent of US pork exports going to Mexico and Canada, one could argue that a positive outcome to NAFTA is the biggest piece of the puzzle still in need of certainty.

Cattle Expansion Continues

USDA's annual *Cattle* inventory report confirmed that beef herd expansion continued in 2017, albeit at a slower pace than in 2016. Beef herd expansions often last for four to six years. The current expansion began in 2014 and could continue for another year or so. If it does, beef production in this cycle likely would not peak until early in the next decade.

As of January 1, 2018, the US inventory of all cattle and calves was up 0.7 percent at 94.4 million head (Table 2). The beef cow inventory increased 1.6 percent. Beef replacement heifers were down 3.7 percent. Dairy cows were up a slight 0.6 percent and dairy replacement heifers were up 0.6 percent. The feedlot inventory for all feedlots rose to 14 million head.

A headline grabber in the report was an estimated year-over-year decline of 607,400 head of feeder cattle outside of feedlots. Feeder supply can drop when cattle numbers are still rising. The total inventory of steers, other heifers, and calves was up 0.8 percent. However, large feedlot placements in 2017 pulled the January 2018 feedlot inventory up 7.2 percent year-over-year, meaning that more 2017 crop calves are already in feedlots. If realized, the smaller feeder supply could be a catalyst that could spur shorter-term advances in feeder prices, and help support deferred-fed cattle prices on the presumption that feedlot placements in 2018 will be smaller than previously expected, leading to lower than expected fed beef production later in 2018.

Replacements remain large in absolute number and as a percentage of the beef cow herd. Ample replacements and the larger January 2018 cow herd leave room for the 2018 calf crop to expand, suggesting further growth in total cattle inventory into 2019. The question is whether producers are adjusting their intentions. Producers can easily divert open replacement heifers into feeder markets if their expectations change. Such a shift could easily boost feeder cattle supply and derail further expansion.

Corn Acreage Slips

For the corn market, the question for most of the spring was how farmers would adjust their plantings in 2018. That question was initially answered with the March release of the USDA's *Prospective Plantings* report. Farmers indicated they would reduce corn acreage by over two million acres, with most of that reduction coming from the Great Plains. However, with 88 million acres

Table 1. USDA Quarterly Hogs and Pigs Report Summary

	United States			Iowa		
	2017	2018	2018 as % of 2017	2017	2018	2018 as % of 2017
All hogs and pigs	70,701	72,908	103.1	21,600	22,600	104.6
Kept for breeding	6,098	6,200	101.7	1,000	1,020	102.0
Market	64,603	66,708	103.3	20,600	21,580	104.8
Under 50 lbs	20,407	21,047	103.1	5,300	5,590	105.5
50-119 lbs	17,862	18,422	103.1	6,440	6,720	104.3
120-179 lbs	14,435	14,874	103.0	5,270	5,340	101.3
180 lbs and over	11,899	12,364	103.9	3,590	3,930	109.5
Sows farrowing **						
Dec – Feb [1]	2,986	3,057	102.4	510	560	109.8
Mar – May [2]	3,014	3,078	102.1	510	550	107.8
Jun – Aug [2]	3,121	3,165	101.4	530	560	105.7
Dec – Feb pigs per litter	10.43	10.58	101.4	10.75	11.00	102.3
Dec – Feb pig crop *	31,146	32,341	103.8	5,483	6,160	112.3

Notes: * 1,000 head; **1,000 litters; [1]December preceding year; [2]Intentions

Table 2. Cattle Inventory by Class and Calf Crop

	United States			Iowa		
January 1 inventory *	2017	2018	2018 as % of 2017	2017	2018	2018 as % of 2017
Cattle and calves	93,704.6	94,399.0	100.7	3,900	4,000	102.6
Cows and heifers that calved	40,559.2	41,122.6	101.4	1,180	1,190	100.8
Beef cows	31,213.2	31,723.0	101.6	965	970	100.5
Milk cows	9,346.0	9,399.6	100.6	215	220	102.3
Heifers 500 pounds and over	20,132.0	20,244.8	100.6	860	830	96.5
For beef cow replacement	6,368.2	6,131.2	96.3	185	165	89.2
For milk cow replacement	4,754.0	4,781.3	100.6	135	135	100.0
Other heifers	9,009.8	9,332.2	103.6	540	530	98.1
Steers 500 pounds and over	16,383.5	16,352.2	99.8	1,310	1,390	106.1
Bulls 500 pounds and over	2,243.6	2,252.2	100.4	70	70	100.0
Calves under 500 pounds	14,386.3	14,427.2	100.3	480	520	108.3
Feeder cattle outside feedlots	26,712.6	26,105.2	97.7	1,170	1,180	100.9
Cattle on feed	13,067.0	14,006.4	107.2	1,160	1,260	108.6
Calf crop **	35,092.7	35,808.2	102.0	1,090	1,090	100.0

Note: * 1,000 head, ** 2016 and 2017
Source: USDA-NASS

still in corn production, the production prospects are still quite high. USDA's yield trend estimate stands at 174 bushels per acre. That would place expected production at roughly 14 billion bushels, on pace to be the fourth-largest corn crop ever (see Table 3). So large supplies remain an issue.

Corn usage (gray box, Table 3) is projected to diminish slightly. The slight drop in feed and residual use is mainly in the residual category as the livestock herd expansion continues. Corn usage for ethanol continues to grow as both domestic and international ethanol use expands. Exports are the area where the biggest setback is expected, and these numbers were set before the latest tariff announcements. While China is not a key market for US corn, Mexico is and the NAFTA renegotiations are critical for this market. Global corn supplies are also at very high levels, so competition in the corn trade market was expected. However, recent projections for the South American corn crops point to smaller crops due to a combination of drought in Argentina and a reduction in second-crop corn acres in Brazil.

Soybean Acreage Sinks As Well

The biggest shakeup for the crop markets from the *Prospective Plantings* report came from soybeans. Throughout March, the soybean market had been preparing for an announcement of a record number of acres planted to soybeans, exceeding corn for the first time since 1983. Well, the second part of that statement happened, but not the first. Farmers indicated they would plant oen million fewer acres to soybeans (but the total still exceeds corn). However, like with corn, projected

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Does Rural Entrepreneurship Pay?

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RURAL ENTREPRENEURSHIP can help stimulate local economies by creating local jobs and providing goods and services that improve the quality of life of nearby residents. However, as Reynolds et al. (1995) note, rural entrepreneurs can face difficulties through lack of sufficient capital, infrastructure, and access to educated labor. These hardships often result in lower firm entry rates when compared to urban areas and businesses characterized as low-income and low-growth. This leads to the common notion that rural entrepreneurship is necessity driven—entrepreneurs create rural businesses in order to remain in, or relocate to, a rural location (Tosterud and Habbershon 1992).

Recent research, however, has shown that the factors that affect rural business location also increase the likelihood that business will survive (Artz, Guo, and Orazem 2015), suggesting that rural entrepreneurs possess location-specific capital that increases the probability of becoming an entrepreneur and offers greater returns relative to being a wage earner. In order to fully analyze and understand the location choices of entrepreneurs, we analyze survey results from 4,448 Iowa State University alumni who graduated between 1982 and 2007. Furthermore, we assess returns to location-specific human capital by location and the relative earnings of rural and urban wage earners and entrepreneurs.

Our research shows that alumni that live in a rural location are more likely to become entrepreneurs than their urban counterparts, and that rural entrepreneurs earn more than rural wage workers and earn roughly the same as urban entrepreneurs.

Entrepreneurship choice

While there are many factors that influence the choice to become an entrepreneur, two factors—education and family background—have the largest impact. Educational attainment provides some of the necessary skills to become a successful business owner (Bates 1990); however, there is a tipping point, as there is evidence suggesting that earning an advanced degree (MS, Ph.D., etc.) may actually lower the likelihood of becoming an entrepreneur (Matthews and Human 2004).

Familial background can influence entrepreneurial decisions as well, as Matthews and Human (2004) show, entrepreneurial parents can impart their offspring with the necessary skills and may be willing to transfer financial wealth to their offspring.

When examining the earning potential of entrepreneurs, Hamilton (2000) finds that entrepreneurship doesn't pay—the self-employed seem to earn about 25 percent less over the course of 25 years than a wage worker of similar skill level. The assumption is that entrepreneurs are willing to accept a lower rate of pay for the non-financial benefits associated with being self-employed.

Rural Location Choice

Numerous factors must be accounted for when examining the likelihood of choosing to reside in a rural location. Education, labor markets, age, marital status, and the presence of children are all considered important factors in location choice. Even among those born in rural areas, educational attainment has been shown to reduce the likelihood of choosing to reside in a rural areas (Mills and Hazarika 2002). Unlike the choice to become an entrepreneur, there is no tipping point in education—those with higher education levels are less likely to reside in a rural area. While we would expect those born in a rural location would be more likely to reside and operate a business in a rural area, the evidence does not support that hypothesis.

Graves (1979) finds that for adults in their 30s and 40s quality of life and family issues are factors that heavily influence location choice—they are more likely to choose areas that have lower crime rates, more affordable housing, and lower population densities. However, rural labor markets are usually considered "thin" and the return on educational investment is lower in rural areas than in urban areas.

Location-specific Capital

Location-specific capital—an asset accumulated over time from living in a specific place—is an important factor in choosing not only self-employment, but where to locate a business. Location-specific capital can be advantageous to new rural businesses through knowledge of local resources and needs and local social networks that provide access to credit, customers, suppliers, and information.

Despite Mills and Hazarika's (2002) finding that educational attainment reduces the likelihood of residing in a rural area, even for the rural-born, previous research (Artz and Yu 2011) shows that growing up in a rural area is the most significant predictor of choosing a rural residence after college.

Data

The data in our analysis was taken from a 2007 survey of Iowa State University alumni that graduated with a bachelor's degree between 1982 and 2006. Surveys were sent to a random selection of the 84,917 alumni that graduated with a bachelor's degree in that time. Ultimately, we received 4,448 usable observations.

Our data show that 34 percent of our respondents were raised in a rural area, but only 13 percent currently resided in a rural area. Though the majority of alumni raised in a rural area had moved to an urban area, respondents that were raised in a rural area were more likely to reside in a rural area than those raised in an urban area. The proportion of alumni that were raised in rural and urban areas and became entrepreneurs was roughly equal—approximately 11 percent for each group; however, roughly 45 percent of rural-raised entrepreneurs located their business in a rural area, compared to only 14 percent of urban-raised entrepreneurs.

Our data also show that urban residents earn nearly 40 percent more than rural residents, though this statistic wasn't adjusted for cost of living.

Results

The results of our survey reveal many of the contributing factors that lead to becoming self-employed and those that lead to living in a rural area. Having grown up in a rural area does not impact the likelihood of becoming an entrepreneur; however, it does positively impact the likelihood of living in a rural location after college graduation. Graduates of the College of Agriculture and Life Sciences are more likely to live in a rural location and become an entrepreneur than are graduates of the College of Liberal Arts and Sciences.

Older alumni, married alumni, alumni raised by entrepreneurial parents, and alumni with an advanced professional degree (i.e., law degree, medical degree) or that graduated from the College of Design are all more likely to become entrepreneurs, though many from these groups are less likely to reside in a rural area.

Individuals with a more diversified work experience are more likely to live in a rural area and become entrepreneurs. Also, individuals that grew up in a rural area and return to their home state are more likely to become a rural entrepreneur; however, those that grew up in a rural area and don't return to their home state are less likely to become a rural entrepreneur. The positive relationship between rural origin and entrepreneurship for returned individuals confirms that location-specific capital is important to rural entrepreneurship.

Why are rural location and entrepreneurship associated?

We find two likely reasons that rural entrepreneurship and rural location may be associated with each other. The first reason is that rural residents are more likely to start a business because of the thin labor market for wage labor. The second reason is that rural locations are a good match for some entrepreneurs, consistent with the idea of location-specific capital—some entrepreneurs have a productivity advantage due to region-specific knowledge and local social networks that make access to things such as credit, suppliers, and customers more accessible.

References

Artz, G., and L. Yu. 2011. "How Ya Gonna Keep 'em down on the Farm: Which Land Grant Graduates Live in Rural Areas?" *Economic Development Quarterly* 25:341–352.

Artz, G., Z. Guo, and P. Orazem. 2015. "Location, Location, Location: The Role of Location-Specific Human Capital in Rural Firm Entry and Survival." Working Paper, Dept. of Economics, Iowa State University.

Bates, T. 1990. "Entrepreneur Human Capital Inputs and Small Business Longevity." *The Review of Economics and Statistics* 4:551–559.

Graves, P.E. 1979. "A Life-Cycle Empirical Analysis of Migration and Climate, by Race." *Journal of Urban Economics* 6:135–147.

Hamilton, B. 2000. "Does Entrepreneurship Pay: An Empirical Analysis of the Returns to Self-Employment." *Journal of Political Economy* 108(3):602–631.

Matthews, C., and S. Human. 2004. "Family Background." In *Handbook of Entrepreneurial Dynamics, the Process of Business Creation*. Chapter 8. Gartner, W. et al, Eds. Sage Publications: London.

Mills, B., and G. Hazarika. 2001. "The Migration of Young Adults from Non-metropolitan Counties." *American Journal of Agricultural Economics* 83:329–340.

Tosterud, R.J., and G. Habbershon. 1992. "Rural Entrepreneurship: A Preliminary Study." *South Dakota Business Review*, March. ■

Lessons from Previous U.S.-China Trade Disputes
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China, People's Republic of, Ministry of Commerce (MOC). 2018. "Public Announcement no. 13, 2018: Announcement for Initiating Antidumping and Countervailing Investigations on Imported Sorghum from the United States of America." Available at *http://english.mofcom.gov.cn/article/policyrelease/buwei/201802/20180202710853.shtml*.

Davis, B. 2018. "Trump Weighs Tariffs on $100 Billion More of Chinese Goods." *The Wall Street Journal.* Available at *https://www.wsj.com/articles/u-s-to-consider-another-100-billion-in-new-china-tariffs-1522970476*.

Reidy, S. 2018. "China's Appetite for Sorghum Continues." WorldGrain.com. Available at *http://www.world-grain.com/articles/news_home/World_Grain_News/2018/01/Chinas_appetite_for_sorghum_co.aspx?ID=%7B97A50C7A-4971-4CA8-80BD-24A1605155E6%7D*.

Trump, D. 2018. "Presidential Memorandum on the Actions by the United States Related to the Section 301 Investigation." Available at https://www.whitehouse.gov/presidential-actions/presidential-memorandum-actions-united-states-related-section-301-investigation/.

United Nations Comtrade. 2018. Database located at *https://comtrade.un.org/data/. Accessed April 4, 2018.*

United States Department of Agriculture, Foreign Agricultural Service, Global Agricultural Trade System (USDA FAS GATS). 2018. Database located at *https://apps.fas.usda.gov/gats/default.aspx. Accessed April 4, 2018.*

United States Department of Agriculture, Production, Supply, and Distribution (USDA PSD). 2018. Database located at *https://apps.fas.usda.gov/psdonline/app/index.html#/app/home*. Accessed April, 4, 2018.

United States International Trade Commission (USITC). 2009. *Certain Passenger Vehicle and Light Truck Tires from China*. Investigation No. TA-421-7, Publication 4085. Available at *https://www.usitc.gov/investigations/title_7/2015/certain_passenger_vehicle_and_light_truck_tires/final.htm.*

United States Trade Representative. 2018. "Under Section 301 Action, USTR Releases Proposed Tariff List on Chinese Products." Available at https://ustr.gov/about-us/policy-offices/press-office/press-releases/2018/april/under-section-301-action-ustr. ■

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Research Questions Moving Forward

The federal government spends tens of billions of dollars annually on clean water programs (Keiser 2017). Despite its substantial contributions to poor water quality in the United States, the agricultural sector is largely unregulated by existing federal CWA rules. One of the few exceptions is animal feeding operations, making the sector particularly interesting to environmental economists.

A fundamental economic principle is that the efficient level of production in any industry occurs where, on the margin, private and public production costs equal the benefits of additional production. In our setting, that means that the efficient size of hog feeding operations weighs the benefit of additional hog production against both the additional cost of raising and feeding hogs *and* the additional cost to local communities (and society more broadly) of increasing an operation's size. Left alone, markets will not internalize this second category of costs, leaving room for regulation to improve market outcomes.

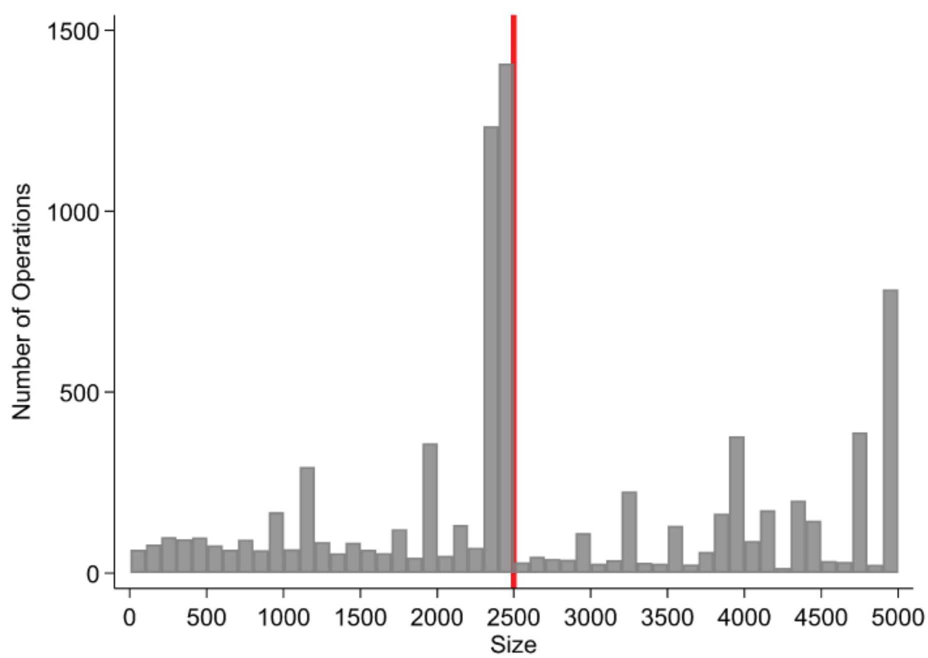

Figure 3. Iowa hog-operation size and CAFO limits

Source: Iowa Department of Natural Resources 1982–2012)

Thus, from an economic perspective, the question is not whether environmental regulations of feeding operations could benefit society, but (*a*) what types of regulations are most efficient; and (*b*) whether less efficient policies still benefit society. Size-based regulations are inefficient ways to regulate most polluting industries. Thus, the focus of our future research relates to this second class of questions. Specifically, we will work on quantifying CAFO regulations' effects on environmental outcomes and weigh them against the costs of these regulations to producers.

Preliminary evidence suggests that these regulations have a large impact on producers. This is best evidenced by Figure 3. Here, we graph the distribution of AFO sizes in Iowa using recent data from the DNR. The red vertical line corresponds to the CAFO limit. Immediately apparent is that many producers avoid regulation by limiting their size to be just below the CAFO threshold. While this is not a new finding (see, e.g., Sneeringer and Key 2011), many questions remain as to the implications of this strategic avoidance. For example, how much do CAFO regulations benefit the local environment? How do these benefits compare to producer costs of meeting CWA requirements? Are there other implications for industry productivity and structure due to the adverse incentives created by the CAFO rules? We will explore these questions and more in future APR articles.

References

Hrirbar, C. 2010. "Understanding Concentrated Animal Feeding Operations and Their Impacts on Communities." Working paper, National Association of Local Boards of Health.

Keiser, D.A. 2017. "The Missing Benefits of Clean Water and the Role of Measured Pollution." Working paper, Iowa State University.

McBride, W., and N. Key. 2013. "U.S. Hog Production from 1992 to 2009: Technology, Restructuring, and Productivity Growth." USDA Economic Research Report Number 158.

Sneeringer, S., and N. Key. 2011. "Effects of Sized-Based Environmental Regulations: Evidence of Regulatory Avoidance." *American Journal of Agricultural Economics* 93(4): 1189–1211.

US Environmental Protection Agency. 2016. "Annual NPDES CAFO Program Status Reports."

US Environmental Protection Agency. 2012. "NPDES Permit Writers' Manual for Concentrated Animal Feeding Operations." U.S. EPA 833-F-12-001. ■

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production is still quite large. The 4.27 billion bushels would be the third-largest soybean crop, following the record crop from last year and the bin-buster from 2016 (see Table 4).

USDA's early projections for 2018 soybean usage will likely face some major revisions given the trade dispute. While domestic usage is expected to continue to grow this year, exports were the major vehicle for the growth in USDA's usage projections. As Table 4 shows, USDA had projected a strong rebound in soybean exports, mainly driven by China. As China represents roughly 60 percent of that export total, the tariff announcements cast a long shadow over these projections. A 25 percent tariff would be a major impediment for US soybeans to overcome and any slowdown in the flow of soybeans will create issues for the market. While other markets would grow to absorb some of the Chinese allocation, it is highly unlikely that the combined growth would match the loss in the Chinese market. ■

Table 3. US Corn Balance Sheet

		2014	2015	2016	2017	2018
Area Planted	(mil. acres)	90.6	88.0	94.0	90.2	88.0
Yield	(bu./acre)	171.0	168.4	174.6	176.6	174.0
Production	(mil. bu.)	14,216	13,602	15,148	14,604	14,076
Beg. Stocks	(mil. bu.)	1,232	1,731	1,737	2,293	2,182
Imports	(mil. bu.)	32	67	57	50	50
Total Supply	(mil. bu.)	15,479	15,401	16,942	16,947	16,308
Feed & Residual	(mil. bu.)	5,280	5,120	5,473	5,500	5,475
Ethanol	(mil. bu.)	5,200	5,224	5,432	5,575	5,650
Food, Seed, & Other	(mil. bu.)	1,401	1,422	1,450	1,465	1,495
Exports	(mil. bu.)	1,867	1,898	2,293	2,225	1,900
Total Use	(mil. bu.)	13,748	13,664	14,649	14,765	14,520
Ending Stocks	(mil. bu.)	1,731	1,737	2,293	2,182	1,788
Season-Average Price	($/bu.)	3.70	3.61	3.36	3.35	3.40

Source: USDA-WAOB

Table 4. US Soybean Balance Sheet

		2014	2015	2016	2017	2018
Area Planted	(mil. acres)	83.3	82.7	83.4	90.1	89.0
Yield	(bu./acre)	47.5	48.0	52.0	49.1	48.5
Production	(mil. bu.)	3,927	3,926	4,296	4,392	4,272
Beg. Stocks	(mil. bu.)	92	191	197	302	550
Imports	(mil. bu.)	33	24	22	25	25
Total Supply	(mil. bu.)	4,052	4,140	4,515	4,718	4,847
Crush	(mil. bu.)	1,873	1,886	1,901	1,970	1,980
Seed & Residual	(mil. bu.)	146	122	139	133	135
Exports	(mil. bu.)	1,842	1,936	2,174	2,065	2,300
Total Use	(mil. bu.)	3,862	3,944	4,213	4,168	4,415
Ending Stocks	(mil. bu.)	191	197	302	550	432
Season-Average Price	($/bu.)	10.10	8.95	9.47	9.30	9.25

Do Cover Crops Pay? Net Returns to Corn/Soybean Farmers in Iowa

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COVER CROPS, which are planted on approximately 700,000 of Iowa's 30 million acres of farmland, have been found to have varying net returns based on several factors—cover crop species, planting technique, termination method, tillage practices, following cash crop, and the farmer's years of experience with cover crops.

Farmers that don't use cover crops for grazing livestock or forage tended to consistently derive negative returns. Farmers that used cover crops for grazing livestock or forage and received cost-share payments tended to see positive net returns.

The full findings are detailed in the working paper "Annual Net Returns to Cover Crops in Iowa." The study was funded by NCR-SARE and the Center for Agricultural and Rural Development at Iowa State University.

The data in the working paper are based on a subset of survey respondents that reported planting cover crops on some, but not all, of their acres in 2015 and planting the same cash crop in 2016 in acres where they did and did not use cover crops. Farmer's production system expenses and revenues were then identified, monetized, and compared when they did and did not use cover crops.

Cover crops can induce revenue and expense changes in a farmer's production system in several ways. Revenue can be affected by savings in livestock feed costs due to cover crop grazing, changes in cash crop production values following cover crop plantings, and cost-share payments that can partially offset the cost of cover crops. Expense changes due to cover crops can be broken down into planting, termination, and other costs. Planting costs include seed purchases, differential planting method costs, and labor. Termination costs typically include herbicide purchases, spraying, and labor. Some of the other costs that might change when using cover crops include costs to repair soil erosion, fertilizer and insecticide costs, cash crop seed costs, and changes in cash rent due to cover crop use.

Net returns to cover crops terminated with herbicides

When examining cover crops terminated with herbicides, net returns were found to be positive, $8.59 and $14.25 per acre for corn and soybeans, respectively. However, net returns became negative when farmers didn't utilize cover crops as livestock feed or received cost-share payments. When excluding those two factors, farmers that terminated cover crops with herbicide faced negative net returns of $48.82 per acre and $38.42 per acre when cover crops were followed by corn and soybeans, respectively.

Net returns based on years of experience

Farmers were placed into three categories based on their experience with cover crops: 3 years or less, 4–9 years, and 10 or more years. More experienced farmers reported a smaller yield drag in corn production than less experienced farmers, and the most experienced farmers reported a corn yield bump following cover crops. When cover crops were followed with corn and not used for livestock feed and cost-share payments were not received, negative net returns were realized—$57.95, $43.19, and $31.97 per acre, respectively. Yield drag in soybean production due to cover crops was less of an issue than in corn production, but the most experienced group showed the largest yield drag. When cover crops were followed with soybeans and not used for livestock feed and cost-share payments were not received, all three experience groups saw negative net returns—$39.36, $34.33, and $36.79 per acre, respectively.

Net returns to cereal rye followed by corn by tillage practice

When examining cereal rye followed by corn, every tillage practice—no-till, reduced-till, and conventional- or vertical-till—produced negative net returns, despite the similar planting costs, when livestock feed savings and cost-share payments were not utilized. Farmers in these conditions saw negative net returns of $30.34, $53.41, and $69.23 per acre for reduced-till, no-till, and conventional-till operations, respectively.

Net returns to cover crops by planting method in no-till systems

Excluding feed cost savings and cost share payments in no-till systems, farmers that followed drill-planted cover crops with corn saw a negative net return of $54.09 per acre; and farmers that followed aerial seeding of cover crops with corn saw a negative net return of $53.73 per acre. When following cover crops with soybeans, farmers that used aerial seeding saw a negative net return of $34.12 per acre, whereas farmers using drill-planting saw a negative net return of $34.65 per acre.

Net returns to cover crops by termination method

Farmers that used tillage to terminate cover crops saw a negative net return of $29.94 per acre; and farmers that used herbicide as the termination method saw a negative net return of $53.55 per acre. These findings are valid for conventional-till operations that used drill planting of cover crops and followed with corn, excluding feed cost savings and cost-share payments.

How do you make cover crops pay?

These results suggest that economic returns are a major stumbling block for widespread adoption of cover crops in Iowa. The lack of market valuations for actual soil health indicators prevents the incorporation of long-term benefits into the calculation. Potential measures to improve the economic viability of cover crops without increasing government transfers to cover croppers include: (a) developing of a more competitive market for cover crop seeds; (b) promoting the use of cover crops for grazing livestock or forage; and, (c) developing and promoting location-specific best management practices particularly focused on minimizing yield drag and containing planting and termination costs.

The full reports on the economics of cover crops for Iowa and the Midwest region are available at: www.card.iastate.edu/conservation/economics-of-cover-crops/. ■

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