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Early Estimates of the Impacts of COVID-19 on U.S. Agricultural Commodity Markets, Farm Income and Government Outlays

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Overview of agricultural product market's vulnerabilities to COVID-19

COVID-19 represents an unprecedented situation both for the economy and the agricultural sector, and thus there is a limit to which prior experience can guide the current analysis. This analysis is both preliminary and highly uncertain given the constantly evolving market conditions. The analysis considers only some of the ways in which COVID-19 may affect markets and is based on a series of assumptions, many of which may be overtaken by events. The objective is not to provide definitive estimates of impacts, but to identify some key issues and help readers develop some notion of the rough magnitudes of possible effects.

The incidence COVID-19 is likely to have broad implications across the agricultural sector

Since the emergence of COVID-19 and its global spread, actions taken to stem the contagion have impacted production, consumption and transit of a wide range of goods as economic activity has been disrupted and consumers have changed purchasing patterns. In the United States, as the population began to shelter in place and business deemed 'nonessential' closed, new unemployment benefit claims surged at the end of March. As movement and commerce slows, the economy is expected to follow with projections of a significant contraction in U.S. gross domestic product (GDP). The depth and duration of the economic downturn remains quite uncertain.

Impacts on individual industries and supply chains will vary significantly

Supply chain disruptions and sharp changes in consumer demand have been observed and have, so far, varied considerably by commodity or product. The expansion of shelter in place orders has reduced food consumed away from home and with it altered consumer demand among food products. In addition, such restrictions on movement have sharply reduced gasoline usage and along with it, demand for ethanol. Distribution and processing have been a concern for livestock and dairy processing as well fruit and vegetable producers, particularly those reliant on supplying restaurants and schools. For those industries significantly impacted, the impacts may be intense in the short-run and moderate over time, thus an annualized look at impacts across a broad sector may not fully reflect the variation across the supply chain or across the course of a year that could occur as the disruptions dissipate.

Longer run, as income falls, demand for agricultural goods will follow with it

Many commercial economic forecasts call for a sharp decline in U.S. GDP in the second quarter in 2020 with an anticipated economic contraction for the year as a whole. The speed and duration of the recovery are also a source of great uncertainty, however, and GDP levels for 2021 and perhaps later could continue to be below levels forecast before the emergence of COVID-19. With the contraction in consumer income is likely to come a corresponding contraction in consumer expenditures. While agriculture has fared better than industries such as energy and manufacturing during past economic downturns such as 'the great recession' experienced from 2007 to 2009, the sector is certainly not immune from demand and price impacts as a result of the loss of income by its consumers both here and around the world. While supply chain disruptions are likely to be resolved within the span of several months, a contraction of consumer income may take longer to recover and have broader effects across sectors.

Quantifying impacts of COVID-19 across agriculture

A lot has happened since FAPRI prepared its outlook for the farm economy based on information available in January 2020. This analysis attempts to isolate COVID-19 impacts from other market changes that have occurred for unrelated reasons. We start from the version of the 2020 FAPRI outlook that assumes implementation of the Phase 1 trade agreement with China.¹ We then change assumptions of that outlook to reflect some of the ways in which COVID-19 may be affecting agricultural markets, solve our system of deterministic models for the U.S. agricultural economy, and observe the resulting model estimates of changes in agricultural markets, farm income and government program outlays.

¹ For a discussion of the January analysis, see [FAPRI-MU Report #01-20](#).

The table shows assumed changes in key assumptions relative to the Phase 1 baseline. For example, the baseline assumed that real consumer expenditures would increase by 2.8% in 2020, based on forecasts available at that time from IHS Markit. In the scenario, we assume that real consumer expenditures will instead decline in 2020 by 2.2% relative to 2019, a difference of 5% from the baseline. In 2021, we assume that the economy recovers, so that real consumer expenditures are just 1% below baseline levels, and by 2021, real consumer expenditures and other variables are back at baseline levels.

Key U.S. macroeconomic assumptions

Calendar year	2020	2021	2022
Real consumer expenditures	-5.0%	-1.0%	0.0%
Consumer expenditures on food and beverages	-2.5%	-1.0%	0.0%
Oil prices	-15.0%	-5.0%	0.0%
Refined petroleum product price index	-10.0%	-3.3%	0.0%
Interest rates (percentage points)	-0.5%	0.0%	0.0%
Gasoline use	-10.0%	~0%	~0%
Diesel use	-5.0%	~0%	~0%

The eventual impact of COVID-19 on the economy depends critically on the length and intensity of the pandemic. The key macroeconomic assumptions made in this analysis represent a sharp and significant decline in the national economy in 2020, with the sharpest decline occurring in the second quarter. The scenario assumes a “V-shaped” recession where the market recovers quickly. Such an outcome is probably contingent on a rapid end to the public health crisis and to current restrictions on economic activity. While it may not be fair to characterize this as a best-case scenario, worse outcomes are certainly possible. If COVID-19 continues to disrupt economic activity through 2020 and into 2021, the recession could be far deeper and last longer.

Consumer expenditures are being negatively impacted by the increase in unemployment and restrictions on economic activity, but the CARES act and other relief legislation may moderate the decline in consumer spending. A decline in consumer expenditures was last seen in 2009, during the great recession. Consumer expenditures on food and beverages tend to be less responsive to income shocks and so are reduced by 2.5% relative to the baseline for 2020.

Oil prices are assumed to decline by 15% as a result of COVID-19. The actual decline in oil prices in March 2020 was much greater, but the analysis assumes that much of the observed decline can be explained by the dispute among oil producers that is not entirely attributable to the COVID crisis. Importantly for biofuels, both gasoline and diesel use are expected to contract. Early reports suggest a dramatic decline in fuel use as travel is restricted. If restrictions remain in place into the summer and beyond, the actual reductions in fuel use could be greater than assumed here.

Supply chain impacts have been varied and, in some cases, severe. The production, processing, transportation and retailing of food have all been affected in ways that have seriously disrupted normal practices and increased costs. Even if it proves temporary, shifting from a world where a significant share of food is consumed in restaurants to one where far more food is consumed at home may require changes in food processing and distribution that may come with additional costs. These supply chain issues are not explicitly considered in this preliminary analysis, other than to assume a modest increase in the average margin between wholesale and retail beef and pork prices in 2020.

Finally, it should be noted that this analysis was conducted with FAPRI’s models of U.S. agricultural markets, not the full global system used to develop the January baseline. For purposes of this analysis, U.S. trade in most commodities is held at or near baseline levels, assuming the impacts of lower prices and a weaker global economy largely offset one another. As with supply chain issues, this is a strong assumption that should be revisited in future analysis.

Commodity price impacts

Crop prices, 2020/21

	Baseline	COVID
Corn (\$/bu)	3.70	3.35
Soybeans (\$/bu)	8.85	8.27
Wheat (\$/bu)	4.84	4.58
Cotton (cents/lb)	61.7	55.5

Livestock prices, 2020

	Baseline	COVID
5-area steers (\$/cwt)	122.10	108.06
Barrows & gilts (\$/cwt)	53.15	48.33
Wholesale broilers (ct/lb)	89.25	81.23
All milk (\$/cwt)	19.46	17.75

Prices percent change

(change from Phase 1 baseline)

Marketing year	2019/20	2020/21
Corn	-8.2%	-9.4%
Soybeans	-4.4%	-6.5%
Wheat	-0.9%	-5.3%
Cotton	-6.1%	-10.1%

Calendar year	2020	2021
Fed cattle	-11.5%	-2.1%
Hogs	-9.1%	-1.0%
Broilers	-7.8%	-1.2%
Milk	-8.8%	-0.5%

- The COVID scenario results in 5-10% reduction in crop prices in the 2020/21 marketing year and 8-12% reductions in livestock sector prices in 2020, relative to the Phase 1 baseline.
- Note that these estimates do not reflect factors other than the COVID crisis that might cause price projections to differ from the levels projected based on January 2020 market conditions.
- Impacts for crop prices received by farmers for the 2019/20 marketing year are limited by the fact that most production was marketed before the crisis hit. This is especially true for wheat.
- Because prices for all crops are impacted, acreage shifts for the 2020/21 marketing year are modest.
- With its bigger relative price change, corn area sees a modest decline. Cotton area holds, despite the large price decline, as government payments offset lost market revenue.
- Livestock, poultry and dairy producer prices all fall sharply in 2020 in response to weaker consumer demand caused by reduced disposable income.
- Supply chain concerns not considered in this analysis could put further downward pressure on producer-level prices for many commodities. In spite of lower fuel prices, farm-to-retail margins may increase for many food items.
- Price impacts for crops tend to be larger in 2020/21 than in 2019/20, even though economic recovery is assumed to begin later this year. Most of 2020 crop production was not priced before the onset of the COVID-19 crisis.
- Livestock changes moderate in 2021 under the assumed economic rebound.

Biofuel production impacts, 2020

(billion gallons)	Baseline	COVID
Ethanol	16.18	14.78
Biomass diesel	2.97	2.68

Biofuel prices, 2020

(\$/gallon)	Baseline	COVID
Ethanol	1.48	1.20
Biodiesel	3.47	3.19

- Much of the reduction in corn prices can be explained by reduced production of ethanol.
- Implementing regulations by the Environmental Protection Agency convert mandated volumes under the renewable fuel standard into a percentage based on anticipated motorfuel and diesel demand prior to the start of the year.
- When gasoline and diesel fuel consumption falls unexpectedly, the mandated amounts of biofuel use decline accordingly. The rates at which biofuels are blended in the overall fuel supply is largely unchanged in the scenario.
- The reduction in biofuel demand results in lower prices, and plant operating margins turn negative, causing plants to stop or scale back production. Actual ethanol market prices in recent weeks have been substantially lower than the projected annual average.
- Ethanol production declines by 1.4 billion gallons relative to the baseline in 2020.

Farm program outlay impacts
(change from Phase 1 baseline)

Fiscal year	2021	2022
	(billion dollars)	
Corn	1.04	2.90
Soybeans	0.20	0.29
Wheat	0.07	0.46
Cotton	0.67	0.42
All other	0.22	0.14
Net CCC outlays	2.21	4.21
Crop insurance	-0.35	-0.35

- Farm program outlays grow with declines in crop prices. ARC and PLC spending increases. In the case of cotton, prices fall low enough to trigger marketing loan benefits.
- If FAPRI-MU were to simulate the model stochastically to incorporate uncertainty, the results would differ. At least for soybeans and some other commodities, the results would likely be larger estimated impacts.
- Crop insurance outlays fall with lower commodity prices.

Farm income impacts
(change from Phase 1 baseline)

Calendar year	2020	2021
	(billion dollars)	
Corn	-4.72	-3.24
Soybeans	-2.05	-1.82
Wheat	-0.40	-0.23
Cotton	-0.61	-0.31
Other crops	-4.08	-1.69
All crop receipts	-11.85	-7.27
Cattle	-9.57	-1.30
Hogs	-2.24	-0.31
Poultry	-4.05	-0.71
Milk	-3.97	-0.32
Other livestock	-0.40	-0.03
All livestock receipts	-20.24	-2.68
Feed	-2.82	-2.41
Purchased livestock	-3.83	-0.22
Fuel & fertilizer	-2.20	-1.73
Other expenses	-2.41	-2.74
All production expen.	-11.25	-7.10
Government payments	2.30	4.49
Other net farm income ²	-1.54	-1.34
Net farm income	-20.08	0.29

- Livestock receipts drop more than crop receipts in 2020, given the relative changes in market prices.
- In 2021, crop receipts are affected by the estimated changes in 2020/21 marketing year prices. Given model assumptions, livestock receipts rebound to closer to baseline levels in 2021.
- The reduction in receipts for livestock producers is partially offset by a decline in production expenses with lower purchased livestock, feed, fuel, interest, and other expenses.
- Also partially offsetting the drop in receipts is an increase in government payments.
- The reported reduction in receipts for “other crops” is partly attributed to an assumed reduction in the value of fruits, vegetables and nursery crops that are not modeled in detail.
- 2020 net farm income declines by about \$20 billion
- With an assumed economic rebound in 2021, farm income differs little from baseline values. Continued or extended COVID-19 impacts could increase or extend negative impacts on farm income.

² Other net farm income includes non-money income, changes in the value of inventories the value of crop insurance net indemnities and other farm-related income.