



ECONOMIC EMERGENCY PROGRAM

Impact of Poultry and Egg Production Losses and Poultry Processing Losses Due to the Avian Influenza

EXECUTIVE SUMMARY

In late winter 2015, avian influenza was discovered in a flock of commercial turkeys in Minnesota. After the first flock was infected, the virus spread rapidly. As of May 11, 2015, the disease has been confirmed at 85 turkey and chicken farms in 21 Minnesota counties, resulting in the direct loss of nearly 5.7 million birds in the state.¹ Approximately 9 percent of all turkeys and 14 percent of all laying chickens have been affected by the outbreak.² In 2014, the value of turkey production in Minnesota was \$866.2 million. The value of egg production was \$265.9 million. Applying those figures to 2015, as of May 11, an *estimated* \$113.6 million of poultry production has been lost in Minnesota. This does not include the value of future lost production (due to the further spread of the disease or lost production due to barn disinfection and cleaning).

Farms with the disease lose not only the infected birds, but the rest of their flocks on the same farm as well. Poultry and egg barns need to be disinfected over a period of time, meaning barns will sit empty, further decreasing poultry and egg production.

Clearly, these losses are affecting turkey, chicken, and egg producers. However, producers are not the only businesses to be affected by this incident. With fewer birds going to market and potential delays in restocking the farms, producers will spend less on local purchases of their traditional inputs into poultry and egg production (such as feed and veterinary supplies). Producers and their employees will also have less household income to spend at local businesses. These are the ripple effects of avian influenza.³

In addition to losses at the producer level, a decline in poultry and eggs produced has the potential to affect the processing industry as well. On May 5, Jennie-O announced it will lay off 233 workers at its turkey processing plant in Faribault. Obviously, idling of processing plants will also have ripple effects on the local economy.

To quantify these ripple effects, University of Minnesota Extension conducted an Emergency Economic Impact Analysis (EIA). This Emergency EIA quantifies the ripple effects of the loss of \$1 million in poultry and egg production showing that \$1 million in direct losses will likely result in a decline of \$1.8 million in economic output in Greater Minnesota, including \$450,000 in lost farm

¹ Source: Minnesota Bureau of Animal Health, <https://www.bah.state.mn.us/>.

² Source: Minnesota Agricultural Statistics Service

³ Note: Producers will have expenses related to clean up and disinfection, as well as restocking their barns.

and household income. It also quantifies the ripple effects of the loss of 100 poultry processing jobs, showing that 100 lost jobs at poultry processing plants will lead to a loss of 210 jobs across Greater Minnesota's economy, including \$9.3 million in lost household income.

Because the virus continues to spread, quantifying the exact loss at a specific date and time may not prove useful. Knowing the impact of \$1 million in losses will allow the total economic impact to be adjusted based on the latest information available on poultry and egg production losses. Correspondingly, knowing the impact of 100 lost processing jobs will allow the total economic impact to be adjusted based on the latest information available on poultry processing losses.

This analysis is offered as a quick and initial look at the immediate, short-term impacts of the avian influenza. It is intended to provide context for decision makers in the midst of this economic event. Extension recommends a more in-depth and complete analysis be completed once the avian influenza has been contained in Minnesota.

WHAT IS AN ECONOMIC EMERGENCY?

Communities can face a sudden and unanticipated change in their local economy. A major employer announces it is reducing its workforce, a fire destroys an operating facility, or a flood damages downtown. In these situations, communities often need to make quick, but important, decisions about how to react. They work closely with the local business(es) affected and work to help the business(es) and community recover. The University of Minnesota Extension economic emergency program is designed to provide community leaders with information to assist in making decisions regarding the community's future. Information from the IMPLAN (MIG, Inc.) input-output model is used in this analysis.⁴ This report is presented in partnership with the EDA Center at the University of Minnesota-Crookston.

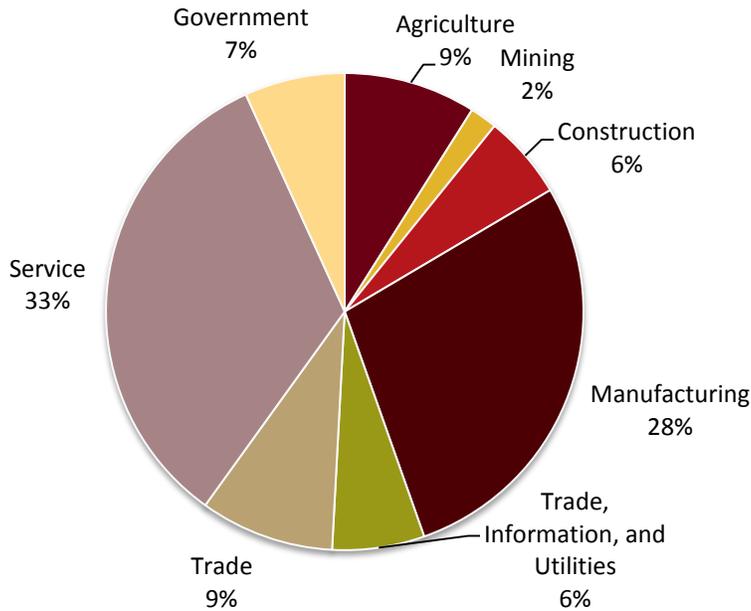
There are a few important things to note related to this analysis and the tool used. Please see the section on assumptions and terms to understand these factors.

CURRENT ECONOMY

In 2013, businesses in Greater Minnesota created \$223.1 billion of output. The agriculture, forestry, hunting, and fishing industry was directly responsible for \$20.0 billion (9%) of that output (chart 1). Manufacturers using agricultural products in their processes produced \$23.3 billion of the \$62.7 billion (37%) in manufacturing output in Greater Minnesota.

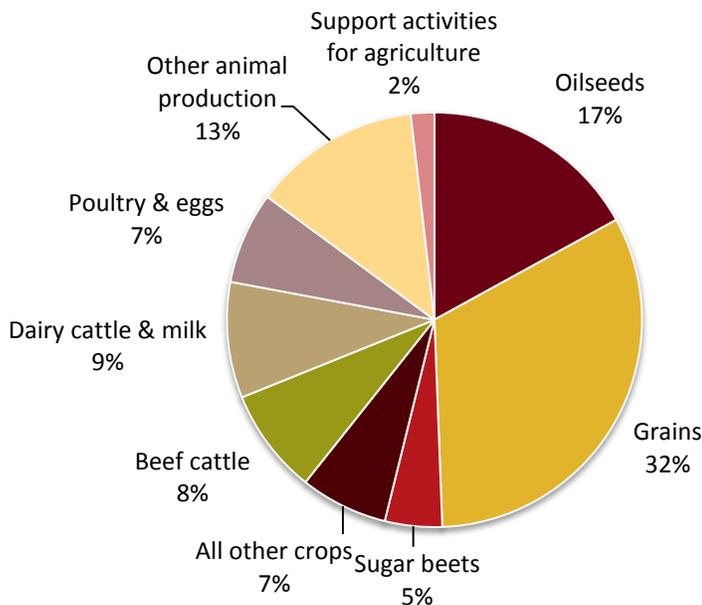
⁴ IMPLAN, Inc. www.implan.com.

Chart 1: Output by Sector, Greater Minnesota, 2013



Poultry and egg producers, in turn, created \$1.4 billion dollars of output in 2013, or approximately 7 percent of Greater Minnesota’s agricultural production (chart 2). In addition, poultry processing facilities produced \$1.6 billion of output. Together, the industries produce \$3.0 billion of output annually in Greater Minnesota.

Chart 2: Agricultural Output by Sector, Greater Minnesota, 2013



ECONOMIC IMPACT OF LOST POULTRY AND EGG PRODUCTION

Since it's unknown how long avian influenza will continue to spread in Minnesota (and thus the full impact of outbreak), this analysis will focus on the loss of \$1 million of poultry and egg production. With careful interpretation, the impact of this \$1 million of loss can be brought to the current scale of losses in the poultry and egg industry in Minnesota by multiplying the estimated total losses presented here by the current value of lost production. These figures should not be applied to the poultry processing industry.

Total Economic Impact

Each \$1 million dollar loss in poultry and egg production means that an estimated 3 jobs at poultry and egg farms themselves will be affected. At this time, the avian influenza is expected to decrease poultry and egg production for a short period of time. If producers are able to return to full production within a few months, it is possible these jobs will not be permanently lost. However, these jobs will be affected in the short-term (for example, employees may go several weeks without work or income).

During this period, an estimated \$283,260 in labor income for the producer and the producer's employees will be lost (see the direct effect in table 1). Labor income includes both proprietor income (income for the self-employed which would include income to poultry producers) and employee compensation (wages, salaries, and benefits for farm workers). Most of the direct loss (85 percent) is lost income for poultry producers.⁵ Losses may be even greater in the short-term for poultry producers, as some will retain employees during the cleaning and disinfecting stages. The producers, at that point, will be paying wages to their employees without receiving any revenue to pay those wages.

Poultry and egg production generates additional economic activity in Greater Minnesota as a result of purchases by poultry and egg producers. These are described as indirect and induced impacts. When poultry and egg producers make purchases of inputs and supplies in the local economy, this creates indirect, or business-to-business impacts. When poultry and egg producers, their families, and their employees make purchases in the local economy, this creates induced, or consumer-to-business, impacts. When these purchases decrease, as a result of declines in poultry and egg production, the corresponding local purchases will also decrease, causing a ripple of economic losses in Greater Minnesota.

Each loss of \$1 million in poultry and egg production will have significant impacts on Greater Minnesota, as displayed in table 1. For every \$1 million decline in poultry and egg production, an estimated additional \$808,590 in output in Greater Minnesota industries that serve producers and their employees will be lost. In total, output in the region declines by an estimated \$1.8 million per \$1 million of lost production. Of that \$1.8 million of lost output, \$450,000 will be lost labor income (includes proprietary/net farm income and employee compensation). For every \$1 million

⁵ Note: some poultry producers may receive government payments to compensate for birds lost, as producers will receive payment for birds euthanized to prevent the spread of the disease. This will partially offset some the lost proprietor income.

decline in poultry and egg production in Greater Minnesota, Minnesotans will lose \$450,000 in household income. Finally, poultry and egg losses will impact other jobs in Greater Minnesota. For every \$1 million of lost poultry and egg production, an estimated 7 jobs will be affected across all industries.

Table 1: Total Economic Impact of a \$1 Million Loss of Poultry and Egg Production, Greater Minnesota

	Output	Employment	Labor Income
Direct	-\$1,000,000	-3	-\$283,260
Indirect	-\$564,160	-2	-\$94,910
Induced	-\$244,430	-2	-\$71,830
Total	-\$1,808,590	-7	-\$450,000

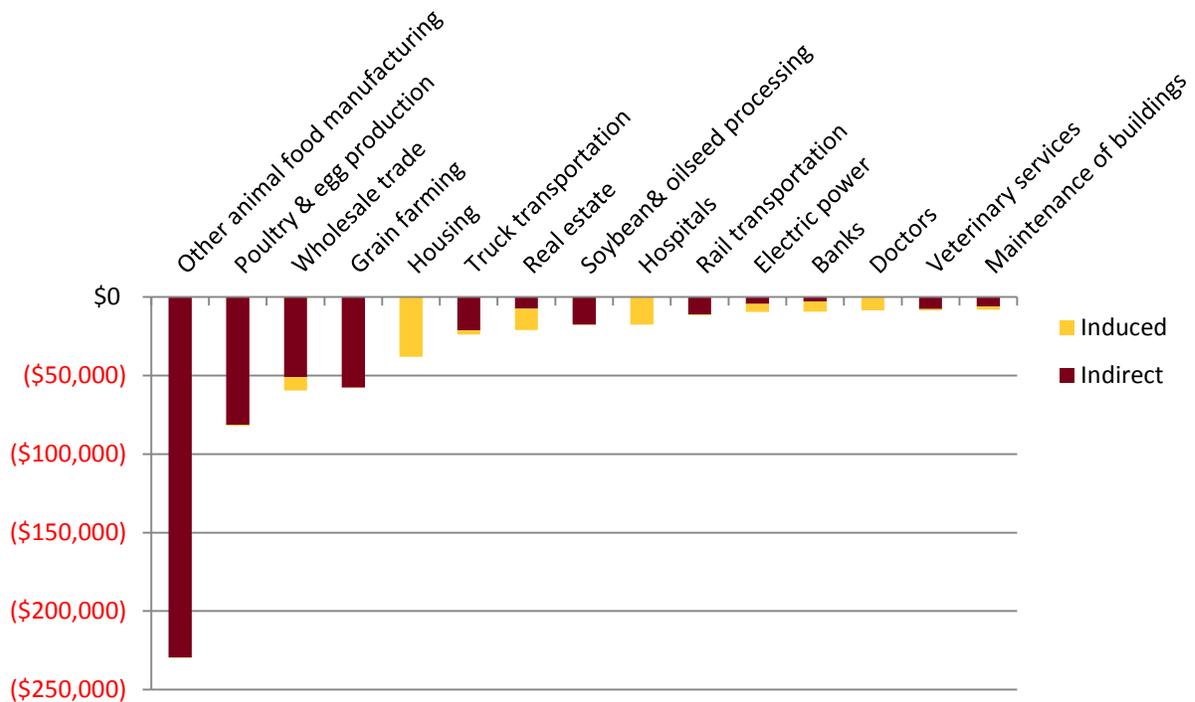
Estimates by University of Minnesota Extension

The focus of this analysis is on Greater Minnesota, because the majority of Minnesota’s poultry and egg production is in Greater Minnesota (the 80 counties not in the 7-county metro). The economic impact of a \$1 million decrease in poultry and egg production on the entire state of Minnesota (including the metro area) is \$2.1 million including 8 jobs affected and \$560,000 of lost income (proprietor and employee compensation).

Top Industries Impacted

The IMPLAN input-output model can also provide estimates of the industries in Greater Minnesota that will feel the largest magnitude of impacts from the loss of poultry and egg production (chart 3). The largest losses will be in “other” animal food manufacturing. Since poultry will not be raised, demand for poultry feed will decline. For every \$1 million of lost poultry production, nearly \$230,000 of demand for poultry feed will be lost in Greater Minnesota. Poultry and egg production itself will also be affected, as shown in chart 3. Likely, these impacts are those related to demand for poults and for chicks. Therefore, this decrease may be temporary. In fact, this subsector of the poultry industry may experience a sharp spike in demand when producers are ready to restock their barns. Grain farming and oilseed farming also appear in the table as industries that will be affected. This chart reflects the number of grain and oilseed farm that provide inputs into poultry feed. Likely, grain and oilseeds not used for poultry feed will be exported.

Chart 3: Top 15 Industries Affected by a \$1 Million Decline in Poultry and Egg Production, Sorted by Output



Modeling the Scale of Losses

As mentioned, the scale of the lost poultry and egg production is yet not clear for Greater Minnesota. Depending on the duration of the avian influenza outbreak, the scale of the impacts could change. Thus, Extension modeled a \$1 million change in poultry and egg production. However, it is useful to think how these impacts might change based on the scale of the event. The following examples are provided only for illustrative purposes and not as predictions for the future.

Example 1: A \$10 million loss of poultry and egg production

If poultry and egg production were to decline by \$10 million in Greater Minnesota, then in total Greater Minnesota would lose an estimated \$18.1 million in economic activity, including \$4.5 of lost labor income. Across all industries, 70 jobs would be affected.

Example 2: A \$113.6 million loss of poultry and egg production

As of May 11, 2015, Extension **estimates** approximately \$113.6 million of poultry and egg production has been lost (based on 2014 production figures). The loss of an estimated \$113.6 million in poultry production would result in a loss of \$205.5 million in economic activity in Greater Minnesota, including \$51.1 million of lost labor income. Nearly 800 jobs would be

affected. These are estimates based on production values from 2014. They should be interpreted with caution. They do not include the value of lost production due to the barns being empty during the cleaning and disinfecting stage. If poultry producers lose another entire cycle of production, these estimates could double.

Example 3: A \$200 million loss of poultry and egg production

Poultry and egg production losses may increase with time. If poultry and egg production were to decline by \$200 million, then in total Greater Minnesota would lose an estimated \$361.7 million in economic activity, including \$90 million of lost labor income. Across all industries, 1,400 jobs would be affected.

ECONOMIC IMPACT OF LOST POULTRY PROCESSING JOBS

Since the effects of the avian influenza are only beginning to be felt by the processing industry, this analysis will focus on the loss of 100 poultry processing manufacturing jobs. With careful interpretation, the impact of these 100 lost jobs can be brought to the current scale of losses in the poultry processing industry in Minnesota by multiplying by the current value of lost jobs. These figures should not be applied to the poultry and egg production industry.

Total Economic Impact

According to the IMPLAN input-output model used in this analysis, the loss of 100 poultry processing jobs in Greater Minnesota is associated with a direct loss of an estimated \$27.3 million in poultry processing output. The lost output includes an estimated \$4.9 million worth of wages, salaries, and benefits for the affected workers.

When a processing plant idles and employees are laid off, businesses beyond the processing plant will be affected. The processing plant will decrease purchases of its material supplies leading to indirect or business-to-business losses. With a drop of 100 jobs at processing plants, an estimated 50 jobs will be lost in other industries. Note, since this analysis examines poultry and egg production impacts separately, lost poultry production jobs are not included in the indirect effects. The model estimates 30 poultry production jobs are affected for each 100 poultry processing jobs lost.

When the processing plant idles, workers will be without incomes. The model estimates that lost incomes for plant workers will affect 60 jobs in other industries in Greater Minnesota.

In total, the loss of 100 poultry processing jobs in Greater Minnesota will result in an estimated 210 jobs being affected across all industries. The total economy will experience a decrease in output of an estimated \$44.8 million, including \$9.3 million in labor income.

Table 2: Total Economic Impact of 100 Lost Poultry Processing Jobs, Greater Minnesota

	Output (millions)	Employment	Labor Income (millions)
Direct	-\$27.3	-100	-\$4.9
Indirect	-\$10.8	-50	-\$2.4
Induced	-\$6.7	-60	-\$2.0
Total	-\$44.8	-210	-\$9.3

*Note: Estimates do not include lost poultry production

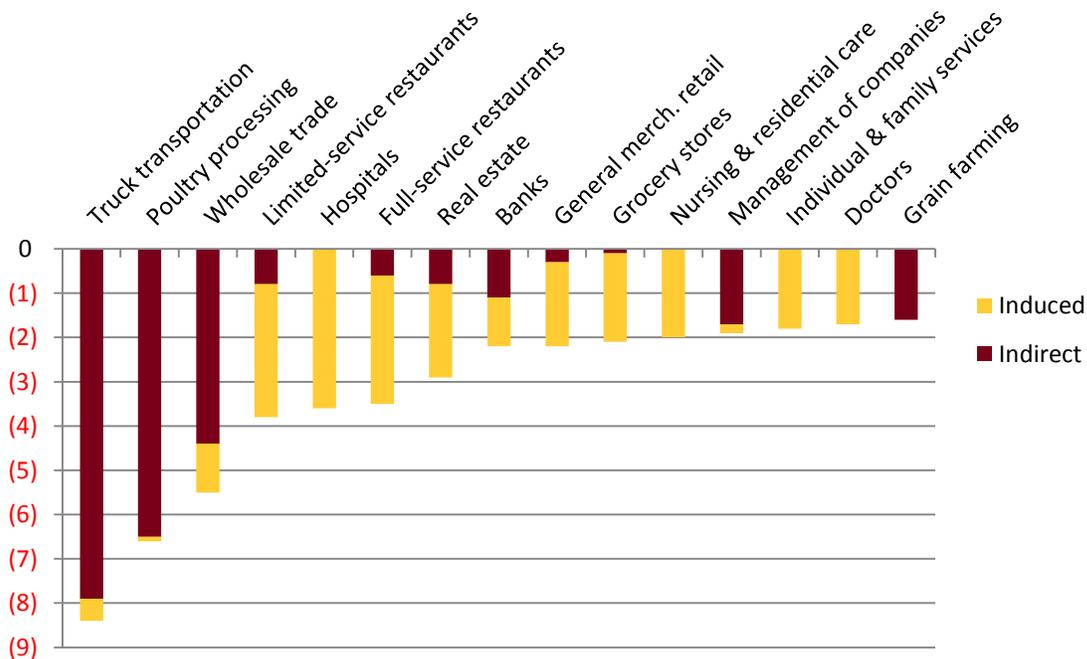
Estimates by University of Minnesota Extension

The focus of this analysis is on Greater Minnesota, because the majority of Minnesota’s poultry processing is in Greater Minnesota. The economic impact of a 100 job decrease in poultry processing on the entire state of Minnesota (including the metro area) is \$64.5 million including 275 jobs affected and \$15.8 million of lost income.

Top Industries Impacted

The top industries affected by lost poultry processing jobs are highlighted in chart 4. A loss of 100 poultry processing jobs will affect nearly 9 trucking jobs, 7 poultry processing jobs (likely at processors that perform specialty processing tasks), and 6 wholesale trade jobs.

Chart 4: Top 15 Industries Affected by a 100 Job Decline in Poultry Processing, Sorted by Employment



Modeling the Scale of Losses

As mentioned, the scale of the lost poultry processing is yet not clear for Greater Minnesota. Depending on the duration of the avian influenza outbreak, the scale of the impacts could change. Thus, Extension modeled a 100 job change in poultry processing. However, it is useful to think how these impacts might change based on the scale of the event. The following examples are provided only for illustrative purposes and not as predictions for the future.

Example 1: 233 Lost Poultry Processing Jobs

The loss of 233 poultry processing jobs will result in 490 jobs across all industries in Greater Minnesota being affected. It will result in the loss of \$104.4 million of lost output, including \$21.7 million in labor income.

Example 2: 500 Lost Poultry Processing Jobs

It is possible additional poultry processing jobs will be affected as a result of the avian influenza. If 500 poultry processing jobs are lost, then 1,050 jobs across all industries would be affected. The lost jobs would translate into \$224.0 of lost economic activity, including \$46.5 million in lost labor income in Greater Minnesota.

Considerations

Given the ever changing nature of the avian influenza in Greater Minnesota, Extension elected to analyze using a unit loss of \$1 million in poultry and egg production and 100 lost poultry processing jobs. There are several layers of additional considerations when thinking about the overall impact of the avian influenza in Greater Minnesota.

- **Age and maturity of bird losses.** Producers with older birds will have higher investments in their birds than producers whose birds were younger at time of infection.
- **Fixed prices.** This analysis assumes prices remain fixed. This is an important assumption, as decreased demand for inputs into poultry and egg production may decrease the cost of inputs. Decreased input prices will affect expenditures for those inputs. Further, changes in the price of poultry and eggs, which could rise as supply decreases, would also change farm incomes. The input-output model used in this analysis does not account for price changes.
- **Insurance or government reimbursement.** Some of the producers affected may receive compensation for lost birds, mitigating the effects of some of the lost farm income. However, impacts on the supplying industries (identified as indirect effects in this report) will not be offset.
- **Impacts of barn cleaning and disinfecting.** This analysis focuses on a loss of poultry and egg production using a fixed model of production. The avian influenza will cause some spending and activity to occur that is outside the normal for producers. For example, there will be producer costs associated with purchasing cleaning supplies and then resetting the barns for production (for example, added bedding). These will be costs to the poultry producers in the short-term, but might actually spur additional economic activity as suppliers of poultry bedding increase production to meet demand.
- **Long-term effects on the poultry and egg industry.** This analysis focuses on the short-term effects of lost poultry and egg production. If producers are able to return to full production within a few months, these effects will dissipate. However, this is a point of

high uncertainty in the industry. If avian influenza persists as an issue, producers may not be able to return to full production, leaving them vulnerable to leaving the industry. Uncertainty may affect credit availability, further hindering operations.

PURCHASING PATTERNS FOR PRODUCERS AND PROCESSORS

The input-output model, IMPLAN, estimates ripple effects based on industry purchasing patterns (production functions). Extension is providing the production functions here to allow decision makers to understand supply linkages. Note: IMPLAN adjusts the amount spent in a local economy based on supply available in the study area.

Poultry and Egg Producer Purchases

Table 3 shows purchases by poultry and egg producers. According to the IMPLAN input-output model, for every \$1 spent by poultry and egg producers, \$0.68 is spent on inputs (goods and services). The other \$0.32 is spent on labor, indirect business taxes, and property income.

Table 3: Purchases by Poultry and Egg Producers

Item	Amount of Every \$1 Spent
Animal food	\$ 0.40
Labor income, indirect business taxes, and property income costs	\$ 0.32
Poultry and egg products	\$ 0.09
Wholesale trade	\$ 0.05
Grains	\$ 0.02
Energy	\$ 0.02
Truck transportation	\$ 0.01
Soybean and oilseed processing	\$ 0.01
Support activities for agriculture	\$ 0.01
Veterinary services	\$ 0.01
All other inputs	\$ 0.06
Total	\$ 1.00

Source: IMPLAN

Poultry Processing Purchases

Table 4 shows purchases by poultry processors. According to the IMPLAN input-output model, for every \$1 spent by poultry processors, \$0.79 is spent on inputs (goods and services). The other \$0.21 is spent on labor, indirect business taxes, and property income.

Table 4: Purchases by Poultry Processors

Item	Amount of Every \$1 Spent
Poultry and egg products	\$ 0.45
Labor income, indirect business taxes, and property income costs	\$ 0.21
Processed poultry meat products	\$ 0.11
Truck transportation services	\$ 0.04
Management of companies	\$ 0.02
Wholesale trade	\$ 0.02
Paper bags and coated and treated paper	\$ 0.01
Paperboard containers	\$ 0.01
Meat processed from carcasses	\$ 0.01
Other plastics products	\$ 0.01
All other inputs	\$ 0.11
Total	\$ 1.00

Source: IMPLAN

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ASSUMPTIONS AND TERMS

Economic impact analysis is based on several critical assumptions. An understanding of the assumptions ensures the results are interpreted properly. Here are the key assumptions made in this analysis.

- One job is one job, regardless if the job is full-time, part-time, or seasonal. The jobs considered here are not full-time equivalents. Therefore, it isn't unusual for industries with high levels of part-time employment to experience higher employment impacts.
- The model is linear. Changes in output or employment can be modeled in a linear fashion. For example, if the estimated lost production of poultry and eggs in Greater Minnesota are \$10 million, one may multiply the amounts noted in this report for losses in total output

and employment from \$1 million in lost production by 10 to obtain estimates for the \$10 million in lost production.

- The database is built on data available publicly. When data is not available for a specific industry, say due to data disclosure issues, econometric models are used to create estimates for the industry.

KEY TERMS

The following are a few key terms used in economic impact analysis.

Output

Output is measured in dollars and is equivalent to total sales. The output measure can include significant double counting. For example, think of corn. The value of the corn is counted when it is sold to the mill, again when it is sold to the dairy farmer, again as part of the price of fluid milk, and then yet again when it is sold as cheese. The value of the corn is built into the price of each of these items and then the sales of each of these items are added up to get total sales (or output).

Employment

Employment includes full- and part-time workers and is measured in annual average jobs. Total wage and salaried employees as well as the self-employed are included in employment estimates in IMPLAN. Because employment is measured in jobs and not in dollar values, it tends to be a very stable metric.

In the model, one job is one job, regardless if the job is full-time, part-time, and seasonal.

Labor Income

Labor income measures the value that is added to the product by the labor component. For example, in the corn example, when the corn is sold, a certain percentage of the sale goes to the farmer for his/her labor. Then when the mill sells the corn as feed to the dairy farmer it includes in the price some markup for its labor costs. When the dairy farmer sells the milk to the cheese manufacturer, he/she includes a value for his/her labor. These individual value increments for labor can be measured. This is labor income. Labor income does not include double counting.

Labor income is comprised of employee compensation (wages, salaries, and benefits) and proprietor income. Proprietor income includes income for the self-employed, which is how many agricultural producers register their income.

Property Income

Property income is a computation of the value that accrues due to ownership of property. This includes payments for rents, royalties, and dividends.

Indirect Business Taxes

Indirect business taxes are taxes a business pays for normal operations. It includes excise, sales, and property taxes. Fees, fines, licenses, and permits are also included in this category.

Direct Impact

The direct impact is equivalent to the initial change in the economy.

Indirect Impact

The indirect impact is the summation of changes in the local economy that occur due to **spending for inputs** (goods and services) by the industry or industries directly impacted. For instance, if employment in a manufacturing plant increases by 100 jobs, this implies a corresponding increase in output by the plant. As the plant increases output, it must also purchase more of its inputs, such as electricity, steel, and equipment. As it increases its purchase of these items, its suppliers must also increase its production, and so forth. As these ripples move through the economy, they can be captured and measured. Ripples related to the purchase of goods and services are indirect impacts.

Induced Impact

The induced impact is the summation of changes in the local economy that occur due to **spending by labor** -- employees in the industry or industries directly impacted. For instance, if employment in a manufacturing plant increases by 100 jobs, the new employees will have more money to spend to purchase housing, buy groceries, and go out to dinner. As they spend their new income, more activity occurs in the local economy. This can be quantified and is called the induced impact.

Total Impact

The total impact is the summation of the direct, indirect and induced impacts.