

Economic Impact Analysis of the Goshen/Gering Ft. Laramie Canal Failure

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Some surface-water irrigators along the North Platte River in Goshen County, WY, and Scotts Bluff County, NE have lost their water supply due to a partially collapsed tunnel that occurred July 17, 2019, on the Goshen/Gering-Ft. Laramie Canal. The water disruption affects 107,325 acres of cropland in these two counties. This report will estimate the economic impact of this event.

Background

Goshen and Scotts Bluff County reside in the High Plains, receiving less than 16 inches of average annual precipitation. This low precipitation makes surface-water irrigation a critical component of modern agriculture in this area.¹ Farmers in these counties produce irrigated alfalfa, corn, sugar beet, and dry edible beans, as well as other hay and crops. Table 1 shows the 2017 harvested acres of each of these commodities for each county.

Table 1
2017 Harvested Irrigated Acres

	Scotts Bluff, NE	Goshen, WY
Alfalfa	33,703	49,292
Corn for grain	70,936	23,570
Sugar beet	9,773	1,600 ^a
Dry edible beans	38,993	8,862
Other Hay	4,249	15,938
Other crops	4,909	4,386
Total	162,563	103,648

Source: 2017 Census of Agriculture

^a Estimated by University of Wyoming Extension

“Surface water” refers to water derived from melted snow that is delivered through a series of dams and canals from the mountains of Colorado and Wyoming along the North Platte River. This infrastructure, often referred to as “The North Platte Project,” was built by the Department of Interior and Bureau of Reclamation in the early 1900s. The North Platte Project has supplied surface-water to 368,433 acres of farmland in Nebraska and Wyoming for over a century.²

The canals and structures, a part of the North Platte Project, are operated and maintained by twenty-one irrigation districts in Nebraska and Wyoming, including the Goshen Irrigation District (Wyoming) and the Gering-Ft. Laramie District (Nebraska), which share a canal. The Goshen /Gering-Ft. Laramie Canal delivers surface water to farmers south of the North Platte River. The Goshen/Gering-Ft. Laramie canal is 130 miles long, with three tunnels, and provides surface water to 107,325 acres of cropland in Goshen and Scotts Bluff counties.

¹ Groundwater is also used for irrigation in this area. “Groundwater” refers to water pumped by a high capacity wells from below-ground aquifers. Some farms have access to both surface water and ground water. However, the majority rely on just one source.

² The North Platte Project is also used for hydroelectric power generation, flood control, recreation, municipal and industrial water supplies, sediment retention, pollution abatement, protection of endangered species and wildlife habitat.

Challenge

A tunnel used to convey water for the Goshen Irrigation District (Wyoming) and the Gering-Ft. Laramie Irrigation District (Nebraska) collapsed July 17, 2019. Diversions of water to the Goshen/Gering-Ft. Laramie Canal have been stopped in order to inspect and repair the damage. The disruption of water during this critical period of crop growth could be detrimental to crop yield and the economies of these two counties.

Economic Impact of the Goshen/Gering Ft. Laramie Tunnel Collapse

This report examines the potential economic impact of the Goshen/Gering-Ft. Laramie Tunnel Collapse. This is a unique challenge, as farmers had made significant investments in crop production at the time of the collapse. This analysis will assume a total loss of corn, dry edible beans and sugar beet in the affected region and 1/3 loss of alfalfa production. Other hay and other crops cannot be estimated by this analysis due to a lack of historical information regarding acreage, yield and price.

Production of irrigated crops is critical to these two rural counties. The production and processing of irrigated agriculture goods has both direct and re-spending effects within the local communities.

A direct effect will measure the economic impact of the loss of irrigated crop production in each county. Agricultural production statistics maintained by the United States Department of Agriculture (USDA) are used to estimate irrigated crop production in the affected area. This direct impact is the primary impact on the two counties' economies.

There is also a multiplier impact, which measures the money generated, or in this case lost, by the production and sale of irrigated crops as it circulates further within the regional economy and is exported out of the region. For example, farmers purchase goods and services, and the employees (and their households) of grain processors and other businesses linked to farming spend their paychecks throughout the economy on household purchases, including housing, food, other retail items, entertainment, health care, insurance, and the like. These additional revenues beget more opportunities and spending, which beget another round. These rounds are not infinite; the amount of economic activity diminishes due to savings and other leakages.

Multiplier impacts are estimated using an IMPLAN model.³ The IMPLAN model calculates re-spending for individual states, counties and multi-state and county regions. Whichever geographical area is the focus, the IMPLAN model calculates employment, labor income, value-added and sales (output) multipliers, which show the ratio between the additional jobs in the economy per direct job, or the additional output for each dollar of direct output (sales).

For example, a labor income multiplier of 1.5 would indicate that there is a multiplier of \$0.5 million per \$1 million in direct labor income. In other words, if there is \$1 million in labor income in irrigated crop

³ IMPLAN is a regional economic analysis software application that is designed to estimate the impact or ripple effect (specifically backward linkages) of a given economic activity within a specific geographic area through the implementation of its Input-Output model. Studies, results, and reports that rely on IMPLAN data or applications are limited by the researcher's assumptions concerning the subject or event being modeled.

production, then there would be \$0.5 million in additional labor income throughout the economy due to re-spending effects. The total labor income impact would be \$1.5 million. In this report, economic multipliers for output (sales), value-added, labor income and employment are estimated for irrigated crop production, using the IMPLAN model.

Direct Impact

The economic impact of the Goshen/Gering Ft. Laramie Tunnel Collapse is a function of the estimated acres of crops in the affected area, estimated production loss, and average selling price during recent years. This analysis will assume a total loss of corn, dry edible beans and sugar beet in the affected region and 1/3 loss of alfalfa production. We recognize that some of the affected acres may be insured by the federal crop insurance program. However, there is some uncertainty at the time of this publication if crop insurance will cover this loss. If farmers receive indemnity payments for their crop losses, this will lessen the overall impact of the tunnel collapse.

To estimate the acres of each crop under the Goshen/Gering Ft. Laramie Tunnel Collapse, we assumed the affected area would have an equivalent percentage of each irrigated crop as reported by the 2017 U.S. Census of Agriculture for each county. Estimates of crop acreage are shown in table 2.

Table 2
Estimated Acres of Crops Affected by the Goshen/Gering-Ft. Laramie Tunnel Collapse

	Scotts Bluff, NE	Goshen, WY	Total
Alfalfa	11,402.75	24,729.70	36,132
Corn for grain	23,999.80	11,825.02	35,825
Sugar beet	3,306.50	802.72 ^b	4,109
Dry edible beans	13,192.52	4,446.05	17,639
Other Hay	1,437.57	7,996.06	9,434
Other crops	1,660.86	2,200.45	3,861

^b Estimated by University of Wyoming Extension

Yields used for this estimate are the 2018 yields reported by USDA National Agricultural Statistics Service (NASS) for each county unless otherwise noted in table 3.

Table 3
Previous Reported USDA NASS Yield

	Scotts Bluff, NE	Goshen, WY
Alfalfa (tons/acre)	5.15	4.8
Corn for grain (bushels/acre)	194.8	155.7 ^c
Sugar beet (tons/acre)	32.8	32.9
Dry edible beans (cwt/acre)	25.6	25.3 ^d

Source: USDA NASS,

^c2017 State Census Reported Yield; ^d 2017 Reported Yield

Prices for commodities vary both spatially as well as over time. To estimate the value of lost crops, we used prices reported by the USDA Agricultural Marketing Service (AMS) closest to the date of the collapse unless otherwise noted. Prices used are reported in table 4.

Table 4
Price of Each Commodity

Alfalfa (\$/ton)	160
Corn for grain (\$/bushel)	4.26
Sugar beet (\$/ton)	35.50 ^e
Dry edible beans (\$/cwt.)	22.50

^e 2017 USDA NASS reported, Nebraska and Wyoming State Average per ton.

Multiplying assumed acres, yield, and prices shown in tables 2, 3 and 4 estimates the lost sales of irrigated crops from the tunnel collapse for each county. The estimated direct economic loss from Goshen/Gering-Ft. Laramie Canal collapse is \$17.4 million in Goshen and \$34.5 million in Scotts Bluff. The direct economic impact is a difficult number to describe in production agriculture. These numbers are assuming all agricultural products are harvested at average crop yields and sold at current market prices. In this current situation some crops will be utilized differently than their intended purpose. For example, corn might be chopped for silage instead of taken to grain. However, the market value of the crop can be interpreted the underlying value to the agricultural operations and using it as feed would be as valuable as sending it to the market.

In addition to the loss of sales, there may also be loss of employment, earnings and value added. Utilizing the 2019 University of Nebraska – Lincoln crop budgets, we evaluated what additional input, and labor will not be employed by affected farmers. Direct economic impact for each county is shown in table 5.

Table 5
Lost Direct Economic Impact of Goshen/Gering-Ft. Laramie Canal Collapse

Measure	Scotts Bluff, NE	Goshen, WY
Employment	98	148
Labor Income (Millions \$)	7.49	4.22
Value-Added (Millions \$)	11.68	6.24
Output (Millions \$)	34.50	17.40

Source: University of Wyoming Extension, Roger Coupal-State Community Development Specialist

Note that labor income is a component of value-added and value-added is in turn a component of output (sales). The output impact, therefore, is the most comprehensive measure of economic impact. The other measures are simply alternative ways to examine how irrigated crop production impacts each county. Value-added and labor income impacts should not be added to the output impact.

Re-Spending Impact and Total Economic Impact

Table 6 repeats the direct economic impact for each measure, and also provides economic multipliers and the estimate of total economic loss. Economic multipliers were estimated via the IMPLAN model. The labor market multiplier impacts are large for irrigated crop production, as is typically true in production agriculture, since production is very input-intensive. Multipliers range between 1.41 and 1.95 for other measures, reflecting that \$1.00 of output, value-added or labor income within irrigated crop production generates between \$0.41 and \$0.95 in additional economic activity in industries throughout the economies of Scotts Bluff and Goshen County.

Table 6
Total Impact of the Goshen/Gering-Ft. Laramie Canal Collapse in Each County

Measure	Direct Impact	Multiplier	Total Impact
<i>---Scotts Bluff, NE---</i>			
Employment	98	2.55	248
Labor Income (Millions \$)	7.49	1.76	13.15
Value-Added (Millions \$)	11.68	1.85	21.66
Output (Millions \$)	34.50	1.53	52.77
<i>---Goshen, WY---</i>			
Employment	148	1.52	225
Labor Income (Millions \$)	4.22	1.60	6.76
Value-Added (Millions \$)	6.24	1.68	10.50
Output (Millions \$)	17.40	1.41	24.57

Source: University of Wyoming Extension, Roger Coupal-State Community Development Specialist

Although most economic activity related to irrigated crop production would happen in the affected area, the economic impact of this collapse is not confined by county boundaries. In addition to the county impacts there are also “spillover” affects between the counties and the rest of each state. This spillover is a function of re-spending across the county line.

To quantify this interconnection two spillover analysis were conducted. The first, table 7 shows the interdependence of these two counties estimating the total impact of Scotts Bluff and Goshen counties together. This is an important measure as lost crop production in Goshen County could impact the Scotts Bluff County economy and vice versa.

Table 7
Total Impact of the Goshen/Gering-Ft. Laramie Canal Collapse

Measure	Scotts Bluff, NE Total Impact	Goshen, WY Total Impact	Spillover Impact between counties	Total Impact 2-County Region
Employment	248	225	5	478
Labor Income (Millions \$)	13.15	6.76	0.23	20.14
Value-Added (Millions \$)	21.66	10.50	0.43	32.59
Output (Millions \$)	52.77	24.57	1.02	78.36

Source: University of Wyoming Extension, Roger Coupal-State Community Development Specialist

The 2-county regional impact plus the state spillover impact can be summed to provide the total impact of the Goshen/Gering-Ft. Laramie Tunnel Collapse. Table 8 repeats the impact in the 2-county region, provides the estimate of the state spillover impact for both Wyoming and Nebraska. Total economic loss caused by the Goshen/Gering-Ft. Laramie Tunnel Collapses is \$89.13 million as reported in table 8.

Table 8
Total Impact of the Goshen/Gering-Ft. Laramie Canal Collapse

Measure	Total Impact 2-County Region	Spillover Impact Between the 2-County region Nebraska and Wyoming	Total Impact 2-StateRegion
Employment	478	83.1	561
Labor Income (Millions \$)	20.14	5.1	25.27
Value-Added (Millions \$)	32.59	7.0	39.56
Output (Millions \$)	78.36	10.8	89.13

Source: University of Wyoming Extension, Roger Coupal-State Community Development Specialist

Considerations

This economic impact model was produced with the best data available given the variability in agriculture. The majority of the acres are covered in the four primary crops listed above, although other crops are produced in the area. Due to lack of data for other crops grown, they were not considered in the analysis. Other hay (not including alfalfa) was initially proposed in the analysis due to the large number of acres in the impacted area. Due to the variability of harvest practices and potential for grazing, it was not included in the final analysis.

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