



# Impact of COVID-19 on Nebraska Agricultural Economics

Jiarui Han, Vijendra Boken

University of Nebraska at Lincoln, USA

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**Abstract:** COVID-19 spread rapidly in 2020 in many states including Nebraska. Many businesses, small or big, suffered significant economic losses due to the pandemic as businesses closed or remained restricted. Demand and supply chains are destructed in a particular extent, which has an impact on workers and food supply chain. This impacted pricing of agricultural produce. Besides, many elderly farmers contracted the virus and some of them died, which may have negatively impacted the agricultural operations. The present study examines the impact of COVID-19 on farming, poultry, crop yields and prices of agricultural products in 2020.

**Keywords:** COVID-19, business, demand and supply chains, agricultural, farmers, agricultural operations

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## 1. Introduction

COVID-19 pandemic significantly affected the entire world in 2020. The present study assesses the impact of COVID-19 on Nebraskan agriculture, particularly on corn and soybean yields and on beef production. In the context of the agricultural sector of various counties in Nebraska, the spread of COVID-19 has cumulatively brought a series of severely unfavorable economic effects to the agricultural industry. It was expected that this pandemic may have caused a decline in agricultural labor which, in turn, may have affected agricultural production negatively impacting the state economy. A variety of businesses suffered from significant economic losses due to the pandemic as business closed or remained restricted, as the result, the pricing of agricultural produce is impacted. For example, although federal and state governments sought to shield the food processing sector from adverse economic outcomes associated with the restrictive policies implemented to curb the pandemic by classifying food processing as an essential function exempt from widely implemented cessations of activity, many processing plants shut down when a major epidemic was discovered, exerting tremendous pressure particularly on livestock and poultry industries including beef production. (Marchant-Forde & Boyle, 2020, p. 1) The objective of this study was to assess the impact of COVID-19 cases on yields and production of the main crops and on beef production, as well as the major agricultural industry in the state. The objective of the discussion herein is to utilize the findings regarding the pandemic's impact on the agricultural industry as the basis for generating pertinent recommendations for the future.

## 2. Study area

The study included all the counties in Nebraska. However, only counties with major corn and soybean production and beef production were considered in the analysis. In general, this paper covers the study of the state's experience of the adverse effects from the perspectives of the indirect and immediate impact of COVID-19 on the agricultural industry's supply and demand, the direct pandemic impacts in terms of the health concerns of the industry's workers and disruptions of the food supply chain in different counties.

## 3. Data used

Data included COVID-19 cases and related deaths and were collected from New York Times website (<https://www.nytimes.com/interactive/2020/us/nebraska-coronavirus-cases.html>). Agricultural data in recent years including 2020 was downloaded from the National Agricultural Statistics Service of the United States Agricultural Service ([https://www.nass.usda.gov/Statistics\\_by\\_State/Nebraska/](https://www.nass.usda.gov/Statistics_by_State/Nebraska/)), including county level corn and soybean yield and production, county level COVID-cases, beef production in 2020 and other relevant data.

## 4. Methods

### 4.1 The direct impact of COVID-19 on labor production

Employee and farmers' health concerns due to COVID-19 was an important factor in many counties. The most direct influence of COVID-19 on Nebraska's agricultural industry relates to the health and wellbeing of the local industry's workers. As highlighted in the introductory section above, employees working in various domains of Nebraska's agricultural industry and especially within the food processing and packaging industries constitute some of the populations that are most vulnerable to exposures and infection by the dreaded novel coronavirus owing to the nature of their occupational environment (Marchant-Forde & Boyle, 2020; Olberding, 2020b). In meat packing plants, for instance, people work in close proximity to refrigerated places where transmission of the COVID-19 is highly likely to be spread among employees. (Lusk & Croney, 2020). As exemplified in the case of 'Tyson Fresh Meats' beef plant in Dakota city', approximately 670 workers were tested positive for COVID-19 in May 2020 according to reliable sources familiar with the situation. (Dreeszen, 2020)

The health implications of the pandemic for the state's agriculture industry's workers were most pronounced in meat processing where even though both the federal and state governments implemented deliberate measures to exempt meat processing plants from shutting down during the pandemic. Figure 1 shows the relationship between the variables of total cases in different counties in Nebraska and beef production: in the county which beef production is high, the line of number of infected people goes down, showing an opposite trend. This will be illustrated more specially in the following correlation analysis. Nebraska's major plants were forced to cease operations abruptly by April 2020. (Curry & Rempe, 2020). These cessations of operations followed a rise in the number of infections that were positively traceable back to the meat production and processing facilities (Olberding, 2020b). By the beginning of May 2020, for example, three Nebraska operations had temporarily shut down operations because of health concerns including Tyson, which shut down its beef operations in Dakota city and its pork plant in Madison until all employees could be tested for the novel corona virus; and Cargill which ceased its beef operations in Schuyler (Olberding, 2020b).

The overarching impact of employees' health concerns for the Nebraskan agricultural industry was thus the convolution of limited labor supply, slower processing speeds, and reduced operations and operational capacity. The resultant increase in the supply of livestock products thus a caused a dramatic plunge in the price of livestock commodities, while the prices of pork and beef skyrocketed at the retail level owing to a run-on meat by consumers following concerns regarding shortages that were attributable to the reduced processing capacities and production capabilities. The rise in wage rates has increased the cost of goods produced by companies, forcing them to raise prices. As the price of products rises, consumers will buy fewer products, and the products produced and sold will also decrease. This means that the amount of labor will be reduced. (Figure 2) Nonetheless, the state's average wage rate has remained fairly the same. It peaked at 11.89 in 2010 and has stabilized for almost a decade. (Figure 3)

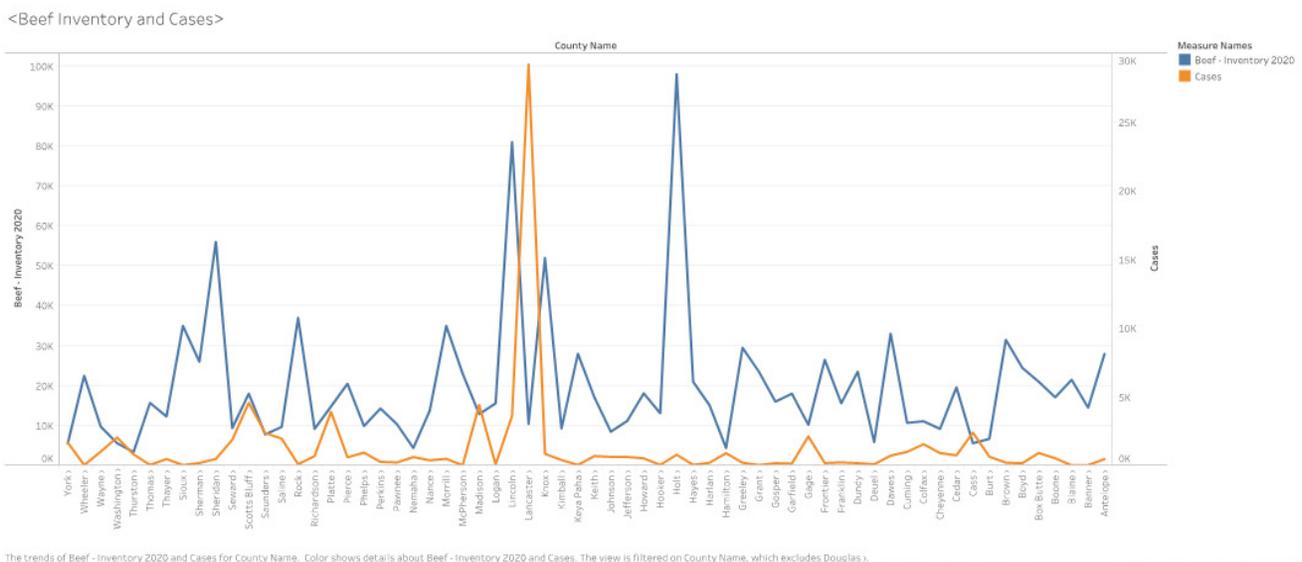


Figure 1. Beef inventory and cases

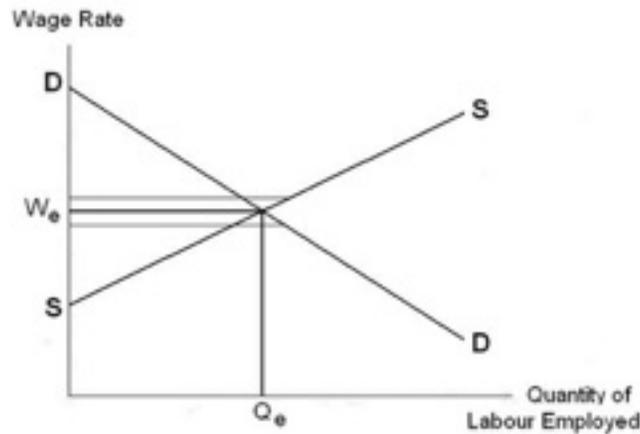


Figure 2. The labor market



Figure 3. Labor hired - wage rate

#### 4.2 The indirect impact of COVID-19 pandemic on agriculture and animal sector

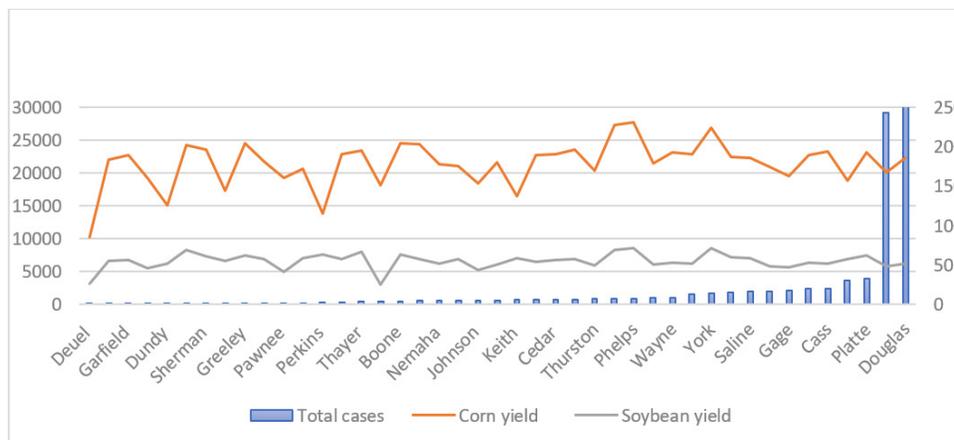
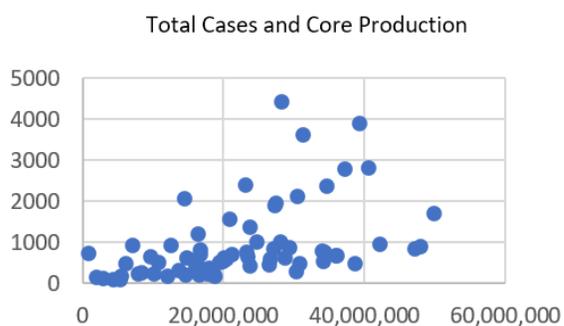


Figure 4. Total cases, corn yield and soybean yield in different counties

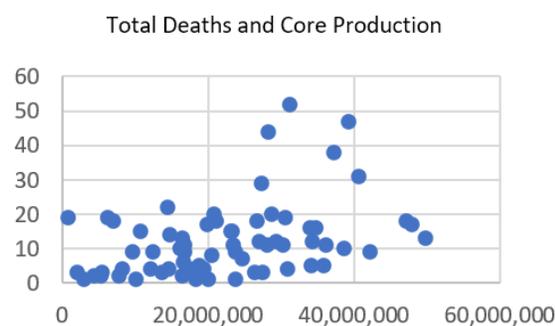
The outbreak of the pandemic in the United States and specifically in Nebraska occurred in the context of large cattle and hog inventories carried over into 2020 from 2019 (Curry & Rempe, 2020). This indicated that the processing facilities were expected to operate and peak performance to minimize backlogs even under ideal and optimal conditions. These carried-over backlogs further exacerbated the implications of the pandemic-related health concerns for Nebraska’s agricultural industry. Overall, the COVID-19 pandemic had direct effects on Nebraska’s agricultural industry that manifested in the form of health concerns, which impacted not only the industry’s workers but also livestock farmers who were harmed by the

lack of destination for their products as the consequence of the resultant industry-wide decline in production and processing capacity. Figure 4 clearly illustrates that corn production has also taken a hit as evidenced by the large variance in 2020. According to National Agricultural Statistics Service, counties such as Keya Paha and Loup recorded variances of 10.5 and 7.8 percent respectively, demonstrating a dip in yield.

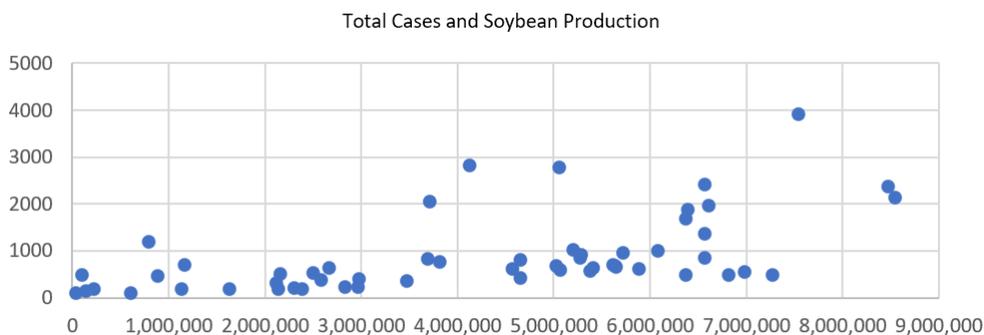
Figure 9 and 10 shows the correlation between total cases and beef production; total deaths and beef production is -0.39 and -0.12 respectively which means that two variables move in different direction, increasing number of people infected by the epidemic and deaths have led to a decline on beef production. Beyond the sector-specific and farm-level effects of the supply chain disruptions, the entire Nebraskan agricultural industry faced notable losses and cost implications that were estimated to exceed a total of \$4 billion in 2020 alone without accounting for the potential positive impact of COVID-19 related financial assistance and improvements in the prevailing economic conditions (Curry & Rempe, 2020). Generally, the pandemic's disruptions of the food supply chain also constituted a core source of adverse effects for Nebraska's agriculture industry.



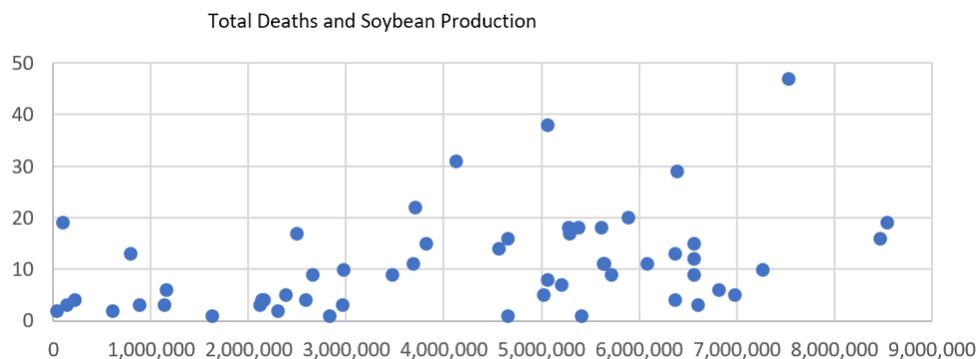
**Figure 5. Correlation between total cases and core production**



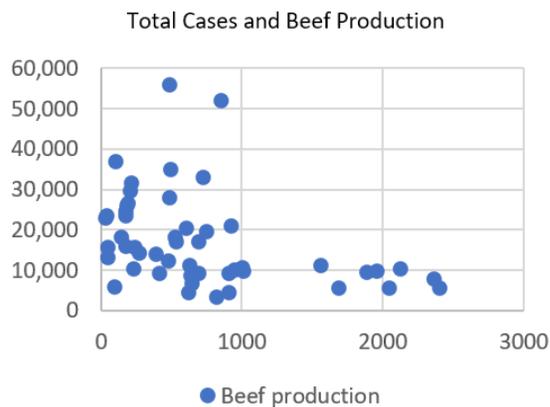
**Figure 6. Correlation between total deaths and core production**



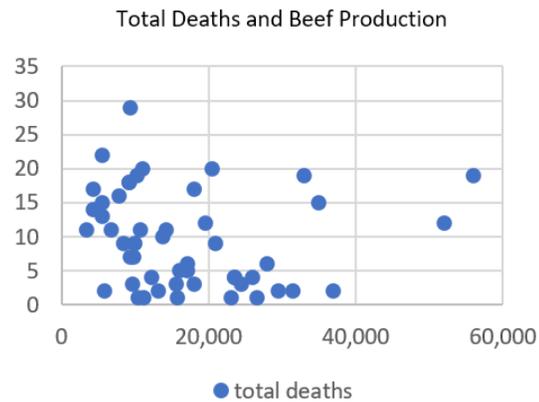
**Figure 7. Correlation between total cases and soybean production**



**Figure 8. Correlation between total deaths and soybean production**



**Figure 9. Correlation between total cases and beef production**



**Figure 10. Correlation between total deaths and beef production**

### 4.3 Indirect pandemic-related impacts on Nebraska AG industry’s supply and demand

Furthermore, the most observable, indirect implication of the COVID-19 pandemic for Nebraska’s agricultural industry, arguably, was the destruction of the industry’s demand structure. The pandemic deconstructed and destroyed the demand structure of Nebraska’s agriculture industry through the mediation of the policy actions that were implemented at both the state and national levels in the attempt to curb the spread of the highly contagious corona virus by use of measures that were aimed specifically at flattening the infection rate curve (Beghin, 2020). Some of the state’s industries and sectors that were hit hardest by these policy responses included the hospitality industry, the restaurant sector, and the institutional food service sector that are cumulatively referred to as the HRI sectors (Curry & Rempe, 2020). The shutdown of the HRI industries and sectors was particularly crucial and consequential for Nebraska’s agricultural industry as these vital domains of the Nebraska economy constituted the largest sources of demand for the state’s agricultural industry (Olbderding, 2020a).

Notably, the volumes of farm-level production and output within the impacted sectors of Nebraska’s agricultural economy remained the same even as the demand structure constricted in response to the pandemic and pandemic-related measures. A constant supply capacity juxtaposed against declining demand therefore meant that the gross levels of supply within the state’s agricultural industry and related markets had outweighed the gross levels of demand substantially by April of 2020. The consequences of these dynamics and observations are clearly reflected in the downward spiral in commodity prices that characterized the state’s agricultural industry’s experience with the pandemic environment. According to Nebraska’s Farm Bureau, for instance, all agriculture future prices declined sharply between 2nd January and 9 April 2020 following the deconstruction of the industry’s demand and supply structure as illustrated in chart 1 below. The indirect effects of the pandemic on Nebraska’s agricultural industry in terms of the deconstruction of the said industry’s demand and supply structure are therefore consistent with the demand-supply macroeconomic dynamic, whereby increased supply co-occurs with reduced demand and generally results in observable decrements in price levels as in the Nebraskan case.

## 5. Discussion

Figure 5 to 8 demonstrates the correlation analysis between corn production, soybean production, total cases, and deaths. Both the variable of corn production and total cases; soybean production and total cases have a positive correlation which means that they move in the same direction, thus they basically have a weak relationship. This is because the main influencing factor of production of corns is weather. Temperature and moisture are most necessary adjustment for crop production. Artificial method such as irrigation can only change the water content, but it’s difficult to affect the temperature.

What’s more, the findings of this paper reveal only preliminary relationships between COVID-19 cases and few agricultural variables. There is a need to collect additional reliable data. Only limited data were available and were analyzed in the present study. To assess a comprehensive impact of COVID-19 on agriculture, additional data need to be collected for further analysis.

## 6. Conclusion

It is clear from the evidence-based analyses of the discussion herein that the direct and indirect implications of COVID-19 for Nebraska's agriculture industry revolve around the impacts experienced from the perspective of supply chain disruptions, health concerns, and the deconstruction of the industry's demand and supply structures. Although federal and state assistance for farmers, workers, and other stakeholders continue to be vital for the industry's sustainable, long-term recovery, the findings of this paper reveal three cogent measures that policymakers are best advised to emphasize to facilitate sufficient mitigation of the pandemic-related risks. Firstly, there is a need to both decentralize and diversify processing in Nebraska's agricultural industry to ensure that farmers have a sufficient number of alternatives for the destination of their products in the event of sudden disruptive events such as the COVID-19 pandemic. Secondly, stringent implementation of COVID-19 health policies in agricultural sectors, including widespread vaccination, can be instrumental in resolving most if not all capacity difficulties generated by the health concerns associated with the pandemic. Finally, there is also a need to build agricultural supply chain capacities to ensure that the supply chains can more readily adapt to evolving external conditions. The implementation of these three recommendations will not only ensure that Nebraska's agriculture industry recovers from the current effects of the pandemic but is also sufficiently prepared for the next large scale disruptive event post-COVID-19.

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