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World's Largest Pork Producer in Crisis: China's African Swine Fever Outbreak

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AFTER SUFFERING a major blow from trade disruptions with China and Mexico, US pork producers are keeping close watch on African Swine Fever (ASF) in China and other countries. The first case of ASF in China was confirmed August 2, 2018 in the northeastern city of Shenyang. According to our information, by the end of October 2018, there were 45 cases of ASF in China with 5,439 pigs infected and 3,841 pigs dead (download the ASF cases in China as an Excel file).

On the one hand, if ASF spreads to the United States it would devastate US pork exports. On the other hand, ASF may create a pork shortage in China, the largest pork producer and consumer in the world. Even though directly exporting from the United States to China is curtailed by the trade war, China may import pork from other countries and regions such as Canada and the EU, allowing the United States to backfill into these markets.

In this article we introduce the background and current developments of the ASF outbreak in China and discuss the impacts on production, prices, and international trade.

Background

ASF is a highly contagious disease that affects domestic and wild pigs of all ages. Infected animals usually experience high fever, anorexia, lethargy, weakness, and recumbency, and most die within 10 days (Center for Food Security and Public Health 2018). The disease "*… is transmitted directly during contact between infected and susceptible pigs, by consumption of the meat from infected pigs, by the bites of infected tampans (Ornithodoros spp.), and by contact with material or objects (bedding, feed, equipment, clothes and footwear, vehicles) contaminated by virus-containing matter such as blood, feces, urine or saliva from infected pigs.*" (Penrith and Vosloo 2009, pg. 59) So far, there is no vaccine or treatment for ASF.

ASF first occurred in Africa in the early 1900s and spread to Europe in the 1950s. Before the outbreak in China, ASF had been active in East Europe and Russia and caused massive economic harm, accounting for over 800,000 hog deaths from 2007 to 2017 in Russia alone (Kolbasov et al. 2018). The source for the recent ASF outbreak in China is not clear, but it is the same strain prevalent in Russia (Zhou et al. 2018). Beyond China, ASF has recently been discovered in Poland, Latvia, Ukraine, Romania, Moldova, Belgium, Russia, and Bulgaria (The Pig Site 2018).

Current Developments of ASF in China

The first case of ASF in China was discovered in the northeastern province of Liaoning in early August, 2018. From August to late September, there

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were scattered cases throughout northern and central China, and eight concentrated cases in Anhui province in southern China. At the end of September, ASF cases started to reoccur in Liaoning Province, eventually hitting the region with a string of 11 cases. The first ASF cases reached the southwestern province of Yunnan in the second half of October. In terms of inventory, Yunnan was the fifth-largest hog producing province in 2016, while its neighboring province, Sichuan, was the largest (National Bureau of Statistics of China 2018).

As the disease progressed, it started to affect larger producers. All of the producers in cases before October had less than 1,000 pigs in their inventory. However, seven cases in October involved producers with more than 1,000 pigs, and the three largest producers in these cases had 19,938, 7,684, and 6,640 hogs (download the ASF cases in China as an Excel file). The fact that the disease reoccurred in a province that was already on high alert, and infected large commercial producers that supposedly had better biosecurity measures, is worrying. The total hog inventory involved in ASF cases has reached at least 60,592, with cases in October accounting for 89 percent (download the ASF cases in China as an Excel file).

Chinese Government's Response

The Chinese government's major responses can be summarized by the following (MOA 2018a; MOA 2018b; Gao 2018):

1. Quarantine areas are set up within approximately three kilometer radius of the sites for ASF cases (the exact shape and size depend on natural barriers). All pigs within the quarantine area are euthanized, and no hog or hog products are allowed to leave the quarantine area. No hogs are allowed to enter the quarantine areas. The quarantine is lifted if no new cases are discovered within six weeks. Currently, 13 quarantines have been lifted.
2. So far, it is estimated that about 200,000 pigs have been culled (Reuters 2018). Producers were initially compensated at 800 RMB per head. Compensation was raised to 1,200 RMB per head (sohu.com 2018) in mid-September (current sales price is about 1,350 RMB per hog, assuming body weight of 100 kg).
3. Restrictions on hog product (pork and pork variety meats) transportation: If two or more prefectures (i.e., cities with surrounding rural areas) in a province have ASF, then hog products cannot be shipped outside of that province. There are also within-province shipping restrictions.[1]
4. Restriction on hog transportation: Provinces with ASF cannot ship live hogs outside their borders. Adjacent provinces cannot ship live hogs in or out of the affected provinces' borders. Cross-province hog transportation cannot go through provinces with ASF. There are also within-province shipping restrictions.[2]
5. Restrictions on slaughtering and live hog markets: Slaughter houses

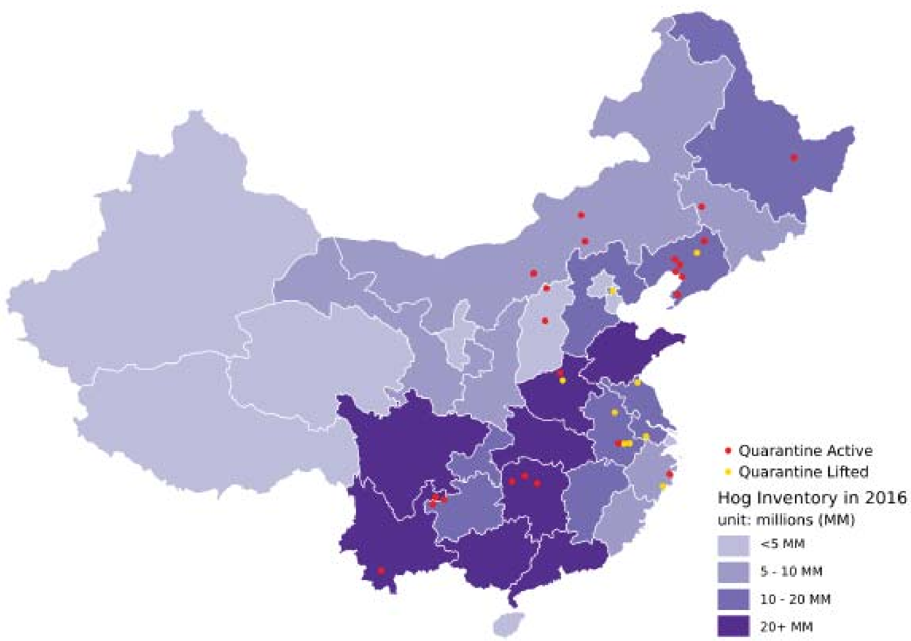

Figure 1. Locations of ASF outbreaks from 08/02/2018 to 10/30/2018.
Source: Data gathered by authors from disclosure announcements by the Chinese government.

[1]If a county (prefecture) has one case of ASF, then this county (prefecture) can only ship hog products within the prefecture (province). If a county has two or more cases, transporting hog products from that county are forbidden all together, and other counties in the same prefecture cannot ship outside of the prefecture. For a prefecture, if two or more of its counties have ASF, then shipping outside of that prefecture is forbidden.

[2]For a given geographical unit (county, prefecture, or province), one ASF will cause a ban on transporting hogs outside of that geographical unit. If two or more of its sub-divisions have ASF (i.e., two counties in a prefecture or two prefectures in a province), shipping across sub-divisions will be banned. Furthermore, all cross-province hog transportation is banned in provinces adjacent to provinces with ASF.

are closed in provinces with ASF. Live hog markets are closed in provinces with ASF and adjacent provinces.

6. Feeding hogs with food waste has been banned nationwide.

Despite the government's active response, challenges remain. First, the transmission channel is not entirely clear, making it difficult to form effective policy responses. Second, the prevalence of backyard producers means high monitoring cost. Third, the restrictions on the movement of pork products are more relaxed compared to those on the transportation of live hogs. Since the ASF virus can survive up to 150 days in refrigeration (Center for Food Security and Public Health 2018), the shipment of hog products posts a significant risk.

Current and Potential Economic Impacts

China accounts for about half of the world's pork consumption. Ninety-seven percent of the pork that China consumes is produced domestically (authors' calculation using data from the USDA PS&D database). Therefore, a relatively small shortage in China can cause a large increase in the demand for pork imports. Currently, the leading pork exporters to China include Canada, Germany, Spain, and Denmark. In the case of a large increase in China's import demand, each country's ability to supply pork to China will depend on the development of ASF in that country. Due to the recent tariff increases (Balistreri et al. 2018), pork products from the United States are not competitive in China. However, if ASF goes out of control in both China and Europe, there is a chance that China may import from the United States despite the high tariff.

So far, direct damage from culling is about 270 million RMB (assuming a live hog price of 13.5 RMB/kg, average hog weight of 100 kg, and a total of 200,000 hogs culled), or $37.8 million dollars. Furthermore, the restrictions on cross-province hog transportation have caused regional hog prices to diverge. The restrictions on cross-province hog transportation were first placed on provinces with ASF on August 31 (MOA 2018a), then expanded to adjacent provinces on September 11 (MOA 2018b). So far, cross-province hog transport has essentially ground to a halt. In northeastern China, a pork surplus region where ASF was first discovered, live hog prices dropped 11 percent from August 1 to October 19. In eastern China, which is a major pork consumption region, hog prices increased 16 percent during the same period (Figure 2). The divergence of regional pork prices is even more dramatic between certain regions. For instance, from August 1 to October 19, the price of pork decreased by six percent in northeastern China, increased by 19 percent in eastern China, and increased by 27 percent in western China (Figure 3). Despite the relatively relaxed transportation restrictions on pork compared to those on hogs, it seems that substantial regional pork shortages are starting to develop.

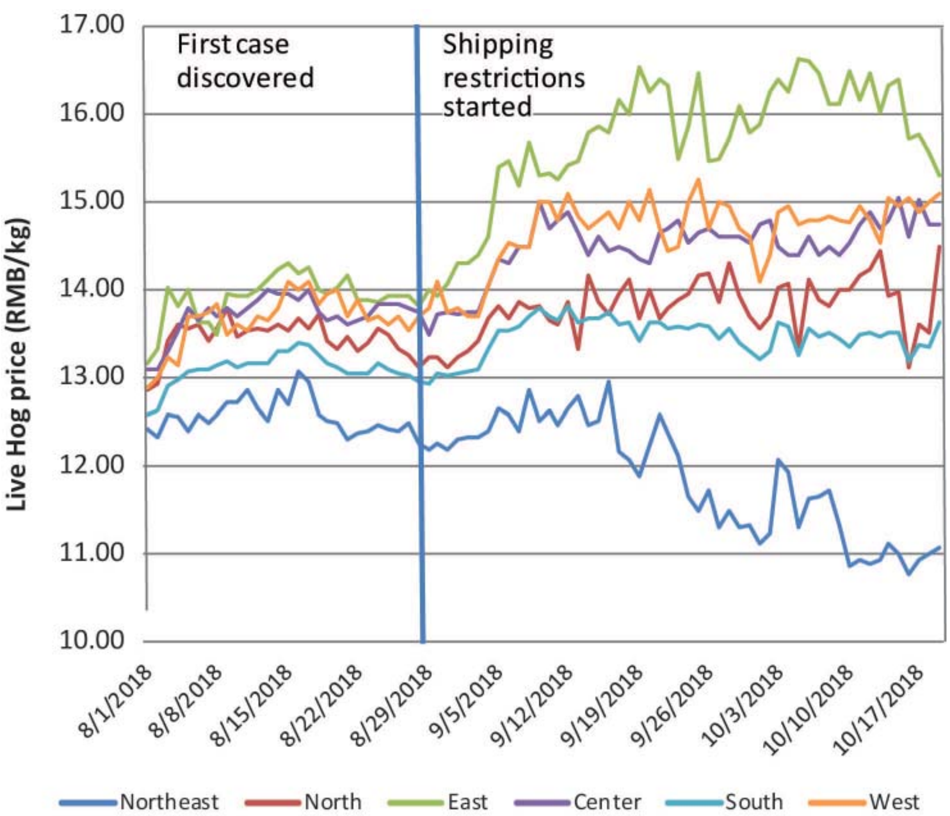

Figure 2. Regional hog price divergence.

Note: Price data are collected from www.zhujiage.com.cn. Regional prices are simple averages of prices in member provinces. Due to data availability, Northeast includes Heilongjiang, Jilin, and Liaoning; North includes Tianjin, Beijing, and Heibei; East includes Jiangsu, Zhejiang, and Shanghai; South includes Guangdong and Guangxi; and, West includes Sichuan and Shanxi.

It remains uncertain whether the ASF situation will cause China to import more pork. This will happen if the heavily populated coastal provinces experience increases in pork prices due to restrictions on the movement of pork and hogs. The relative increases in pork prices in the south suggest that this may be imminent. Sources of uncertainties include, but are not limited to, the

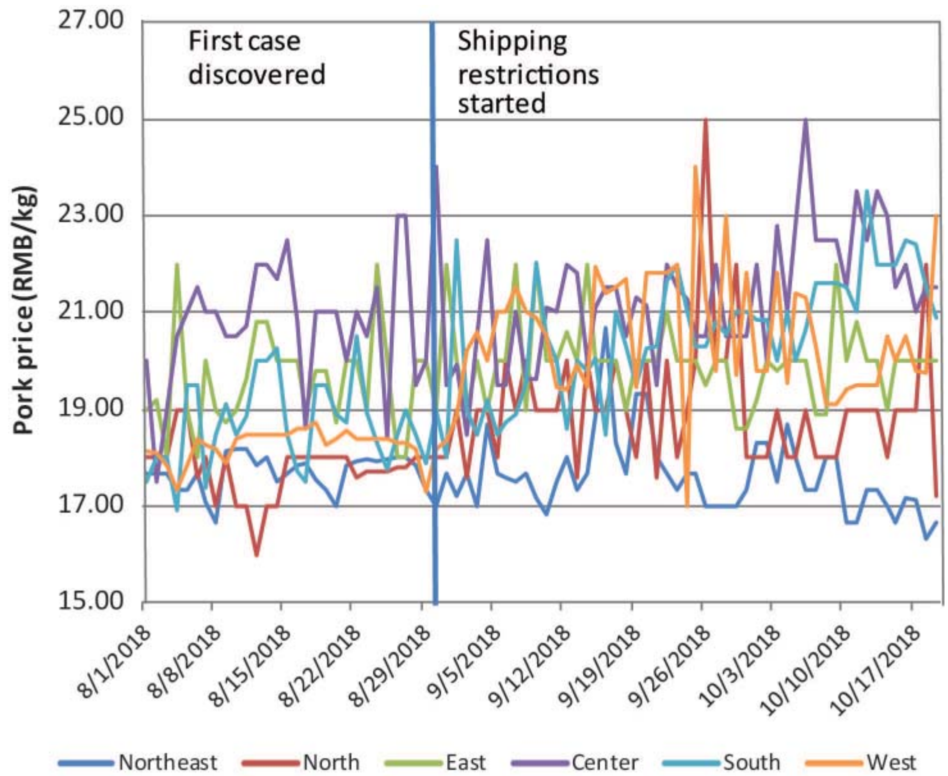

Figure 3. Regional pork price divergence.

Note: Price data are collected from www.zhujiage.com.cn. Regional prices are simple averages of prices in member provinces. Due to data availability, Northeast includes Heilongjiang, Jilin, and Liaoning; North includes Heibei; East includes Jiangsu; South includes Guangdong and Guangxi; and, West includes Sichuan and Shan'xi.

further development of ASF in China, producers' responses to low prices in some regions, consumers' food safety concerns and reactions, whether the government will place more or less restrictions on pork transportation, and the development of ASF in Europe, which will affect import availability and price.

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Using Markets to Balance Agricultural Expansion and Forest Conservation

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HOW CAN we balance agricultural expansion and forest conservation in developing countries? Brazil has a productive agricultural sector with potential for expansion and a rich endowment of natural vegetation resources located on private land. According to the last Agricultural Census, Brazilian farms possessed about 98.5 million hectares of forestland (IBGE 2006), a little less than the combined land area of France and Germany. In 1975, when agricultural production was concentrated in southeast Brazil (Figure 1), about 60 percent of farmland was native vegetation. However, since then, technological change and market reforms have enabled national agricultural expansion. By 2006, the share of native vegetation within private properties had decreased to 46 percent (IBGE 1975; 2006).

In this study, we assess Brazil's application of transferable development rights (TDR), a tradable allowance for the conversion of one hectare of natural vegetation into agriculture and a promising market-based instrument that supports both the conservation of natural vegetation and agricultural expansion. TDR allows a farmer to offset the conversion of one hectare of forestland to agriculture by buying one TDR from a farmer willing to maintain or convert less productive land into natural vegetation.

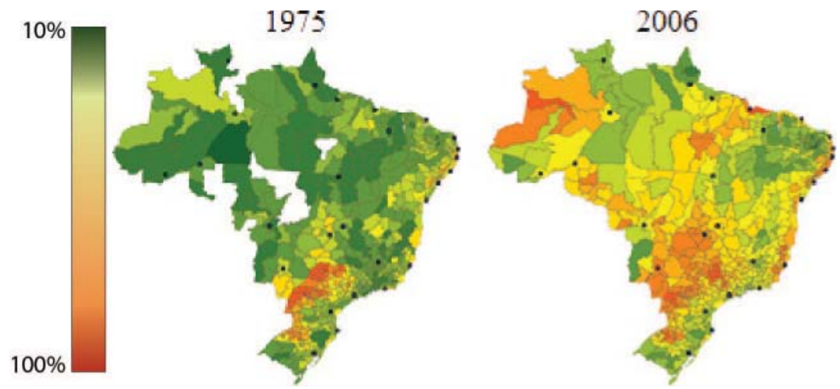

Figure 1. Share of agricultural land within private properties in Brazil.
Source: Agricultural Censuses (IBGE 1975; 2006).

The New Brazilian Forestry Code and TDRs

The forestry code, which regulates private property land use in Brazil, aims to preserve the endowment of natural vegetation inside farms given the value of biodiversity and ecosystem services such as freshwater protection and carbon sequestration. The code specifies two land diversion requirements, the legal reserve and the areas of permanent preservation. The legal reserve requirement specifies, at the biome level, the proportion of farmland that must be preserved in the original natural vegetation. The reserve requirement is 80 percent in the Amazon, 35 percent in the Savanna, and 20 percent in the remaining biomes.

The new Brazilian forestry code, approved in 2012 (Law 12.651/2012), allows TDR trading to ensure compliance with land diversion requirements. For example, a farmer with a reforestation gap of 100 hectares could meet his or her obligations either by converting 100 hectares of his or her farm into natural vegetation or by purchasing 100 TDRs in the market. TDR implementation depends on the regulation of the Brazilian TDR market and completion of a national registry of rural properties. All Brazilian farmers must complete their registration by December 31, 2018.

Soares-Filho et al. (2014) integrate multiple data sources at the watershed level to analyze changes to the Brazilian forestry code and estimate the resulting reforestation gap by biome and state. Our analysis extends their work by simulating the potential of the TDR instrument for forestry conservation using farm-level census data. We also estimate the savings in compliance costs using TDRs.

Supply of Forestland

The gains from trading in the TDR market depend on differences in the opportunity cost of forestland; that is, the foregone agricultural profits from keeping land as natural vegetation. We model the opportunity cost of forestland by estimating a land-use model for Brazil using census data and then simulate the share of forestland within each farm at different TDR prices. The result is the supply function of forestland in Brazil. Figure 2 shows the simulated supply functions of forestland for the entire Savanna biome (solid line) and the Savanna biome within the state of Mato Grosso (dotted-and-dashed line). Mato Grosso is important because it is the largest producer of soy and corn in Brazil. The solid line assumes one TDR market for the entire Savanna biome, whereas the dotted-and-dashed line models a TDR market only for Mato Grosso. The dotted line represents a TDR model for Mato Grosso with supply restricted based on the reserve requirements. In such a restricted market, farmers can only sell TDRs for acreage above the required 35 percent share of natural vegetation.

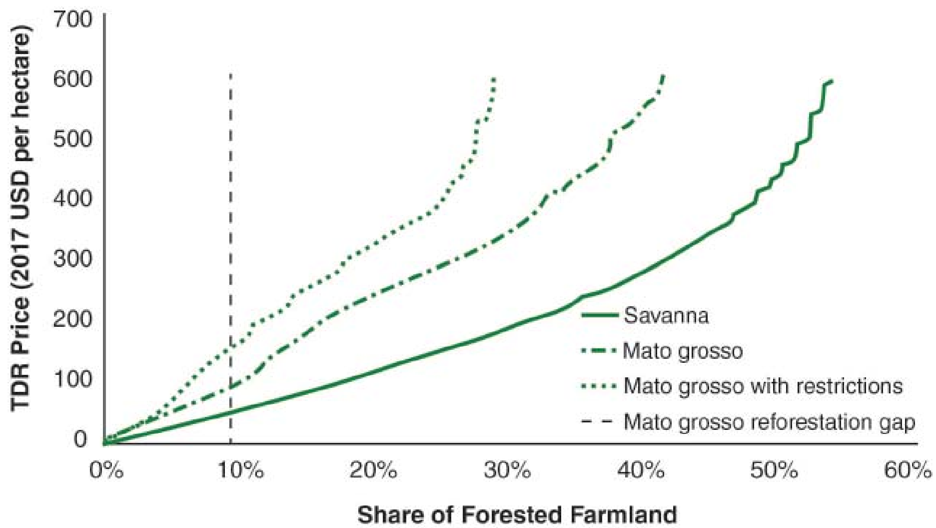

Figure 2. Supply of forestland in the Savanna and Mato Grosso.

For example, a TDR price of $100 would incentivize Savanna farmers to reforest 17 percent of farmland. The lowest productivity land is reforested first, and the supply function becomes more inelastic as we move to highly productive farmland. The vertical dashed line represents the reforestation gap for Mato Grosso. Soares-Filho et al. (2014) estimate a reforestation gap of 1.6 million hectares in Mato Grosso and 3.7 million hectares in the entire Savanna. This reforestation gap captures demand for forestland implicit in the forestry code. We estimate equilibrium TDR prices of $24, $96, and $156 for the Savanna, Mato Grosso, and Mato Grosso restricted TDR markets, respectively. Without a TDR market, each farmer would have to reforest up to the 35 percent requirement level. We estimate a compliance cost of $1.7 billion for Mato Grosso without TDRs, using median land prices. With a TDR market, the compliance cost reduces to approximately $250 million based on the Mato Grosso restricted market, the most likely design. Implementing a TDR market within a large geographical scope (i.e., crossing state boundaries) is operationally and politically challenging because monitoring and enforcement capabilities vary across states and there is potential for the concentration of agricultural production in a few locations. The implementation of a TDR market at the state/biome level would thus reduce compliance costs by 75 percent in Mato Grosso.

The TDR mechanism incorporates the value of agricultural expansion into an environmental policy to balance environmental and development objectives. Further, the market for TDRs can be extended to incorporate the additional benefits of reforestation such as carbon sequestration and the development of biodiversity corridors.

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The Blessing and Curse of Productivity

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CAN YOU have too much of a good thing? In the case of agricultural products, the answer from a market perspective is yes. Over the past six years, the United States has produced a series of bumper crops, greatly expanded pork production, and seen a significant rebound in beef production. But those production gains have come at the cost of lower prices and incomes. Arguably the largest challenge in agricultural markets today is finding enough demand growth to keep pace with production increases.

For corn, the strong production run began with the recovery from the drought of 2012. The last six corn crops (2013–2018) are the largest the United States has ever produced. Planted acreage reductions have been offset by yield increases. In each of the last two years, the national average yield has reached a new record (soon to be broken by this year's crop, based on current projections). This string of large corn crops has overwhelmed corn usage during the period, resulting in a significant expansion of corn stocks and a roughly 50 percent drop in corn prices.

For soybeans, the production march is a combination of higher planted area and higher yields. Farmers across the nation have shifted roughly 25 million acres to soybeans from other crops since 2007. The growth in soybean area has mainly centered in the Great Plains, where soybeans have replaced wheat on the landscape. At the same time, newer soybean varieties have been introduced that are more adaptable to cooler and drier conditions. This has translated into higher national yields, despite the move into what was traditionally lower yielding areas of the country. While soybean acreage peaked in 2017, a

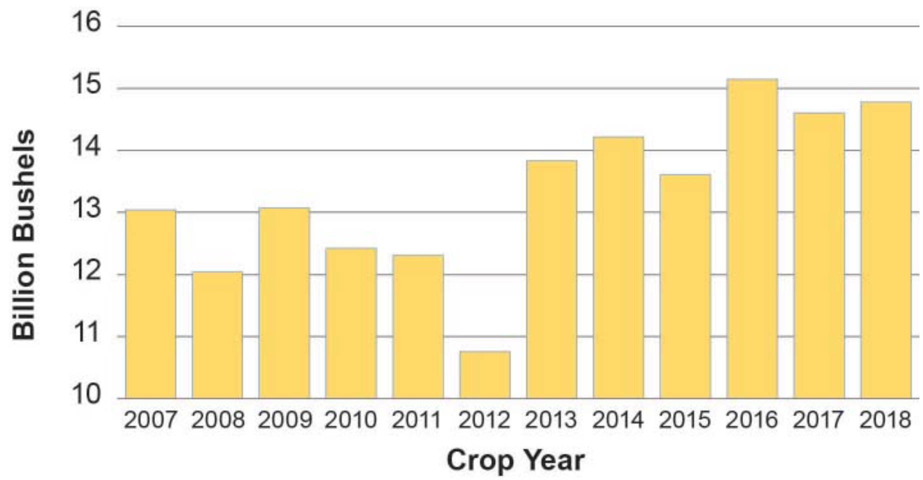

Figure 1. US corn production, 2007–2018
Source: USDA-NASS and USDA-WAOB

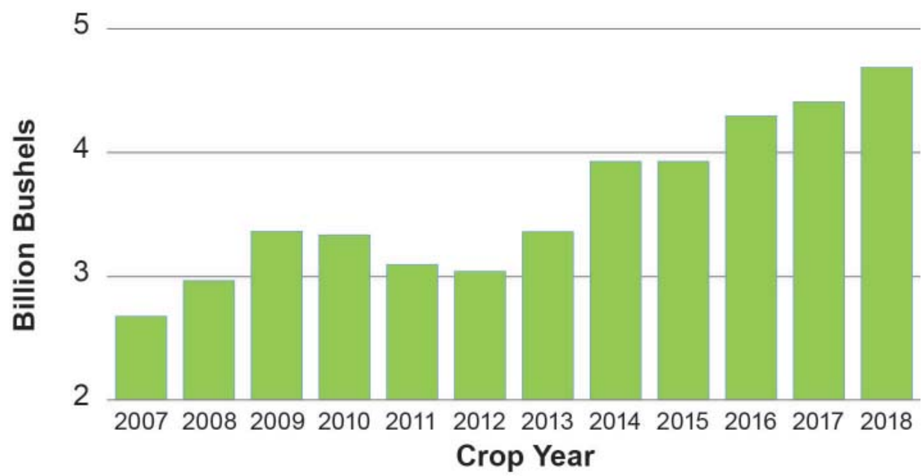

Figure 2. US soybean production, 2007–2018
Source: USDA-NASS and USDA-WAOB

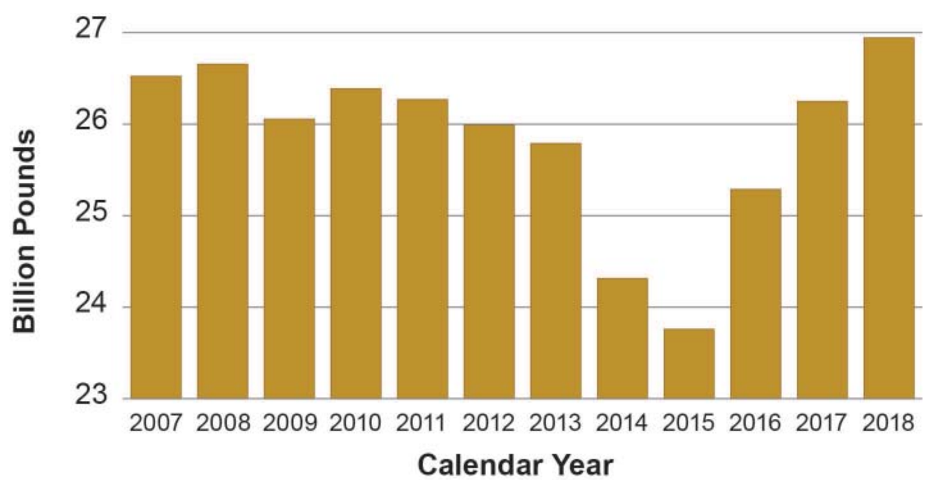

Figure 3. US beef production, 2007–2018
Source: USDA-NASS and USDA-WAOB

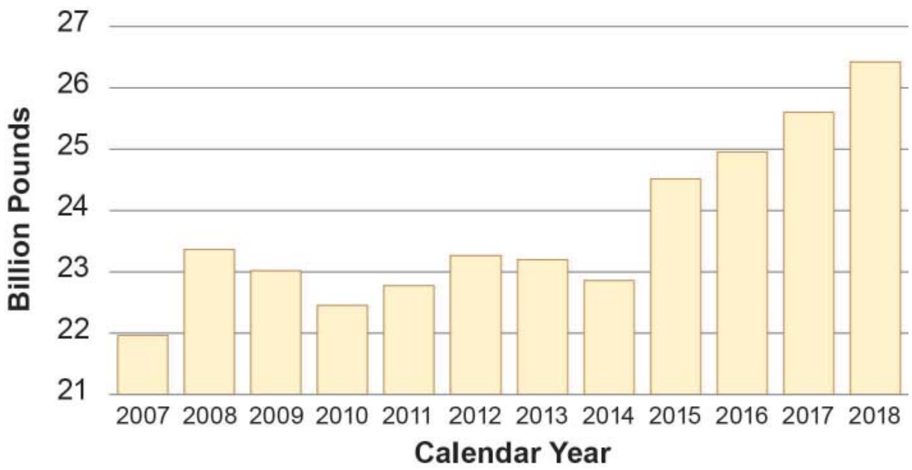

Figure 4. US pork production, 2007–2018
Source: USDA-NASS and USDA-WAOB

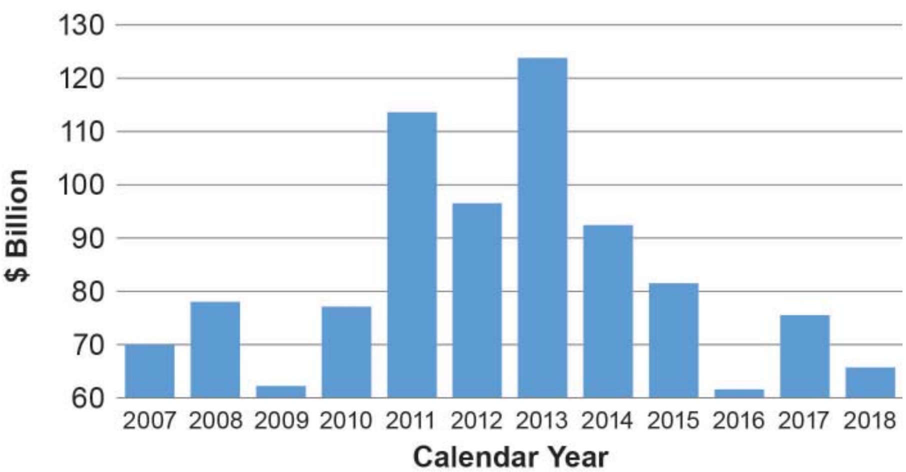

Figure 5. US net farm income, 2007–2018
Source: USDA-ERS

projected record national yield in 2018 has boosted soybean production above 4.5 billion bushels for the first time. It has been an incredible expansion in a short amount of time. Parallel to corn, the soybean production run has coincided with a recent build-up of ending stocks and prices approximately half of what they were five years ago.

US beef production is the one area where we cannot talk about record production, but it is close. After a drought devastated the Southern Plains in 2011 and 2012 and feed costs reached record highs, the US cattle herd shrank significantly, reaching a low in 2014. However, brighter prospects, lower cost feed, and higher prices provided incentives for cattle ranchers to regrow their herds. The repopulation, combined with heavier weights on a per animal basis, have led to a quick rebound in beef production. While cattle numbers have returned to levels last seen in 2010, beef production has risen to nearly 27 billion pounds. Record beef production occurred in 2002, with 27.2 billion pounds of beef entering the market. Based on current USDA projections, that record will be broken in 2019.

Meanwhile, the pork industry is mirroring the soybean industry, with record production in each of the past four years. As with beef, higher feed costs limited expansion opportunities between 2007 and 2014. But once feed prices dropped, the herd expansion began, along with a push toward higher animal weights. Since 2014, pork production has increased 15 percent, a rapid scale-up for the industry. This expansion has been accompanied by growth in packing capacity, with five new packing plants entering processing over the past three years.

It has been an amazing run of agricultural productivity. Since 2015, corn production is up 9 percent, soybeans 19 percent, beef 13 percent, and pork 8 percent. Over the past 12 years, soybean production has swelled by 75 percent, while pork has grown by 20 percent. In aggregate, there is substantially more agricultural production available to the marketplace than a decade ago. While it is great to brag about record yields and high production, those statistics do not necessarily translate into record profits or returns in agriculture. As production rose, farm incomes fell. Farmers and ranchers had more to sell, but found that it took a much lower price to stimulate enough usage to clear the bin and empty the freezer. This is the curse of high productivity, as prices can often move more quickly downward than supplies increase. That is exactly what US farmers and ranchers have experienced since 2013—net farm income fell even faster than production rose.

While trade has been given the blame for much of the price swoons this year, high production has been a constant source of downward price pressure for the last several years, and that pressure continues today. The 2018 corn and soybean crops are massive. Meat production in 2019 should establish new beef and pork records. The productivity beat goes on.

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The Costs and Benefits of Nutrient Reduction Programs

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IN THE fall of 1997, the Mississippi River/Gulf of Mexico Watershed Nutrient Task Force was established to better understand and address hypoxia concerns in the Gulf of Mexico. The task force includes representatives from numerous state and federal agencies including the US Army Corps of Engineers, USDA, the US Department of Commerce, US Department of Interior, US Fish and Wildlife Service, EPA, and the National Tribal Water Council. In 2008, the Task Force released an action plan outlining a national strategy to tackle recurrent hypoxic conditions in the Northern Gulf of Mexico and improve water quality in the Mississippi River Basin (Gulf Hypoxia Action Plan 2008). The report suggests that at least a 45 percent reduction in riverine total nitrogen and phosphorus is needed in order to control the size of the hypoxic zone in the Gulf of Mexico. Complementary efforts by EPA have encouraged individual states to establish frameworks to reduce nutrient pollution in their states (US EPA 2011; 2016). The EPA underscores that nitrogen and phosphorus pollution could become "one of the costliest and the most challenging environmental problems [in the United States]."

In response to the 2008 action plan and EPA's calls, Iowa developed the Iowa Nutrient Reduction Strategy (INRS) in 2013. The INRS provides a scientific assessment of the effectiveness of a range of conservation practices and estimates the costs of the suite of practices that could achieve the state's water quality goals. The state has already invested substantial resources in implementing the INRS. The estimated financial costs of INRS-related efforts—including education and outreach, research, practice implementation, and water monitoring—for 2016 and 2017 were $388 million and $420 million, respectively (Iowa State University 2017). In January 2018, the Iowa Legislature passed a $282 million water quality bill to further mitigate the level of nitrogen and phosphorus in the state's waterways, mostly by providing financial support for farmers to implement land conservation practices.

The report suggests that at least a 45 percent reduction in riverine total nitrogen and phosphorus is needed in order to control the size of the hypoxic zone in the Gulf of Mexico.

Key questions remain around these water quality programs in the state. For example, are the current suite of water quality programs worth the cost to taxpayers? Should we be spending more or less on these programs? Economists and policymakers have answered these sorts of questions for decades using cost-benefit analyses (CBAs). The idea behind CBAs for policy evaluation is simple but powerful: a key metric of whether a policy is worthwhile is whether benefits accrued to all citizens outweigh the costs.

The key to successfully performing a CBA is to quantify all costs and benefits associated with the policy accurately. This is a tall order, especially for environmental policies, since a substantial part of benefits may not be obvious or are difficult to quantify (Keiser, Kling, and Shapiro 2018). Reducing nutrients in Iowa's waterways could have many benefits for residents both in the state and in downstream areas. While the costs are relatively well-known, much less is known about the economic value of many of the benefits from implementing the strategy.

Earlier this year, we released a report summarizing the current state of knowledge on the benefits of reducing nutrient pollution to the citizens of Iowa. Unlike previous studies that focus on benefits from decreasing the Gulf of Mexico hypoxic zone, our report focuses on in-state benefits from the INRS.[1] We highlight three broad benefits to Iowa citizens of meeting the INRS targets: reduced drinking water treatment costs, improved recreational benefits for all Iowans, and decreased exposure to nitrates in drinking water and associated human health impacts.

Nitrates end up in Iowa waterways from a variety of sources including point sources (e.g., wastewater treatment plants) and non-point sources (e.g., runoff from agricultural or urban areas). Nitrate levels in Iowa's waters in a given year depends on many factors, including the condition of the farm economy, weather, geology of the land, and land use. While levels fluctuate, average nitrate levels in many rivers, streams, and groundwater sources in the state are elevated.

[1] Full report: https://www.card.iastate.edu/products/publications/texts/water-quality-report.pdf

The cost of treating drinking water with elevated nitrate levels is high. Many public water supply systems in the state must either invest in treatment technologies that remove nitrates from their water sources or blend water from multiple sources to ensure nitrate concentrations in their drinking water are below acceptable levels. Since 2000, five public water supply systems in Iowa have invested at least $1.8 million (2015 dollars) in nitrate-removal equipment. Small public water supply systems, those serving less than 500 people, in areas with high nitrates face difficult choices. Nitrate reduction equipment in those communities is typically too costly to justify, and smaller communities often do not have multiple water sources for blending.

In addition to public water suppliers, private well owners would also benefit from reduced nitrate pollution. As few as 7 percent and as many as 25 percent of private wells in Iowa may contain unhealthy nitrate levels.[2] While many state programs are available to help public water supply systems and homeowners manage nitrates in their drinking water, a key benefit of the INRS is reduced expenditures for cleaning up our drinking water.

Recreational users are another important benefactor of meeting INRS targets, as Iowa's lakes provide tremendous recreational opportunities. However, nutrient pollution is a well-established contributor to poor water quality, including harmful algal blooms and beach closures. Nutrient pollution not only leads to visibly poorer water quality, but there is strong evidence that people change their behavior in response to poor water quality. Using data from the CARD Iowa Lakes Survey,[3] we estimate the annual value for recreational users of meeting INRS water quality goals at $30 million dollars. These recreational benefits would be even greater if we included benefits from improved water quality in rivers and streams.

A final, but uncertain, benefit of meeting the INRS is human health. Researchers have known since the 1940s that extremely high nitrate levels in drinking water can cause blue baby syndrome, a potentially fatal disease. Thanks to advanced treatment technologies and water quality regulations, blue baby syndrome is largely non-existent in the United States. However, much less is known about the impacts of long-run exposure to drinking water that contains lower, but still elevated nitrate levels. Several studies have documented associations between long-term exposure to nitrates and chronic conditions like colorectal cancer, thyroid disease, and neural tube defects (Ward et al. 2018). However, more data and research are needed to explore these issues for decision-makers and policy analysts to identify health benefits of the INRS.

Both here and in our report, we highlight key benefits of meeting the INRS, but much more work remains. In addition to these three areas, there are likely even more categories, including broad, difficult-to-measure benefits of improvements to ecosystems. To be useful, we must quantify all of these benefits and compare their magnitudes to the program's costs. The estimated recreation benefits alone suggest that the benefits of significant reductions in nutrient pollution in the state are high, but more research is needed to conduct a comprehensive analysis. Thus, while this pilot study is certainly not a full CBA, it serves as an informative building block for further research. Formal and comprehensive CBAs have played an important role in decision making at the federal level since the Reagan administration. Similar analyses on INRS could help Iowans better understand the fuller picture of this policy and mobilize stakeholders and local government to achieve proposed goals.

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[2] Data are summarized based on data from Iowa Drinking Water Treatment Inventory and Iowa Private Well Tracking System, both provided by the Iowa Department of Natural Resources.

[3] See more information about the Survey: *https://www.card.iastate.edu/lakes/*

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However, the trade disputes will likely change the production pattern going forward, especially for soybeans. Exports and production tend to move together, more product being produced means more product available for international markets. Much of the surge in soybean and pork production has been associated with strong international demand. China was a leading figure in that strong demand. The tariff implementation over the past year has curtailed agricultural shipments to China. This has little direct impact for the corn and beef markets as China purchased very little of those products, but has larger impacts for pork and soybeans. Those export shifts have slowed the projected growth in the pork sector and have farmers considering shifting acreage away from soybeans next spring.

When prices are high, farmers and ranchers expand production, which eventually lowers prices. When prices are low, farmers and ranchers reduce production, which eventually allows prices to rise. This has not worked so well over the past few years. While prices and incomes have retreated, production has remained strong. ■

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