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Impacts of COVID-19 on U.S. Corn Revenue for the 2019 through 2021 Marketing Years

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Executive Summary

Herein, we present estimates of corn revenue for the U.S. on a per acre basis. Projections are made for 2019, 2020, and 2021 for pre-COVID and a post-COVID scenarios. Total revenue includes crop revenue, Commodity title program payments (Agricultural Risk Coverage and Price Loss Coverage), and crop insurance. Also included are Market Facilitation Program (MFP) and Coronavirus Food Assistance Program (CFAP) payments.

Comparison of pre-COVID and post-COVID scenarios indicate:

- Price declines associated with 2019 crop will result in revenue losses. Even after accounting for increases in the 2019 Commodity title and CFAP payments, total revenue declines by $15 per acre on the 2019 crop.
- For 2020, a post-COVID price of $3.20 per bushel and a national yield of 179 bushels per acre results in crop revenue of $573 per acre. Crop revenue of $573 would be $49 per acre below the average crop revenue from 2014-2019. A $573 would be the lowest crop revenue since 2006.
- PLC payments on the 2020 crop would result under the post-COVID price scenario. Even after accounting for PLC payments, post-COVID revenue projections are well below the 2014-2018 average for total revenue. Without additional federal aid, revenue and incomes will be extremely low for corn farmers in 2020.
- Low revenues likely will persist into 2021, particularly if trend yields or higher occur in 2020, leading to large ending stocks for the 2020 marketing year. Corn farmers will find 2021 a challenging income year under likely supply/demand scenarios.

The following sections provide detail on corn prices used in projections. Then revenue methodology calculations are given. The final sections provide a summary of 2019, 2020, and 2021 revenue projections.

Corn Price: Pre and Post-COVID

The Coronavirus and resulting COVID-19 control measures have caused a sharp drop in corn prices, as illustrated by the central Illinois cash prices shown in Figure 1. Before the introduction of COVID-19 control measures, cash prices averaged $3.78 per bushel during the months of January and February. Since the beginning of March, prices have fallen, reaching levels below $3.00 at the end of April. In the first week of June, cash corn prices in central Illinois have been between $3.00 and $3.10 per bushel. All areas of the country have seen similar declines, with cash prices in the upper Midwest and Great Plains being well below $3.00 per bushel.

Expectations of prices in the future also have declined. Table 1 shows estimates of Market Year Average (MYA) prices for 2019 through 2021. These prices represent the average U.S. price for a marketing year,

which runs from September to August, and are the prices used by USDA to determine Commodity title payments. For the pre-COVID price scenario, MYA prices are $3.85 per bushel for 2019, $3.70 for 2020, and $3.60 for 2021. The 2019 and 2020 MYA prices are the same as those released in a February 21, 2020 Grain and Oilseeds Outlook paper that was made available at the 2020 Agricultural Outlook Forum[1]. The 2021 MYA price is based on a $3.40 estimate contained in USDA long-run projections, adjusted up because the Grain and Oilseeds Outlook contained more optimistic estimates of price.

Based on prices on Chicago Mercantile Exchange (CME) contracts, MYA prices were re-estimated[2]. The post-COVID prices are $3.50 per bushel for 2019, $3.20 for 2020, and $3.40 for 2021. These prices are down from pre-COVID price estimates by 9.1% in 2019, 13.5% for 2020, and 5.6% in 2021. These prices are roughly consistent with a major recession occurring because of COVID-19 control measures, but a U-shaped recovery. Losses in corn demand will occur because of reduced demand for ethanol and livestock feeds, leading to much lower corn prices in 2020. These prices will continue to be low into 2021 because of large projected stocks at the end of the 2020 marketing year. However, prices do rebound somewhat in 2021 because of an economic recovery. The reasonableness of this quick of a return to more normal demand is questionable. However there is little previous experience on which to base projections.

The impacts of stocks can be seen by examining corn supply and use statements produced by the Office of Chief Economist and published in the World Agricultural Supply and Demand (WASDE) report. The first three columns of Table 2 show supply and use estimates contained in the May 2020 WASDE report for 2018, 2019, and 2020 marketing years. For the 2020 marketing year, the May WASDE report contains an estimated 15,995 million bushels of corn production, based on 89.6 million acres harvested and a yield of 178.5 bushels per acre. Domestic use is at 12,650 million bushels, with 6,050 million attributed to feed and residual and another 5,200 million bushels attributed to ethanol and by-products. The May 2020 WASDE report gave an estimate of the 2020 MYA price of $3.20 per bushel, the same as we are using for the post-COVID scenario (see Table 1).

Ending 2020 stocks are projected at 3,318 million bushels. The 3,318 million bushels would be a record stock level for the end of a marketing year. The next highest was 2,220 million bushels on 2019. The average ending stock from 2010 to 2019 was 1,600 million bushels, less than half the size of the projected 2020 stock level. Higher stocks relative to use have been shown to have a relationship with MYA prices, with higher stocks relative to use leading to lower prices[3]. The May 2020 stocks and uses lead to low price projections.

The WASDE projections for 2020 are roughly consistent with a U-shaped economic recovery. Note that the 2020 projections include 5,200 million use of ethanol, up from the 4,950 million bushels projected use in 2019. The 5,200 million bushels would be 100 million bushels less than use in 2019. This scenario is consistent with a very quick return to more normal driving patterns throughout most of later part of 2020 and through 2021. Feed and residual use also is projected at 6,650 million bushels for 2020, up from those levels in 2019 (5,430 million) and 2019 (5,700 million). In essence, the Office of Chief Economist is predicting a quick return to normal economic conditions.

At this point, there is a great deal of uncertainty about 2020, and a U-shaped recovery is not a foregone conclusion. Lower use of corn will lead to higher ending stocks and lower prices. The “lower ethanol” scenario has ethanol use at 4,950 million bushels – the same as in 2020. Feed and residual use was increased to account for less distillers’ grains being produced with ethanol. This scenario results in 3,478 million bushels and an estimated farm price of $3.10 per bushel. One can question whether this level of corn use in ethanol will occur in 2020.

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1 See https://www.usda.gov/oce/forum/2020/outlooks/Grains_and_Oilseeds.pdf.
2 See farmdoc Daily, April 29, 2020 for more detail.
3 See *farmdoc Daily*, April 9, 2015 and May 25, 2016.

Higher yields could also increase ending stocks, leading to lower 2020 prices. The "higher yield" scenario has a harvested yield of 180 bushels per acre, total production of 16,128 bushels per acre. Ending stocks are 3,521 million bushels, and the average farm price is $3.00 per bushel.

The above "lower ethanol" and "higher yield" scenarios are reasonable outcomes to expect for at least planning purposes. A combination of lower use and higher yields could result in scenarios with very high 2020 ending stocks, and conceivably market year average prices that are below $3.00 for 2020. The high ending stocks would then lower price expectations for 2021.

Other scenarios could result in lower ending stocks for 2020. The best "hope" for lower ending stocks would be a reduction in corn acres and below trend yield. The "optimistic" scenario in Table 3 has 2 million less harvested acres for corn and a yield of 174 bushels per acre. We continue the lower ethanol use scenario. This scenario results in 2,475 million bushels of ending stocks, and an MYA price estimate near $3.40.

Lower Revenue and Incomes

Lower COVID prices will result in lower 2019 through 2020 revenue projections. These revenue projections are shown in Table 3 and represent average U.S. revenue on a per acre revenue values. The values in Table 3 associate payments with the marketing year in which they are produced. For example, Agricultural Risk Coverage (ARC) for the pre-COVID scenario is $8 per acre. This is the 2019 ARC program associated with 2019 production that will be paid in October 2020. Fiscal year accounting for government purposes will differ in the years for which the values from which payments are shown in Table 3. Several notes on calculations:

- ARC payments are a combination of ARC at the county level and ARC at the individual level.
- PLC values in each year equal a per bushel rate equal to the $3.70 effective price minus the respective years' MYA price estimate. The effective rate is multiplied by 138 (.81 times average yield from 2013 to 2018) times .85 (the rate of payment acres to base acres time .75[4].
- MFP is an estimate of Market Facilitation Program (MFP) payments in 2019
- CFAP is Coronavirus Food Assistance Program (CFAP) payments for corn. Estimates are based on national yield times 40%. The 40% is an estimate of bushels that will be eligible for CFAP payments. Total CFAP payment equals 167.8 national yield time .335 rate x 40%. The first payment is 80%, or $18 per acre. The second is 20%, or $4 per acre.
- Crop insurance payments are the national average of $44 per acre. Note that no adjustment has been made for prevent plant, which represents a significant portion of the total crop insurance indemnities.

Note on ARC and PLC payments: Note that PLC and ARC payments are decoupled. While Table 3 attributes PLC and ARC payments to corn acres, payments occur on base acres not on planted acres. Further, soybean ARC and PLC payments will be much lower than corn, resulting in an under-compensation of losses for soybeans. Not accounting for under compensating of commodity title payments for soybeans results in an overstatement of commodity title impacts for farms that grow both corn and soybeans.

4 The .75 equals the national number of acres enrolled in PLC divided by harvested acres.

2019 Revenue

Based on a 167.8 yield and a $3.85 MYA price, crop revenue is projected at $646 per acre for the pre-COVID scenario. Other revenues in the pre-COVID scenario include $8 of ARC payments, $55 per acre of MFP payments, and $44 of crop insurance. Total revenue then is $753 per acre.

Crop revenue falls to $587 per acre for the post-COVID scenario due to the price decline to $3.50 per bushel. ARC payments are projected to increase by $4 to $12 per acre. On a national basis, PLC payments increase to $18 per acre. CFAP payments are projected at $18 per acre for the first payment and $4 per acre for the second payment. The second payment is not guaranteed.

Total revenue for the post-COVID scenario is projected at $738 per acre, a decline of $15 from the pre-COVID scenario. Note that Federal aid in increased Commodity Title payments and CFAP payments still result in lower revenue for the post-COVID case as compared to the pre-COVID case

2020 Revenue

The estimate of pre-COVID revenue for 2020 is $662 per acre based on a 179 bushel per acre national yield and a $3.70 MYA price. A reduction in price to $3.20 results in a revenue estimate of $573 per acre, a decrease of -$89 from the pre-COVID scenario.

The $573 post-COVID projection is an extremely low crop revenue. Corn crop revenue projections have come down from a high of $913 per acre in 2011 and have been averaging $611 per acre from 2014 to 2018 (see Figure 2). The $573 projection would be $38 per acre below the 2014-2018 average. The last time crop revenue was lower occurred in 2006, when revenue averaged $453 per acre.

PLC is projected to make a $44 per acre payment for 2020. With the projected PLC payment, total revenue would be $617 per acre, $45 below the pre-COVID scenario. The $617 per acre total revenue would be $49 per acre below the 2012-2018 average total revenue of $660 per acre.

These projections indicate that 2020 revenue will be very low for corn farmers in 2020 even after considering PLC payments. Note that those 2020 PLC payments will be made in October 2021. The CFAP payments will not cover losses on 2020 crop revenue declines. Without additional aid for 2020, COVID-19 measures will cause financial hardships on corn farmers as revenue and resulting income will be very low.

2021 Revenue

Price declines are projected to continue into 2021. Pre-COVID, total revenue in 2021 was projected at $670 per acre. Post-COIVD, revenue is projected at $638 per acre. This revenue is composed of $612 of crop revenue and $26 per acre of PLC payments. Again, the $638 revenue projected for 2021 would be below the 2012-2018 average of $660 per acre.

The impacts of COVID-19 control measures could occur over a considerable period of time, particularly if yields are near or above trend in 2020.

FIgure 1. Central Illinois Cash Corn and Soybean Prices, January 2, 2020 to June 2, 2020

Table 1. Market Year Average Price Estimates, Pre and Post-COVID, Corn.

Marketing Year	Pre-COVID	Post-COVID
	$/bu.	$/bu.
2019	3.85	3.50
2020	3.70	3.20
2021	3.60	3.40

Table 2. Supply and Use Values for U.S. Corn, May 2020 WASDE Report with Alternative Scenarios.

	WASDE (May 2020)[1]			Alternative 2020 Scenarios		
	2018	2019	2020	Lower Ethanol[2]	Higher Yield[3]	Optimistic Trend-line[4]
Area Planted	88.9	89.7	97	97	97	95
Area Harvested	81.3	81.4	89.6	90	90	88
Yield per Harvested Acre	176.4	167.8	178.5	178.5	180.0	174.0
	Million (bushels)			Million (bushels)		
Beginning Stocks	2,140	2,221	2,098	2,098	2,098	2,098
Production	14,340	13,663	15,995	15,995	16,128	15,242
Imports	28	45	25	25	25	25
Supply, Total	16,509	15,928	18,118	18,118	18,251	17,365
Feed and Residual	5,430	5,700	6,050	6,140	6,230	6,140
Food, Seed & Industrial	6,793	6,355	6,600	6,350	6,350	6,600
Ethanol & by-products	5,378	4,950	5,200	4,950	4,950	4,950
Domestic, Total	12,223	12,055	12,650	12,490	12,580	12,740
Exports	2,065	1,775	2,150	2,150	2,150	2,150
Use, Total	14,288	13,830	14,800	14,640	14,730	14,890
Ending Stocks	2,221	2,098	3,318	3,478	3,521	2,475
Avg. Farm Price ($/bu)	3.61	3.60	3.20	3.10	3.00	3.40

[1] Taken from May 2020, World Agricultural Supply and Demand Estimates (WASDE).

[2] Ethanol use is reduced to 2019 projected levels, while feed and residual is increased.

[3] A yield of 180 bushels per acre is used in projections.

[4] Acres harvested are reduced 2 million acres and yield is reduced 3.5 bushels per acre.

Table 3. Estimates of Revenue for 2019, 2020, and 2021 Marketing Years, U.S. Corn on a Per Acre Basis, Pre and Post-COVID.

	2019			2020			2021		
	Pre-COVID	Post-COVID	Change	Pre-COVID	Post-COVID	Change	Pre-COVID	Post-COVID	Change
Yield[1]	167.8	167.8		179	179		180	180	
Price[2]	$3.85	$3.50		$3.70	$3.20		$3.67	$3.40	
Crop Revenue	**$646**	**$587**	**-$59**	**$662**	**$573**	**-$89**	**$661**	**$612**	**-$49**
ARC[3]	8	12							
PLC[4]		18			44		9	26	
MFP	55	55							
CFAP - 1st Payment[5]		18							
CFAP -- 2nd Payment[5]		4							
Crop Insurance[6]	44	44							
Total Revenue	**$753**	**$738**	**-$15**	**$662**	**$617**	**-$45**	**$670**	**$638**	**-$32**

[1] The actual yield is used for 2019. The 2020 yield is a trend yield used by WASDE. The 2021 yield again is a trend yield.

[2] Market year average prices are taken from Table 1.

[3] ARC estimates of Agricultural Risk Coverage payments.

[4] PLC estimates of Price Loss Coverage payment. Estimates are based on ($3.70 effective reference price - MYA price) x 138 PLC yield x .85 payment factor x.75 base acres pre planted acre.

[5] CFAP payments equals national yield x $.335 per bushel x 40%. The 40% is the estimates of bushels eligible of CFAP. The first payment is 80% of this amount. The second payment is 20%.

[6] Average of crop insurance payments made in 2019. Crop insurance payments are not included for 2020 and 2021 because yields and prices are still above payment trigger level.
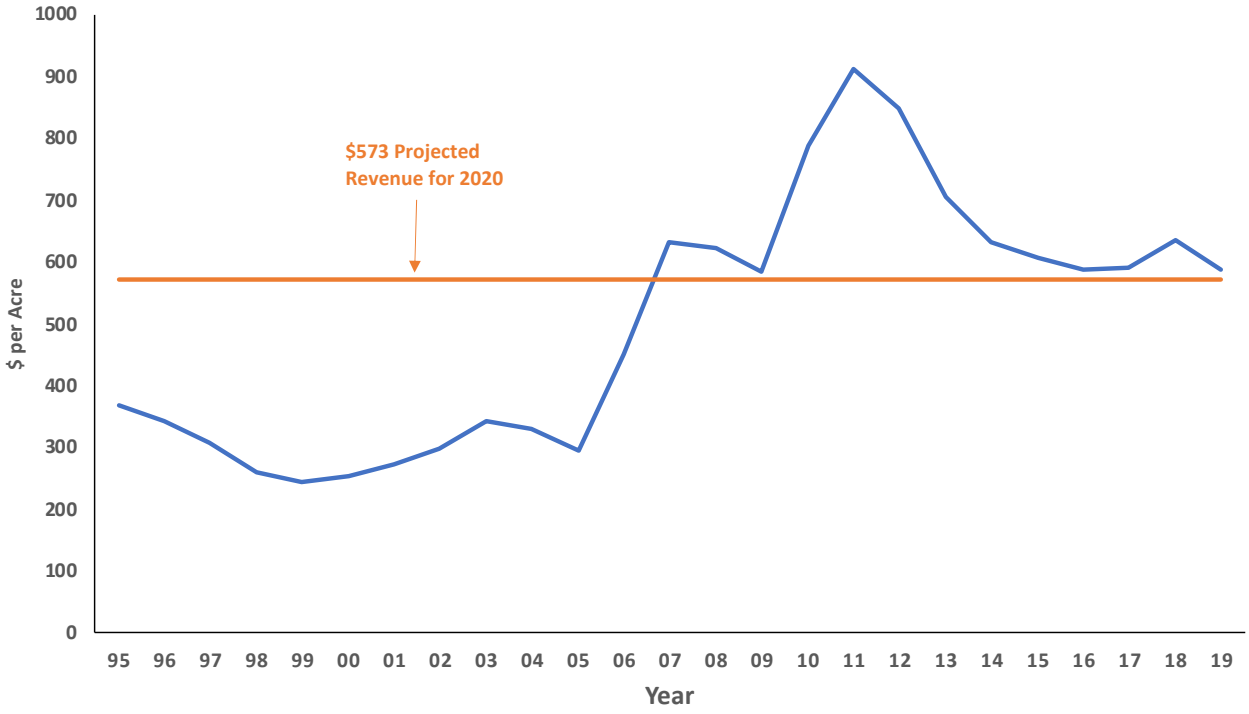
Figure 2. Crop Revenue from Corn, U.S., 1995 to 2019