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PURDUE AGRICULTURAL ECONOMICS REPORT

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Special edition: COVID-19 impact on agriculture

Contents:

Retail markets get a boost during COVID-19

Jayson Lusk, Department Head and Distinguished Professor of Agricultural Economics

The declaration of a national emergency on March 13, 2020 by President Donald Trump, and the corresponding state stay-at-home measures, caused significant disruptions in retail food markets. Aside from take-out, many consumers were suddenly unable to dine at restaurants and food service establishments away from home, which according to U.S. Department of Agriculture data, represents about 54% of all food expenditures. As a result, consumers turned to grocery stores and supermarkets, where the increase in demand, coupled with concerns about future reduced mobility and scarcity, led to a surge in foot traffic and sales.

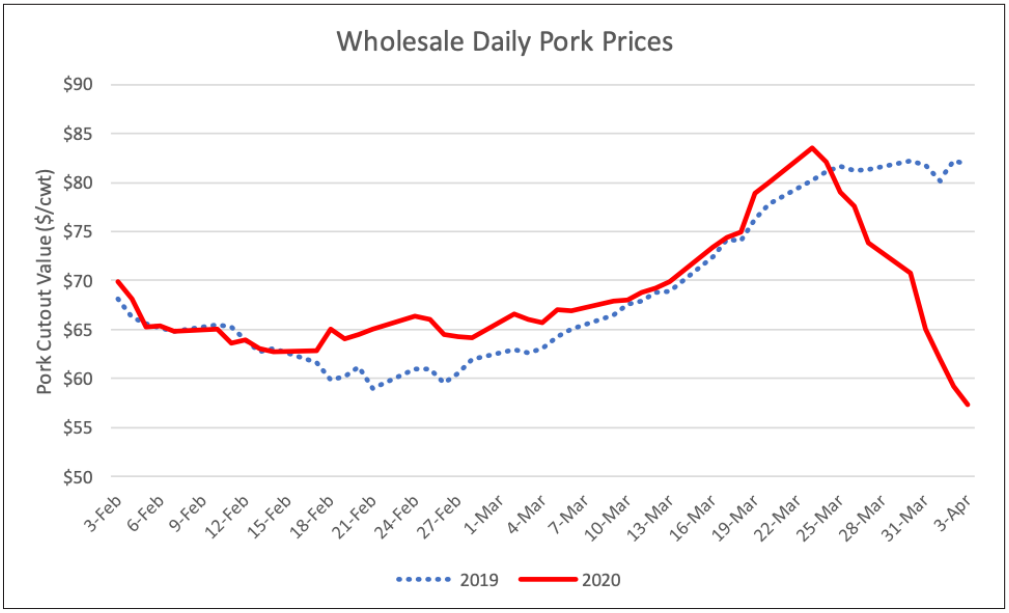
For the week ending March 22, 2020, the number of trips to grocery stores and supermarkets increased 39%, and during each trip, consumers purchased about 12% more items, and spent, in aggregate, about 61% more as compared to the same week one year prior. Fresh meat and frozen food sales led the increase in dollar sales. Pork sales increased 101%, beef sales increased 95%, and chicken sales increased 70% for the week ending March 22, 2020 as compared to the same time period in 2019.

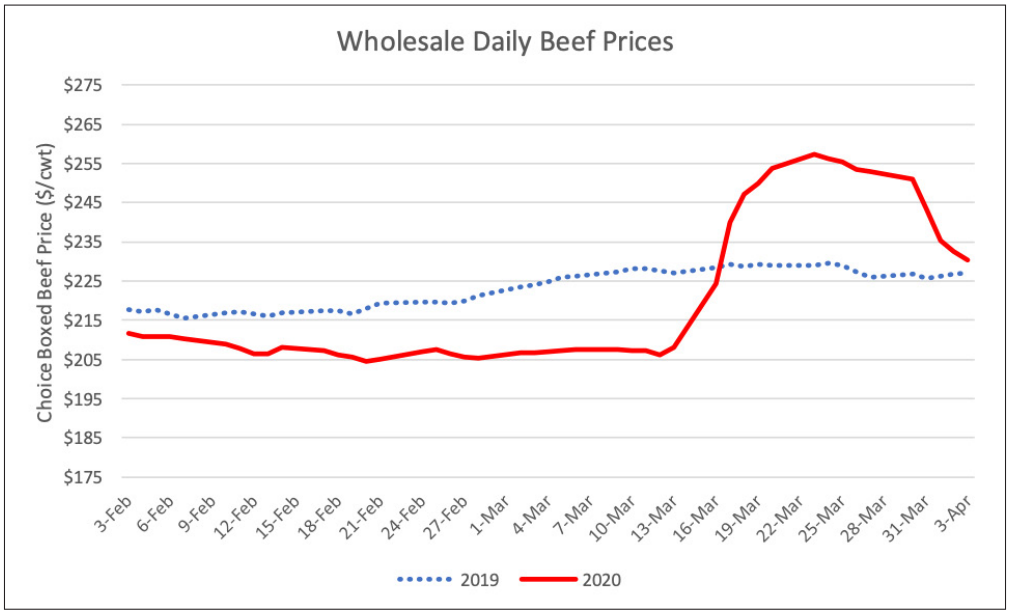
Increasing food prices suggest the increased demand in grocery establishments appears to have more than compensated for the lost demand at restaurants, at least in the short run. The figures below report U.S.

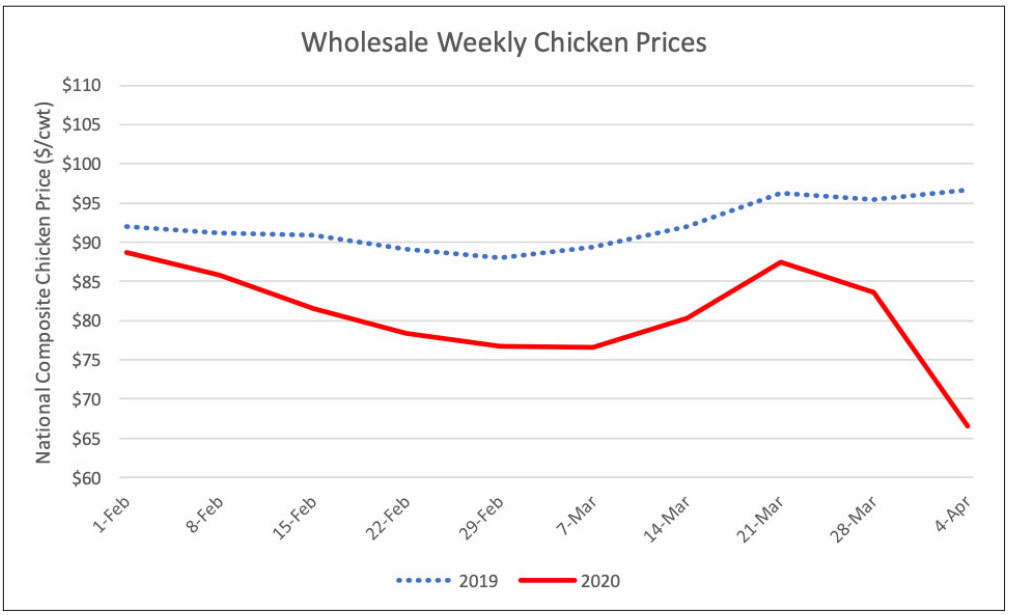
Department of Agriculture data made available by the Livestock Marketing Information Center on wholesale prices of pork, beef, chicken, and eggs. In each of these cases wholesale prices began dramatically rising at about the time President Trump declared the national emergency. For example, wholesale pork prices jumped almost $20/cwt from about $65/cwt in early March to just under $85/cwt by mid-March. For beef, wholesale boxed beef prices increased about $50/cwt, going from about $205/cwt to over $255/cwt. Wholesale chicken prices increased a bit over $10/cwt over this same time period. However, as the figures reveal, the price pressure has already started to subside for beef, pork, and chicken. In fact, for pork and chicken, price levels are near or below what was experienced at the same time last year.

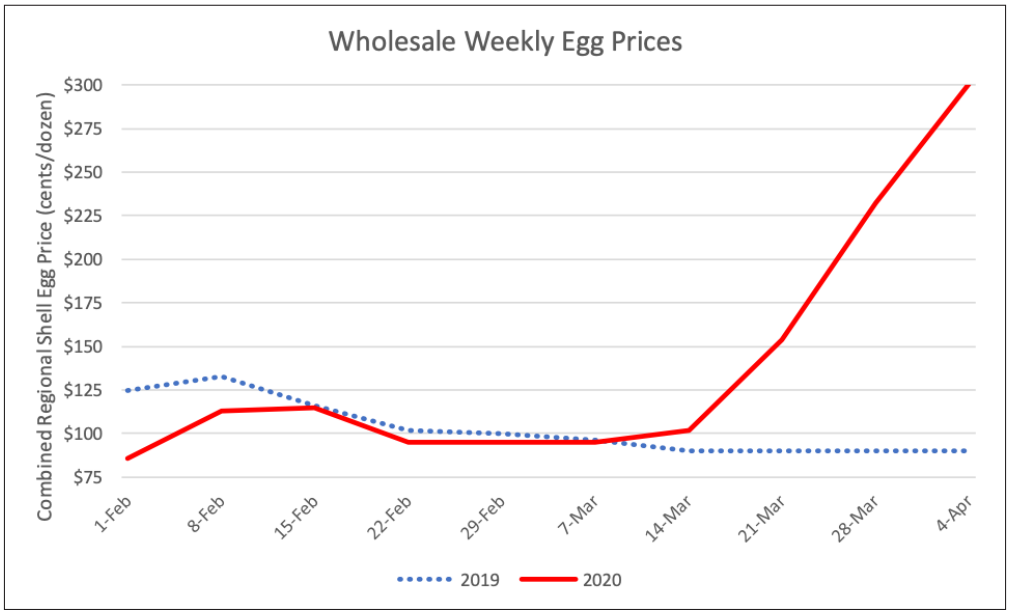
The case of eggs reveals a different story. Wholesale egg prices were about $1/dozen in early to mid-March 2020, approximately in line with prices at the same time in 2019; however, prices have nearly tripled since that time, and by the week ending April 4, 2020, prices were $3/dozen, with the increase showing no sign of slowing as of this writing. A number of explanations have been offered for the price run-up in the egg market including consumer perceptions about the necessity of eggs and their longer shelf life relative to other animal proteins, dynamics associated with Easter egg buying, legal barriers that prohibited easy re-sale of eggs headed for restaurant markets to grocery, and the high degree of concentration in the egg production industry.

The increases in wholesale meat prices were not initially met with corresponding increases in farm-level hog and beef prices, causing some consternation among producers. Going forward, increased concerns about illness spread in packing houses is likely to reduce processing capacity, further exasperating this problem, putting downward pressure on livestock prices. Moreover, coming into 2020, animal inventories were high, leading to large projected total meat and egg production for the year. Temporary stocking-up behavior on the part of consumers buoyed demand in the short run following outbreak of COVID-19, providing a respite to the downward price pressure expected for 2020. However, the loss of restaurant sales, coupled with reduced consumer incomes from a likely recession and export markets for meat products being hard hit by COVID-19, suggest the general downward price movements witnessed in cattle and hog markets may continue even if wholesale prices rebound should processing capacity be adversely affected by disruptions associated with COVID-19.




Wholesale Daily Beef Prices
Choice Boxed Beef Price ($/cwt)
$275
$265
$255
$245
$235
$225
$215
$205
$195
$185
$175
3-Feb
6-Feb
9-Feb
12-Feb
15-Feb
18-Feb
21-Feb
24-Feb
27-Feb
1-Mar
4-Mar
7-Mar
10-Mar
13-Mar
16-Mar
19-Mar
22-Mar
25-Mar
28-Mar
31-Mar
3-Apr
2019
2020


Wholesale Weekly Chicken Prices
National Composite Chicken Price ($/cwt)
$110
$105
$100
$95
$90
$85
$80
$75
$70
$65
$60
1-Feb
8-Feb
15-Feb
22-Feb
29-Feb
7-Mar
14-Mar
21-Mar
28-Mar
4-Apr
2019
2020


Wholesale Weekly Egg Prices
Combined Regional Shell Egg Price (cents/dozen)
$300
$275
$250
$225
$200
$175
$150
$125
$100
$75
1-Feb
8-Feb
15-Feb
22-Feb
29-Feb
7-Mar
14-Mar
21-Mar
28-Mar
4-Apr
2019
2020

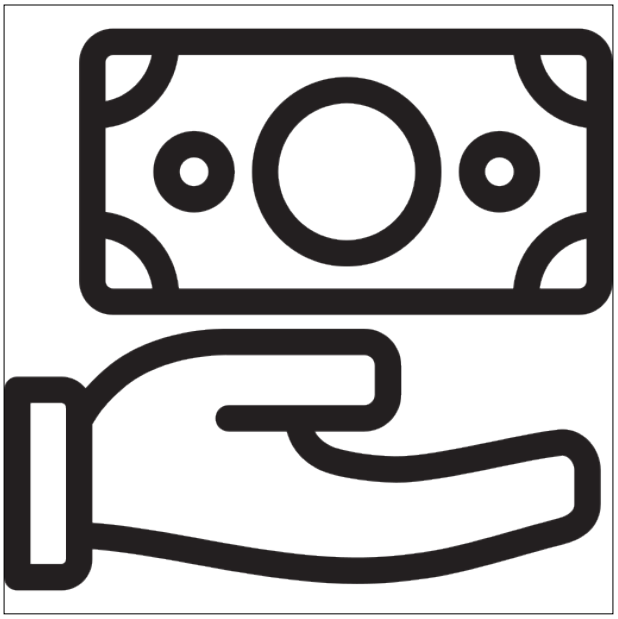
SBA help for small (and family) businesses

Renee Wiatt, Family Business Management Specialist, and Maria I. Marshall, Professor of Agricultural Economics

The U.S. Small Business Administration (SBA) has options for businesses that have been disrupted or otherwise affected by the COVID-19 pandemic. The pandemic has caused disruption or economic injury for many businesses. The pandemic has altered normal business operation as well as access to employees and customers, ultimately resulting in loss of sales. The President has signed the CARES (Coronavirus Aid, Relief, and Economic Security) Act into law. The CARES Act provides potential relief for employees and businesses. The CARES act and its four main provisions through SBA are further explained at the end of this article.

The CARES Act contains four main provisions, explained as follows:

1. The Paycheck Protection Program (PPP) allows employers to keep paying employees. An added incentive of the PPP is that "SBA will forgive all loans if all employees are kept on payroll for eight weeks and the money is used for payroll, rent, mortgage interest, or utilities". Obligations starting as of February 15, 2020 are eligible to be covered.
    a. Application timeframe: April 3rd, 2020 - June 30th, 2020. Funds are dispersed on a first-come-first served basis.
    b. Independent contractors and the self-employed can apply as of April 10th.
    c. Who can qualify: Small businesses with less than 500 employees (from sole proprietorships to LLC's, non-profits, Tribal businesses, and veterans organizations).
    d. Extra details: Loans will be fully forgiven if the loan is used for qualifying expenses (payroll, mortgage interest, rent, and utilities). At least 75% of the loan amount must be applied toward payroll for loan to be fully forgiven.
    e. The loan needs to be repaid in two years and has an interest rate of 1%.
    f. Application sites: Include but not limited to an existing SBA 7(a) lender, federally insured depository institution, federally insured credit union, Farm Credit System institution, and other regulated lenders as they are approved and enrolled.
2. Economic Injury Disaster Loan Emergency Advance is a loan advance program that can provide up to $10,000 of economic relief to businesses that are being affected by COVID-19.
    a. Who can qualify: Businesses with fewer than 500 employees and those businesses with over 500 employees if they meet SBA's size standards for their given industry.
    b. Extra details: Funds can be made available within days of an application being submitted. This loan advance does not need to be repaid.
3. The SBA Express Bridge Loan Pilot Program is available for small businesses that have an urgent need for cash. The loans can be up to $25,000.
    a. Who can qualify: Small businesses with an already-established relationship with an SBA Express Lender.
    b. Extra details: These loans provide quick funds to help small businesses overcome a temporary revenue loss. The loan will eventually be repaid in full or partially by the Economic Injury Disaster Loan, mentioned above.
4. SBA Debt Relief is a program to provide a break from SBA debt repayments.
    a. Who can qualify: Small businesses with SBA loans (current 7(a), 504, and microloans) that are under "regular servicing" status as of March 1st, 2020.
    b. Extra details: SBA will pay principal, interest, and fees for six months for current SBA loans. In addition, SBA will pay principal, interest, and fees of new loans issued before September 27, 2020. Under the six-month period, interest will continue to accrue.



After knowing what the CARES Act contains, small businesses should have two main questions: 1) Has SBA assistance helped businesses in the past? and

2) If so, by how much did the assistance help?

Tomoko Hiramatsu and Maria Marshall explored the impact of SBA disaster loans following Hurricane Katrina. They found that when a business received a SBA disaster loan, that business was positively affected in both objective and subjective business performance (i.e., perceived success and percent change in revenue from before to after Hurricane Katrina). Overall, disaster loans did help businesses to recover from Hurricane Katrina.

References

Hiramatsu, T. and M.I. Marshall. (2018). "The long-term impact of disaster loans: The case of small businesses after Hurricane Katrina". Sustainability, 10, 2364.

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The Purdue Institute for Family Business publishes a quarterly newsletter loaded with information about estate and personal planning, leadership and succession planning, tips for maintaining family bonds, and strategic businessing planning. The next edition will be released in late-April. Get a sneak peek here.

COVID-19 weakens ethanol demand leading to reduced corn usage forecast

Farzad Taheripour, Research Associate Professor of Agricultural Economics, and James Mintert, Professor and Director of Purdue's Center for Commercial Agriculture

As recently as March 2020, USDA projected that 37 percent of the 2019 corn crop would be used to produce ethanol with about 40 percent of the 2019 crop expected to be consumed as animal feed. But the decline in oil and gasoline prices that started prior to the advent of COVID-19, combined with weak consumer demand for gasoline as a result of recent orders for consumers to shelter in place and the U.S. economy's descent into recession, makes it clear that corn usage will be much lower than was forecast earlier this year. To determine by how much demand for corn to produce ethanol and dried distillers grains with solubles (DDGS) will shift in the weeks and months ahead, we start by considering the impact of reduced gasoline prices on ethanol prices and the resulting impact on ethanol plant operating margins. We then consider changes in gasoline usage by consumers both near-term, in response to sheltering in place, and longer term as the U.S. economy attempts to climb out of recession. Results indicate that the impact on total corn usage could be quite large resulting in a significant boost to corn ending stocks at the end of the 2019 crop year.

Historically, the largest single use category for corn was feed for animal agriculture, often accounting for usage of approximately 60 percent of each year's corn production. But that began to change early in this century as corn became an important input in energy production. Since the early 2000s corn used to produce ethanol has increased dramatically. In recent years corn used to produce ethanol and the resulting DDGS byproduct has grown from just 14 percent of U.S. corn production in 2005 to an average of 37 percent of U.S. corn production from the 2014 through 2018 crop years (Figure 1).

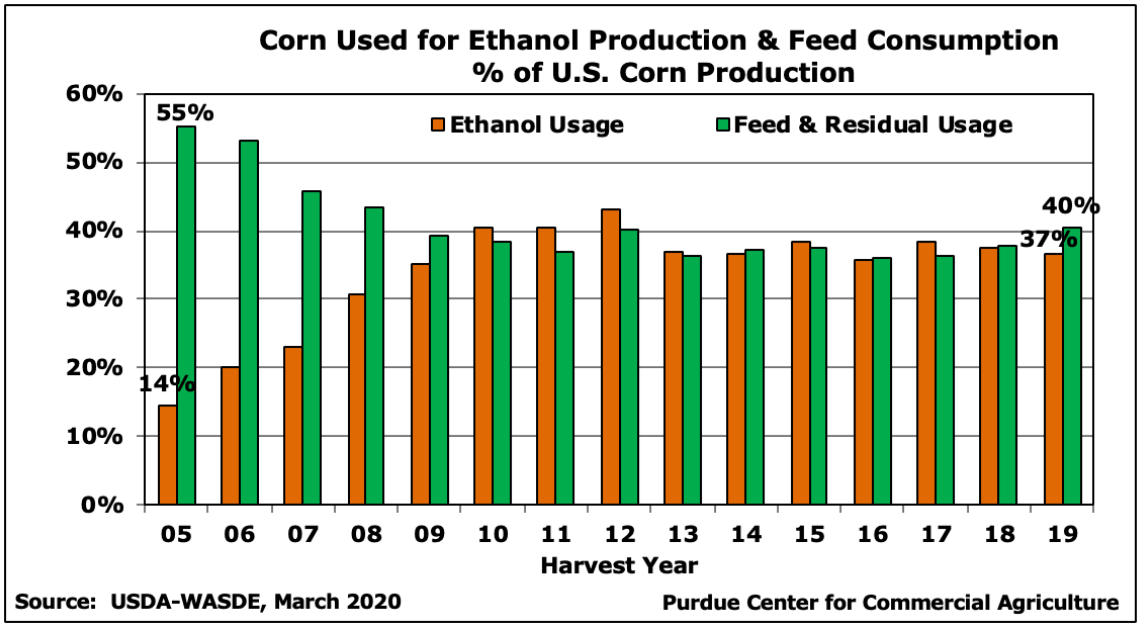

Figure 1. Percentage of U.S. Corn Production Used for Feed Consumption and Ethanol Production, By Harvest Year, 2005-2019

Ethanol is blended into gasoline, primarily at a rate of 10 percent, and as a result ethanol usage is closely tied to gasoline usage. As recently as December the rack price for unleaded gasoline in Omaha, Nebraska averaged $1.82 per gallon. But after weakening modestly early this year, the rack price for unleaded gasoline fell precipitously in March 2020, averaging just $1.14 per gallon in Omaha as oil production by major producers surged and worldwide demand for fuel used in transportation weakened.

Ethanol values at Omaha, which reached a near-term monthly average peak in November 2019 at $1.44 per gallon, began to weaken in late 2019 and early 2020, falling to $1.03 per gallon in February before dipping below $1 in March to average just $0.84 per gallon. The decline in ethanol value of over 40 percent from November 2019 to March 2020 put tremendous pressure on ethanol plant operating margins. Iowa State University's Center for Agricultural and Rural Development (CARD) estimates indicate daily ethanol plant operating margins above variable production costs peaked in November at $0.36 per gallon of ethanol produced, but declined in early 2020 and by mid-March were negative. The inability to recoup variable production costs provided a clear signal to ethanol producers to consider shutting down ethanol plants. In late March and early April, a cascade of announcements ensued from various ethanol producers that they were shutting down plants or delaying scheduled plant openings leading to a sharp reduction in corn usage.

A key question in estimating the impact on corn demand originating from reductions in ethanol production is how large will the short-run impact on consumer behavior be and how rapidly will ethanol production recover once restrictions are lifted? Recently, Scott Irwin and Todd Hubbs, agricultural economists at the University of Illinois, provided a short-run estimate of the impact of reduced ethanol production on U.S. corn demand, estimating that a combination of shelter in place, social distancing and other consumer movement restrictions would lead to a weighted average reduction in gasoline usage of approximately 11 percent in March and 33 percent in April. They assume restrictions on consumer movement and business activity will be relaxed in May leading to a much smaller reduction in gasoline usage of about 17 percent. They implicitly assume a return to normal gasoline usage by June. Their assumptions lead them to estimate that corn used to produce ethanol from March through May would decline by 256 million bushels because of reduced gasoline usage. When adjusted for reduced availability of DDGS, they estimate a decline in corn usage of 181 million bushels.

Our analysis builds upon Irwin and Hubbs. We consider three possible corn demand scenarios: 1) 40% reduction in short-run gasoline usage; 2) 50% reduction in short-run gasoline usage and 3) 60% reduction in short-run gasoline usage. Second, we assume that the recovery in economic activity will be gradual and that reductions in corn demand will continue through the summer and into the fall, providing a gradual recovery in fuel demand and corn consumption rather than the abrupt recovery implied by Irwin and Hubbs. Each scenario assumes that the reduction in gasoline usage will decline each month after April. For example, in the most pessimistic scenario (scenario 3), we assume a 60% decline in gasoline usage in April, a 50% decline in May, followed by a 40% decline in June, a 30% decline in July and a 22% decline in August. We assume a similar gradual change in fuel usage, and therefore corn usage, for the other two scenarios as well[1].

Table 1. Estimated Reductions in U.S. Corn Usage Resulting from Reduced U.S. Gasoline Usage, 2019 Crop Year.

Month	Irwin and Hubbs (Million Bushels)	Purdue Scenario 1 (Million Bushels)	Purdue Scenario 2 (Million Bushels)	Purdue Scenario 3 (Million Bushels)
March	-35	-32	-32	-32
April	-95	-116	-145	-174
May	-50	-90	-120	-150
June	0	-60	-90	-120
July	0	-30	-61	-91
August	0	-26	-48	-69
Total (March-August)	-180	-354	-496	-636

[1]To learn more about these scenarios see: Taheripour, F.and J. Mintert. "Impact of COVID-19 on the Biofuels Industry and Implications for Corn and Soybean Markets." Department of Agricultural Economics, Purdue University, April 13, 2020.

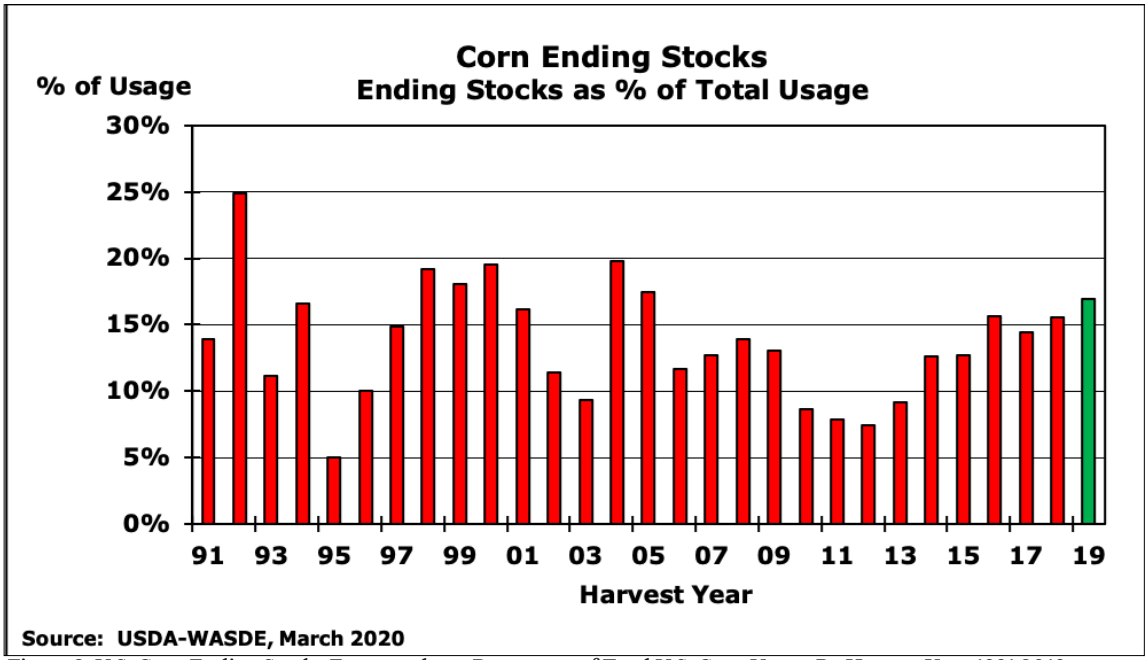

Figure 2. U.S. Corn Ending Stocks Expressed as a Percentage of Total U.S. Corn Usage, By Harvest Year, 1991-2019.

The three scenarios we consider for reductions in short-run gasoline consumption lead to markedly different outcomes with regard to corn used for ethanol production, but all three are larger than the impact estimated by Irwin and Hubbs. Table 1 provides estimates of the reductions in corn demand, net of the shift in corn usage by animal agriculture given reduced availability of DDGS, by month for the three scenarios outlined previously. To keep estimates consistent with the annual corn balance sheets, which are estimated on a crop year basis, we focus on the estimated impact on the 2019 corn crop balance sheet. Under scenario 1, corn consumption for ethanol production in the 2019 crop year declines by about 350 million bushels. Under scenario 2, the corn consumption loss rises to nearly 500 million bushels and under scenario 3 corn used for ethanol production declines by over 600 million bushels. Although there is a large amount of uncertainty surrounding these estimates given the assumptions used to generate them, notice that the smallest estimate of reduced corn consumption, which is provided by scenario 1, is nearly double the estimated loss in corn consumption during the 2019 crop year estimated by Irwin and Hubbs, in part because Irwin and Hubbs assume reductions in gasoline usage will disappear after May

Holding other estimated sources of corn demand constant at the levels forecast by USDA in March 2020, the reductions in corn usage for ethanol production result in a substantial increase in the expected carryover of corn from the 2019 crop year into the 2020 crop year. To put it in perspective, back in March USDA forecast corn ending stocks at the conclusion of the 2019 crop year of 2.3 billion bushels with an ending stocks/total usage ratio of 17 percent. Scenario 1 in our analysis implies ending stocks would rise to nearly 2.7 billion bushels, leading to an ending stocks/total usage ratio of 20 percent. Scenario 3, with the largest reduction in corn used to produce ethanol of the three scenarios we examined, would lead to ending stocks rising to nearly 3 billion bushels and an ending stocks/total usage ratio of 23 percent. Figure 2 provides some historical perspective on corn ending stocks expressed as a percentage of total usage. Scenarios 1 and 2 would potentially boost ending stocks to levels last seen in 2004 and the late 1990s. Scenario 3 would potentially boost ending stocks back to just below the large ending stocks of 1992. All three scenarios imply that corn prices for the remainder of the 2019 crop year will remain under pressure and the increase in corn ending stocks at the end of the marketing year will depress prices for the 2020 crop.

References

Irwin, S. and T. Hubbs. "The Coronavirus and Ethanol Demand Destruction." farmdoc daily (10):56, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, March 26, 2020.

Short-term effects of COVID-19 on U.S. soybean and wheat exports

Mindy Mallory, Associate Professor, Clearing Corporation Charitable Foundation Endowed Chair of Food & Agricultural Marketing

The pandemic caused by Covid-19 will likely be the defining global crisis for at least a generation. The devastating economic consequences of shelter-in-place orders are second only to the heart-wrenching loss of life and human suffering caused by the illness itself. As economies all over the globe shutter for an unknown length of time, the crisis is impacting every aspect of the human condition and the global economy.

The issues exposed relating to broad health, economic, and agricultural policy will take years to work through. For now, an awareness of potential short term impacts can help navigate the next few weeks to months. In this article I consider very near term impacts the COVID-19 crisis could have on U.S. exports of soybeans and wheat. Exports of soybeans and wheat especially could be impacted by two aspects of the crisis: case flare-ups during peak seasonal export times for major exporters and geopolitical tensions sparked by the virus. As with everything related to the virus, the situation is changing daily and impacts are extremely difficult to forecast.

Soybeans

U.S. exports of soybeans are still reeling from the lingering trade war with China. The January 15, 2020 signing of Phase 1 of the U.S.-China trade deal brought hope that U.S. would see a rapid rebound of export volumes of soybeans to China. However, those hopes have not come to fruition, at least not immediately. Figure 1 shows monthly soybean exports from the United States and Brazil. Brazil's bumper crop of 2020 soybeans dampened the impact of the trade deal, especially considering there was only a short window between signing of the trade deal and Brazil's harvest.

Just eight days after signing Phase 1 of the trade deal, the city of Wuhan was placed under a stay-at-home by the Chinese government;[1] by the first week of February new cases were rising in other areas in China and as many as fifteen cities were under some form of stay-at-home order.[2] It is not clear whether widespread restricted movement policies dampened demand for soybeans, but initial evidence suggests that demand was not reduced for soybeans. Figure 1, shows weak exports from the U.S. in February and March are mirrored by especially strong exports from Brazil.

While demand for soybeans in China does not seem to be impacted by the virus, the coming weeks have potential to see disruption in the typical shift from Northern Hemisphere exports to Southern Hemisphere exports. Brazil currently has the third largest outbreak in the Americas, despite a low testing rate, and is expected to reach its peak in late June.[3] This coincides with the period Brazil is typically exporting soybeans at its highest pace. Strict stay-at-home orders in Brazil could inhibit the timely shipment of goods to international markets. With the U.S. also under widespread stay-at-home orders, the same issues could constrain our capacity for shipment, but the U.S. is projected to experience its peak in coronavirus cases in mid-April. Further, Washington State and Louisi-

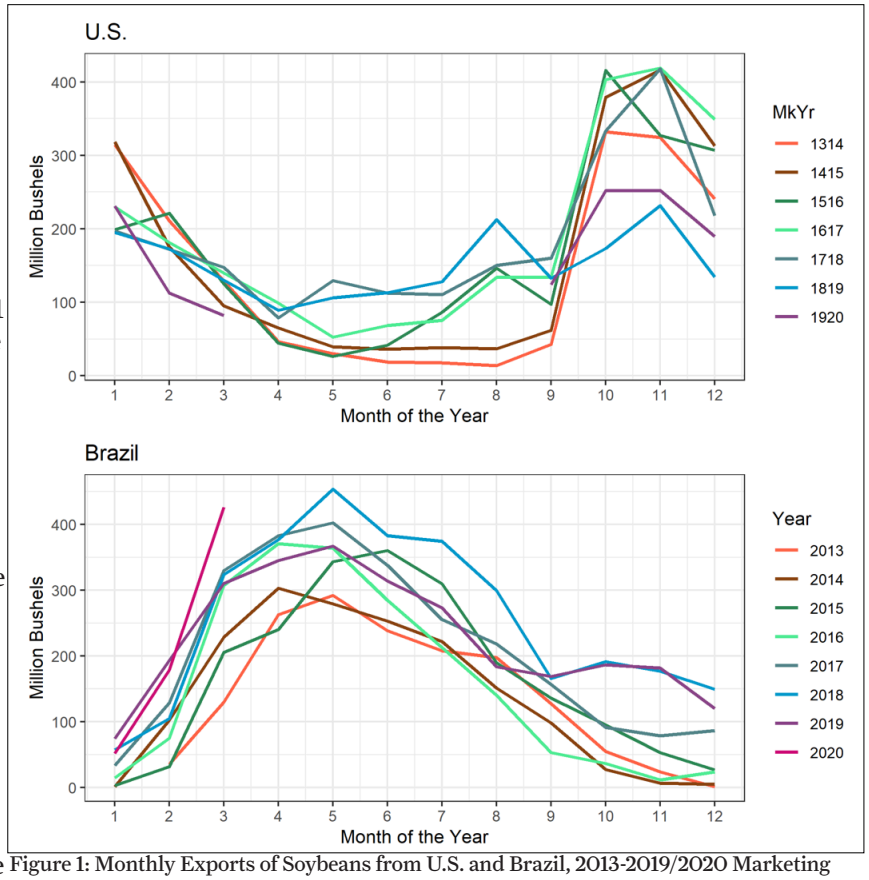

Figure 1: Monthly Exports of Soybeans from U.S. and Brazil, 2013-2019/2020 Marketing Years

[1]Rueters, 2020-01-23, https://www.reuters.com/article/us-china-health-who-idUSKBN1ZM1G9
[2]Aljazeera, 2020-04-08, https://www.aljazeera.com/news/2020/01/timeline-china-coronavirus-spread-200126061554884.html
[3]Associated Press, 2020-04-04, https://apnews.com/a8efbe2f8ca2532d846741873c75e48c

ana, important locations in international shipping, are expected to peak in early April.[4,5] Possibly freeing up capacity at the ports to fulfill Chinese demand while Brazil slows down.

The virus is also putting a strain on China-Brazil diplomacy. Brazil's education minister made a post on twitter mocking Chinese accents and suggesting that the coronavirus crisis would be advantageous to China.[6] The incident is escalating diplomatic tensions between the two countries. Further escalation would disrupt global trade flows of soybeans further.

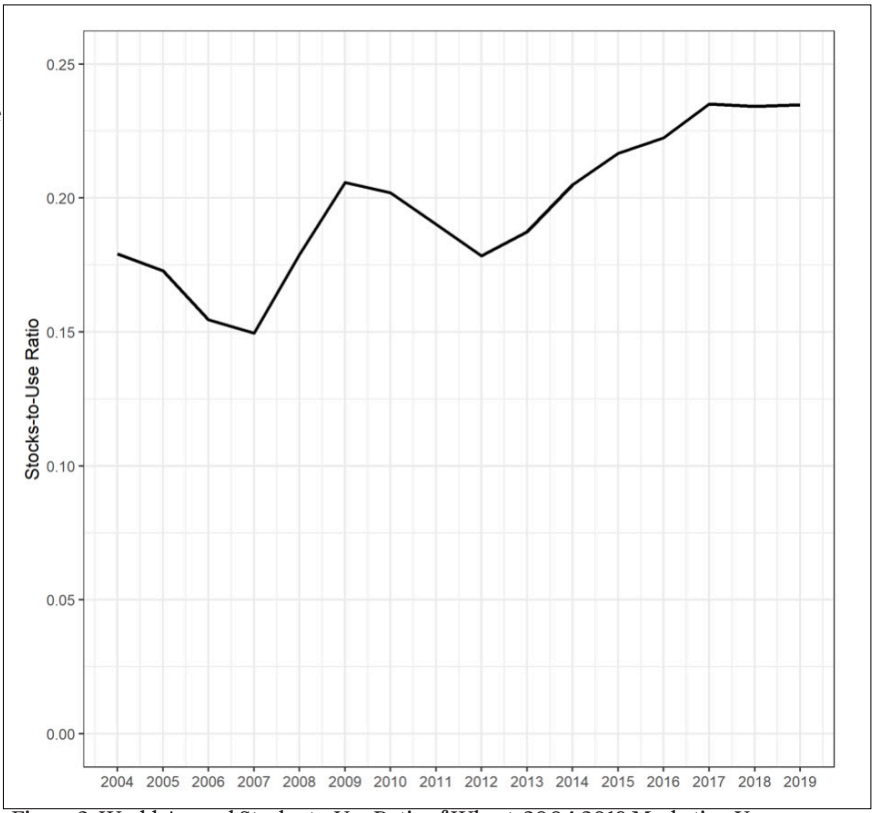

Figure 2: World Annual Stocks-to-Use Ratio of Wheat, 2004-2019 Marketing Years

Wheat

Wheat's importance as a staple food around the world, combined with a global rush for dollars is making many countries rush to limit or ban exports of the commodity.[7] Russia, Ukraine, and Kazakhstan are among the world's top ten exporters of grain that have either implemented or are considering restrictions on exports of wheat or flour. The renewed moves toward protectionism is causing some concern about disruptions to global food supply chains.

With the virus expected to cause a significant downturn in the global economy, risk assets have seen a dramatic reduction in their value, and safe assets like dollars and U.S. treasuries have experienced strength. The weakness of currencies around the globe relative to the dollar are exacerbating fears that commodity traders would rather trade the commodity for dollars on the world market as the value of their domestic currency erodes.

Also, memories are fresh of the commodity boom and bust cycle of 2007-2009, which saw significant export restrictions of wheat and rice around the globe. However, figure 2 shows that world stocks of wheat are currently much more plentiful today (at 24%) than they were in 2007 when they reached a recent low of 15% just before the commodity boom-bust cycle. Of course, today the worry is not tight stocks, but the ability to move stocks to where they are needed. In these unprecedented times, nothing is guaranteed, which is why we see countries taking measures to protect local supplies. Wheat stocks in the U.S. are projected to be about 43% of domestic use, so if shipping is at all possible the U.S. will have opportunity to ramp up exports to meet global demand for wheat.

Final Thoughts

These are times of extreme uncertainty, and there is no playbook for how this will play out. Our most recent example was the flu pandemic of 1918, when global supply chains looked vastly different. It is not clear whether the pandemic will affect some countries' ability to move product through ports in a timely manner. In the case that it does impede trade flows, the U.S. may experience its worst disruptions earlier, and thus could step in to help offset disrupted flows in other parts of the world at later stages of the pandemic. Though, if we see repeated waves of the pandemic with another seasonal peak in the fall, we will have to reassess again what it means for global trade of commodities.

[4]Washington Post, 2020-04-06, https://www.washingtonpost.com/health/2020/04/06/americas-most-influential-coronavirus-model-just-revised-its-estimates-downward-not-every-model-agrees/
[5]NPR, 2020-04-0, https://www.npr.org/sections/health-shots/2020/04/07/825479416/new-yorks-coronavirus-deaths-may-level-off-soon-when-might-your-state-s-peak
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Changing crop net return prospects

Michael Langemeier, Professor of Agricultural Economics

COVID-19 has resulted in widespread changes in crop and livestock prices. For example, corn and soybean prices have dropped substantially since late January. Corn futures price for the December 2020 contract declined 7.3 percent or -0.36 per bushel from late January to late March, and soybean futures for the November 2020 contract declined 5.2 percent or -$0.48 per bu. This article discusses the change in net return prospects for corn and soybeans that has occurred since late January and compares net farm income per acre for 2020 to net farm income for recent years.

Cost and Return Prospects

Table 1 summarizes 2020 estimates in late January and late March of market revenue, variable cost, overhead cost, and earnings for high productivity soil in Indiana. Crop yields for rotation corn and rotation soybeans are assumed to be 210 and 65 bushels per acre, respectively. Comparisons between the two budgets can be found below.

Projected crop revenue for corn and soybeans declined $64 per acre and $36 per acre, respectively, from late January to late March. Table 1 assumes that corn acres were enrolled in the PLC program and soybean acres were enrolled in the ARC-CO program. The drop in crop prices from late January to late March has resulted in an increase in projected government payments per acre for corn and soybeans of $17 per acre. Obviously, the ARC-CO and PLC program only partially mitigate the impact of a drop in crop prices.

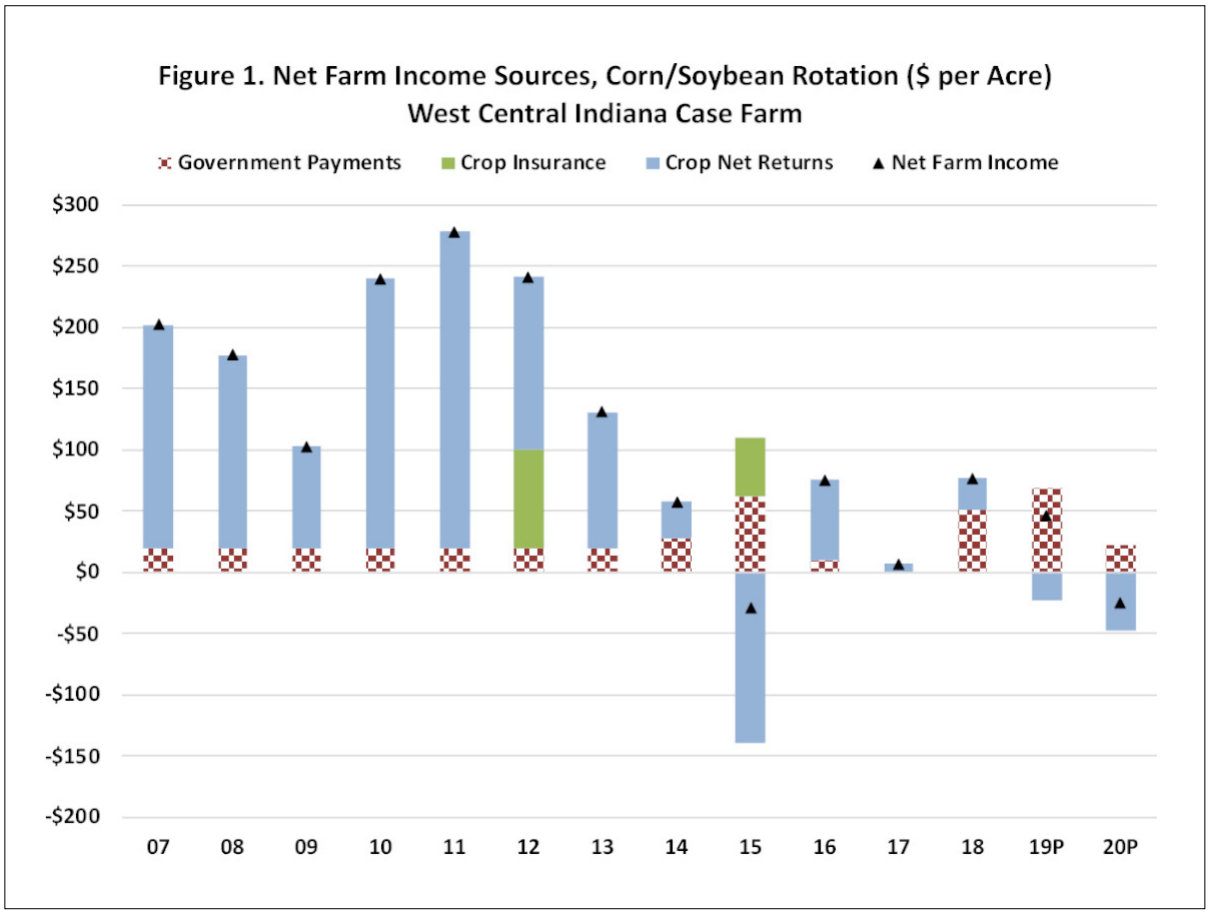
Production cost estimates in Table 1 are taken from the 2020 Purdue Crop Cost and Return Guide in late January and late March. This publication provides estimated costs for planting growing, and harvesting a variety of crops and is available for free download from the Center for Commercial Agriculture website (here). The guide is updated frequently as grain futures prices change and the costs of inputs, such as seed, fertilizer, pesticides and fuel, fluctuate. Production costs in late March were very similar to the estimates in late January.

The contribution margin for each crop in Table 1 is computed by subtracting variable costs from market revenue, which includes crop revenue and estimated government payments. It is important to note that the contribution margin is used to cover overhead costs such as machinery costs, family and hired labor, and cash rent. Earnings are computed by subtracting variable and overhead costs from market revenue. To operate in the short-run, a farm must cover variable costs. In the long-run, a farm needs to be able to cover both variable and overhead costs. Failure to adequately cover overhead costs typically puts downward pressure on cash rent and land values.

The contribution margin and earnings for corn and soybeans dropped $47 per acre and $17 per acre, respectively, from late January to late March. Because production costs are similar between the two periods, the breakeven prices for corn ($3.85 per bushel) and soybeans ($9.55 per bushel) did not change.

Table 1. Comparison of Crop Costs and Returns, January 2020 and March 2020.

	January	March	Difference
Rotation Corn: High Productivity Soil			
Crop Revenue	781	717	-64
Government Payments	6	23	17
Market Revenue	$787	$740	-$47
Variable Costs	$436	$436	$0
Contribution Margin	$351	$304	-$47
Overhead Costs	$376	$376	$0
Earnings	-$25	-$72	-$47
Rotation Soybeans: High Productivity Soil			
Crop Revenue	579	543	-36
Government Payments	6	23	17
Market Revenue	$585	$566	-$19
Variable Costs	$247	$245	-$2
Contribution Margin	$338	$321	-$17
Overhead Costs	$376	$376	$0
Earnings	-$38	-$55	-$17



Trends in Net Farm Income

Even in late January, net return prospects for crop farmers for 2020 were not very good. The drop in net returns for corn and soybeans during the last couple of months made a bad situation worse. We will use a case farm in west central Indiana to compare projected net farm income per acre in 2020 to net farm income per acre during the last few years. This case farm has 3000 crop acres of which 750 acres are owned. The farm utilizes a corn/soybean rotation and has solid liquidity and solvency positions.

Figure 1 illustrates net farm income per acre and sources of net farm income from 2007 to 2020. Sources of net farm income include crop net returns, government payments, and crop insurance indemnity payments. The average net farm income per acre during the 2007 to 2020 period was approximately $113. From 2007 to 2013, net farm income ranged from $103 per acre in 2009 to $278 per acre in 2011. Government payments were relatively large in 2018 and 2019. Despite this fact, net farm income per acre in 2018 and 2019 was only $77 and $46, respectively. The projected net farm income for 2020 is -$24 per acre. If this net return materializes, it would be similar to the very low net farm income in 2015, which was the result of a disastrously wet June.

Conclusions

In summary, corn and soybean earnings have dropped $47 and $17 per acre, respectively, since late January. As noted in this article, this has made a bad situation worse. Using a case farm in west central Indiana, net income per acre is expected to drop from $77 and $46 per acre in 2018 and 2019 to -$24 per acre in 2020. The ARC-CO and PLC programs provide some protection from downside risk, but they only partially mitigate the impact of the recent drop in corn and soybean prices.

Threats to local government revenues from the coronavirus recession

Larry DeBoer, Professor of Agricultural Economics

The coronavirus recession is upon us. Unemployment is rising to double-digits, incomes are falling, and spending on non-essential products has dropped. Many people are sick; many more people face hardships.

Local governments will face hardships too. Counties, townships, cities and towns, school districts, library districts and special districts receive revenue from property taxes, many receive revenue from local income taxes, and school districts receive a large amount of revenue from state aid. All of these revenue sources are threatened by the recession, but how they are threatened depends on the characteristics of each revenue source.

Property taxes, local income taxes and state school aid make up 85% of total local revenues (Figure 1). The recession could affect all three in the short run, and over longer periods of time.

Property Taxes

Property taxes are based on the assessed value of property, less deductions. Tax bills this year are based on assessments in 2019, which were set based on property values in 2018. Local governments set their levies each year based on their budget needs and on a state-imposed maximum levy. The levy is divided by taxable assessed value to set the tax rate, measured in dollars per $100 assessed value. That rate times the assessment of each taxpayers' property is the tax bill, subject to the Constitutional tax caps. Bills that exceed the caps receive a credit, which is money taxpayers do not pay, and revenue local governments do not receive.

Taxpayers pay their property tax bills in two installments, in May and November. The County Treasurer collects the revenue, which is distributed to local governments in June and December. Taxpayers who are late with their payments pay a penalty.

The tax rates are already set and tax bills are based on last years' assessments. It would appear that property tax revenues in 2020 cannot be affected by the current recession.

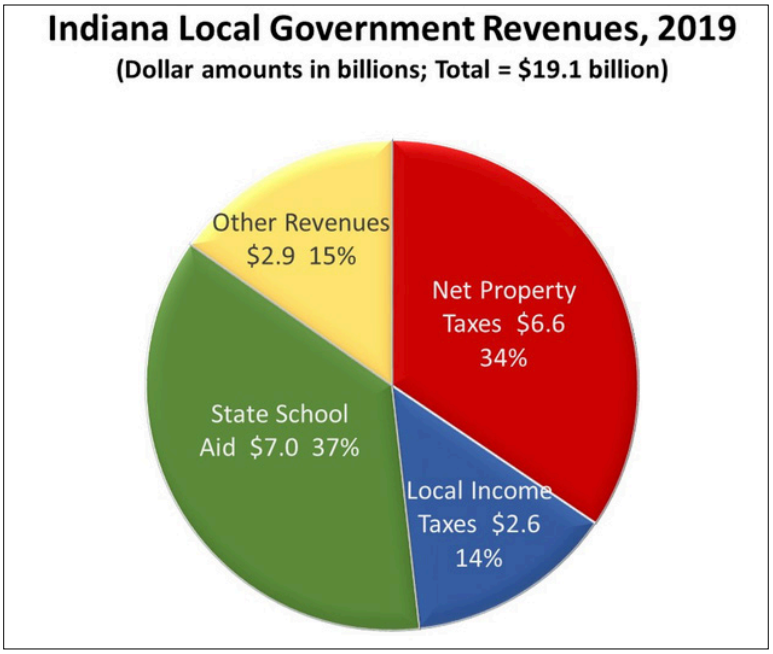
However, on March 20 Governor Holcomb responded to the hardships imposed by the recession and announced that the penalties for late-payment of property taxes would be delayed for 60 days. While the deadline remains May 11, there is no penalty for late payment until July 10. It's possible that property owners who have seen their incomes fall will pay late. It's possible that taxpayers who have not lost income will pay late too, taking advantage of the delay to earn a little interest on their money. And, some tax payments will become delinquent, as taxpayers find they cannot meet their tax obligations out of their reduced incomes.

It's likely that the June distribution of property tax revenues to local governments will fall short of expectations. This may require tapping balances or borrowing temporarily from public or private lenders. Local governments also may request advances on the December distribution from the County Treasurer. The Department of Local Government Finance published documents to assist local governments in solving any cash flow problems.

Will the coronavirus recession cause people to delay or cancel home building? Will businesses delay or cancel construction of buildings or purchases of equipment? Will the recession last long enough to depress property values? During the Great Recession, in 2007-09 and after, construction activity was reduced and property values did fall.

The assessment system responded to these changes. Total gross assessed value before deductions decreased after the Great Recession. Statewide assessments peaked in tax year 2010 at $458 billion, then fell 1.5% in 2011. Assessments did not regain their 2010 peak until 2015.

The quantity and value of property in 2020 will be assessed in 2021. Those assessments will be the basis for tax rates and tax bills in 2022. Lower assessments could mean lower tax levies, but more likely local



governments will set their levies at the state-imposed maximum. Tax rates required to raise those levies will be higher if assessments are lower. Higher tax rates will push more taxpayers above their Constitutional tax caps, which will increase tax cap credits and reduce the share of the levy that local governments can collect. Local governments that overlap cities or towns are particularly vulnerable to these revenue losses.

Property tax levy growth could be restricted well into the 2020's. Yearly increases in the maximum levies are governed by the Maximum Levy Growth Quotient. The MLGQ is the percentage that the state-imposed maximum levy can rise each year. It's based on the annual percentage increase in Indiana non-farm personal income, averaged over six years. The MLGQ is announced by the state each summer in advance of the local budget process. This year the MLGQ is based on annual income growth from 2013 to 2018, which averaged 3.5%. Next year the MLGQ will be about 4%, based on numbers from 2014 to 2019.

The maximum levy growth quotient makes sure that property tax levies do not rise faster than taxpayers' abilities to pay, as measured by income. It's a tax break for taxpayers, but a limit on revenues for local governments.

The U.S. Department of Commerce will tabulate personal income for 2020 by the summer of 2021. It will first enter the MLGQ six-year average in 2022. It's likely that Indiana income in 2020 will decline, which means that a negative number will enter the average in 2022, and remain in the MLGQ calculation for six years, through 2027. Maximum levies will grow more slowly as a result.

This happened after the Great Recession. In 2009 Indiana non-farm personal income dropped by 2.4%. This figure entered the MLGQ in 2011 and remained until 2016. During that time the average growth quotient was 3.3%. In 2010 it had been 3.9%; in 2017 it was 4.2%.

Local Income Taxes

All Indiana counties have adopted local income taxes. The LIT revenue is distributed to county, city and town governments, and in some cases to all other local governments. LIT payments are collected by the state along with the state income tax and distributed to counties each month. The distributions are set in advance. Distributions for 2020 were certified by the State Budget Agency in August and September of 2019. These distributions were based on revenue collections in each county during the previous state fiscal year, July 1, 2018 through June 30, 2019. This means that LIT distributions in 2020 cannot be affected by the current recession.

It's tempting to say the same thing about LIT distributions in 2021, since they will be based on collections this year, which reflect taxes on incomes earned last

year. However, the Federal government postponed the due date for income tax payments from April 15 to July 15, and the Governor followed suit for Indiana's state and local income taxes. LIT distributions for 2021 will be calculated based on revenue collections through June 30, and the deadline for paying taxes is now after that date. If many people delay their income tax payments, collections by June 30 will be lower, and so distributions will be lower in 2021. It may be possible to extend the collection deadline, but if not, the revenue will be part of the 2022 distribution.

Distributions in 2022 will be based on tax collections through June 2021. Those tax payments will be based on incomes earned this year. A recession this year will affect local government LIT revenues in 2022.

It's possible that LIT revenues will be affected beyond that. Distributions are set in advance. Revenue collections come later. After the last two recessions in many counties distributions exceeded collections, and the balances in county accounts became negative. The state had to restrict distributions below collections in later years, until balances were back in the black.

In Elkhart County, for example, balances became negative in early 2009, and were in the red by $19 million in 2011. Distributions were limited below collections through 2013 to rebuild balances. The recession that hit the Elkhart economy in 2008 was still limiting LIT revenues in 2013.

After the Great Recession the General Assembly created a new system for setting distributions and account balances. Distributions were set based on previous collections. The minimum balance in each county's account was set at 15% of distributions. When balances exceeded 15% the state makes a supplemental distribution, so that local governments can use this tax revenue to pay for services.

The 15% minimum balance was set based on an analysis of Elkhart County during the Great Recession. Elkhart was chosen because it is the most volatile economy in Indiana. If 15% is enough to keep Elkhart in the black, it should do the same for all counties. The analysis was based on collections and distributions during the Great Recession, because it was the worst recession since the Great Depression.

At the time it was hard to imagine a recession deeper than the Great Recession—the unemployment rate in Elkhart reached Depression-levels at 20%. Unfortunately, it's possible that this recession will be even worse. If so, balances may again go negative, and LIT distributions would have to be limited into the decade of the 2020's.

State School Aid

State tuition support for school districts is distributed by formula. The formula is set during state budget years, and the total amount to be distributed is appropriated based on forecasts for revenue for the two-year biennium. The appropriations are in the budget bill, so a recession should not affect distributions to school districts through the end of the biennium in June 2021. Tuition support for local schools is $7 billion, more than 40% of the 2020 general fund budget.

However, state revenues will be hard hit by the recession. Most general fund revenues come from sales and income taxes, and the recession and stay-at-home orders will reduce spending and earnings. In March revenues fell short of forecast by 6%--and that mostly reflected economic activity from February. Bigger shortfalls are expected for the remainder of this fiscal year, and into the next.

During the Great Recession in fiscal 2009 revenues fell short of forecast by $1.4 billion, which was 10% of the budget at the time. State balances dropped to $830 million at the end of fiscal 2010, 6.7% of the general fund budget. This was close to the accepted 5% minimum required for cash flow purposes.

A similar shortfall now would amount to $1.7 billion. Indiana's budget balance at the start of the 2020 fiscal year was $2.3 billion. The 5% minimum is $850 million. So, the state has about $1.45 billion to use to cover a shortfall. If the revenue drops 10% below forecast, those balances could cover appropriations for about 10 months.

Great Recession revenue shortfalls lasted for several years, however. Governor Daniels was forced to reduce spending below appropriations. Money not spent "reverts" to the general fund, and reversions increased from an average of $130 million per year in the 5 years before the recession, to an average of $650 million per year in fiscal years 2009-2011. Because school aid was such a large share of the budget, it had to be cut. That may be necessary again, depending on the depth and length of the coronavirus recession.

State aid is distributed on a per-pupil basis. The count of students is taken early in the fall semester. Will parents send their children back to school in August? If the virus is not yet under control, more parents than usual may decide to home school their children. Pupil counts would drop, and so would state aid. The undistributed aid would revert to the state general fund.

Next year, 2021, is a budget year in the General Assembly. The legislature will set state appropriations for fiscal years 2022 and 2023. Appropriations will be based on revenue forecasts, which will be released in December 2020 and revised in April 2021. If the recovery from this recession is slow, forecast revenue growth will be low, growth of appropriations will be limited, and state aid to schools will grow slowly, if at all.

A wild card in the budget is Federal aid. During the Great Recession the Federal government provided Indiana with $2.2 billion in added revenue. The Federal share of Medicaid payments was increased, which saved the state $1.4 billion, and there was $800 million more in fiscal stabilization money. The Federal CARES act included revenue to meet added coronavirus spending, but how much of this can replace lost state revenue remains to be seen.

Other Revenues

Property taxes, local income taxes and state school aid are the three biggest sources of revenue for local governments. Other revenues are much smaller individually, but amount to 15% of the total. Many also are vulnerable to recession.

State road aid comes from current motor fuel tax receipts, and is distributed to counties, cities and towns by formula. This money is used to support road maintenance and construction. Fuel sales are down, and soon road aid will fall too.

Motor vehicle excise taxes are paid on the vehicles owned by Indiana residents. New vehicles are taxed at higher rates. Revenue growth will slow as new vehicle sales fall. Excise surtax and wheel tax revenues will fall as well.

Counties collect innkeeper's taxes on hotels and motels. A few local governments receive revenue from added sales taxes on restaurants. Collections from these revenue sources will drop substantially. Also, likely to drop are parking fees, mass transit fares, recreational fees, and even speeding ticket fines.

Conclusion

The three biggest sources of revenue for Indiana local governments are property taxes, local income taxes and state school aid. This year, revenues from all three ought to be immune from the coronavirus recession. Property tax assessments, tax rates and levies are already set for 2020. So are local income tax distributions and state appropriations for school aid. There are short run dangers from property tax payment delays and school enrollment declines and emergency cuts in school aid if state revenues fall far short.

This year's recession is more likely to affect local governments in 2021 and after. Property assessments could fall, increasing tax rates and tax cap credit revenue losses. Limits on property tax levy growth may get tighter, and last through most of the coming decade. Income losses will affect local income tax distributions in 2022. A really severe recession could deplete local income tax balances. Diminished state revenue forecasts could cut school aid growth in the next biennium.

State and local governments must balance their budgets. Revenue losses, now or in the future, can only mean budget cuts and, probably, reductions in service delivery.

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COVID-19 and online grocery prices

Chinonso Ezenwa Etumnu, Ph.D. Candidate Agricultural Economics

In 2014, retail e-commerce sales in the world stood at $3.5 trillion and it is projected to be $6.5 trillion by 2023. Still, the value of online grocery sales as a component of total e-commerce sales is small. For example, in the United States, about 6.3% of total grocery sales are accounted for by online groceries, according to the food business advisory firm Bricks Meets Clicks.

Will the COVID-19 pandemic cause an increase in online grocery buying? The current global pandemic has resulted in stay-at-home orders and shutdowns in several parts of the United States, which suggests a likely increase in grocery e-commerce.

How might an increase in online grocery buying impact prices? To explore this issue, data from the online retailer Amazon were scraped from the web for ground coffee – a beverage product widely sold online. Data were collected at different points in time, before and during the COVID-19 outbreak.

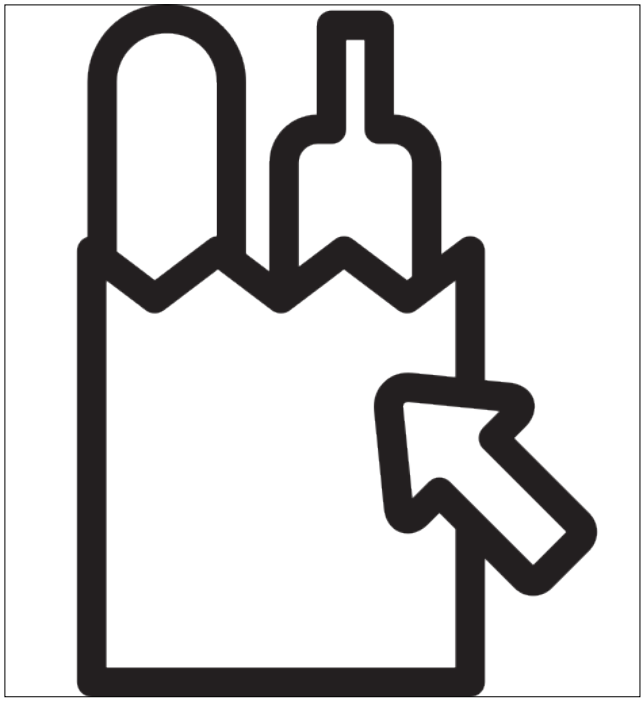
On March 31st, 2020, ground coffee prices were collected for 1087 products from Amazon.com. The average price of these products was $23.10. Comparable data were obtained almost exactly one year prior on March 30th, 2019 for 811 ground coffee products, which had an average price of $23.83.

Because the product mix is not the same in both time

periods, data from March 2020 were matched with the data from March 2019. Only 272 ground coffee products appeared in both samples. The average matched prices in March 2020 and 2019 were $22.36 and $23.43, respectively. The average March 2020 price is lower than the March 2019 price when there was no COVID-19 pandemic. In fact, the March 2020 price is statistically significantly lower than the price in March 2019.

The COVID-19 pandemic does not appear to have resulted in a price surge for ground coffee products on Amazon.com, at least for this particular product. The U.S. food supply chain, as exemplified by Amazon.com, seems to be working much more efficiently in stemming possible surges in grocery prices.

The findings highlight the need to investigate the effect of the pandemic on the relative prices of food products globally to explore whether food supply chains in other parts of the world have been disrupted by the pandemic. These findings also suggest the need for better access and awareness of e-commerce data to understand the full impact of prices faced by consumers.



Specialty farm households' consumption and risk behavior after natural disasters

Ahmad Zia Wahdat, Ph.D. Candidate in Agricultural Economics, Michael Gunderson, Professor of Agricultural Economics, and Jayson Lusk, Distinguished Professor of Agricultural Economics

Midwestern farm producers are facing two major concerns this spring: the COVID-19 epidemic and potential flooding. As COVID-19 has pushed people into 'social-distancing,' followed by a decline in restaurants sales, the epidemic will more likely affect the labor-intense specialty crops than staple crops. Meanwhile, the National Weather Service (NWS) and National Centers for Environmental Prediction (NCEP) forecasts above normal precipitation for the Midwest for spring and early summer. The wet spring and summer of 2019 and 2020, along with COVID-19, could have a compounding negative effect on farm income in the Midwest. A natural question that arises is whether farm income losses have implications for farm household consumption and well-being.

Recent research by the authors was designed to study precisely these questions. A survey of Indiana specialty crop producers was conducted in the summer of 2019. The study had two main objectives. The first was to determine how a farm household changes consumption after a hypothetical income loss from a natural disaster. Secondly, the study sought to understand producers' risk preferences and risk-taking behavior after hypothetical natural disasters.

Average monthly income and expenditures for farm households was calculated for 12 months prior to the date of survey. On average, producers had a monthly income of about $5,500. Household expenditures were the highest for miscellaneous category (mortgage and retirement), followed by health, food, transportation, and utilities. Once producers were exposed to the hypothetical income shock, we found that producers facing disaster-related income losses significantly reduced their total consumption expenditures by about $675 as seen in figure 1. Particularly, producers significantly reduced their expenditures of food ($119) and miscellaneous ($280) categories. This implies that farm households who faced a significant income loss (20% to 32%) are willing to sacrifice part of their food, mortgage, and retirement expenses. Expenses as health and education were not significantly affected by the income losses. Meanwhile, producers were less willing to take financial risk after the income-loss experience.

It is unclear if the reduction in food expense occurs from lower quantity, lower quality, or a change in

healthfulness of items purchased. To the extent that reduced food expenditures imply lower consumption of healthy foods, there are longer run implications for family health. Meanwhile, spending less on mortgage and retirement has implications for longer-run debt and working life. Food, mortgage, and retirement expenses can be easily adjusted when times are hard, but their impact can be real over producers' life.

Understanding the consumption response of farm households to income loss is important for understanding farm household well-being. After a disaster, households adjust different categories of consumption because it is a way of coping with income loss. Marginally, post-disaster recovery and rehabilitation efforts can generate a higher value by targeting those consumption categories that are adjusted downwards by farm households. Meanwhile, credit institutions may need to design better credit terms for disaster-affected producers, so there is an incentive for producers to invest in their farms.

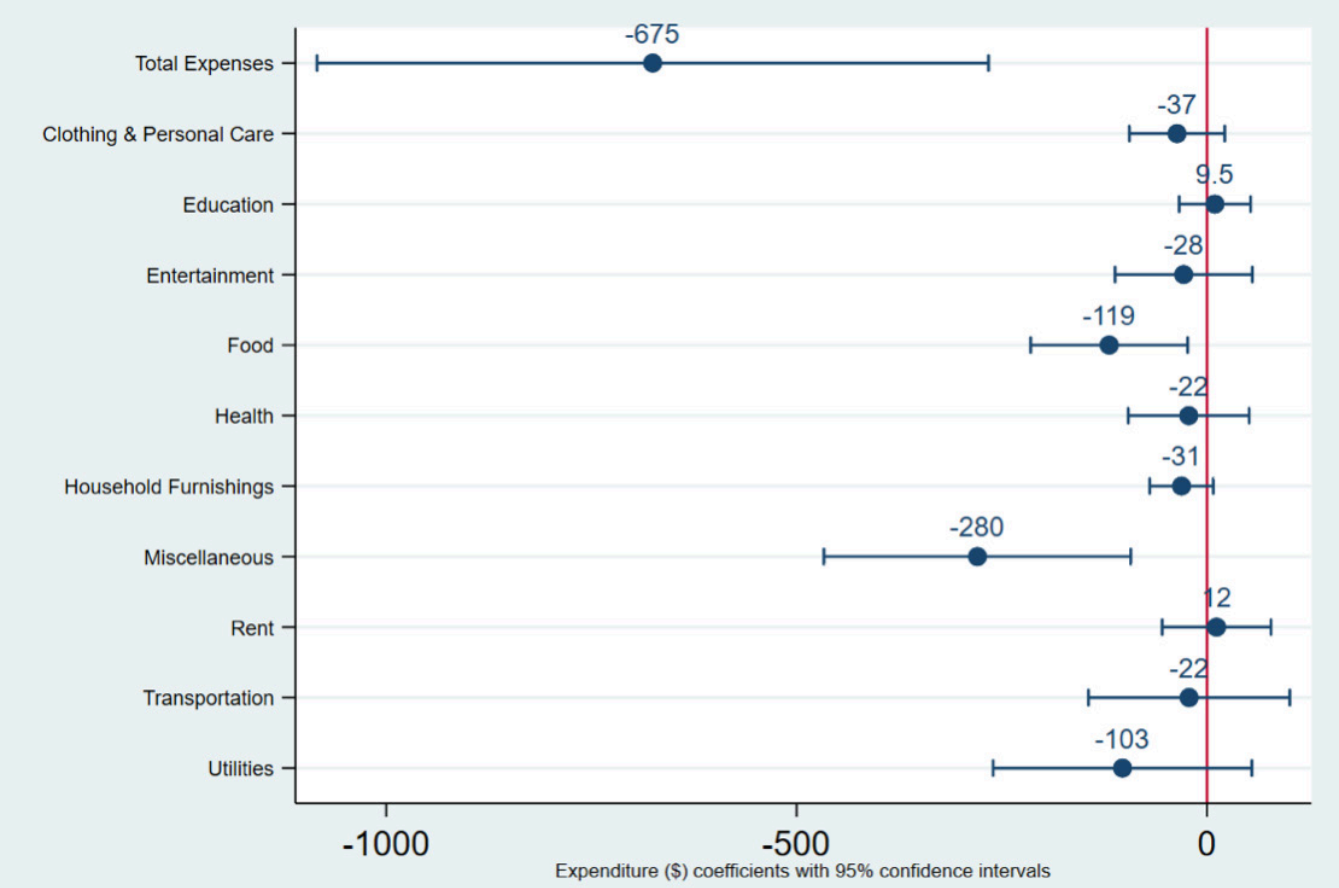


Figure 1. Effects of disaster income loss on expenditures.

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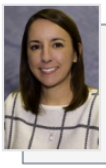

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