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Economic Contribution of the Sugarbeet Industry in Minnesota, North Dakota and South Dakota

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Executive Summary

Agricultural industries in small geographical areas with limited acreage can be overlooked by those not associated with the growing region or industry. Sugarbeets continue to be produced in a relatively small geographic area and on relatively limited acreage in portions of Minnesota and North Dakota. These factors, along with continued debate over policies affecting domestic sugar industries, have prompted an analysis of the economic contribution of the sugarbeet industry to the regional economy.

The sugarbeet industry was defined to include production, processing, marketing, and research but did not include activity relating to Sidney Sugars, Montana. Much of the data for the study was obtained from a survey of processors and marketers in Minnesota and North Dakota. Information was solicited on revenues, expenditures (both gross and those made in Minnesota, North Dakota, and South Dakota), employment, payroll, and government taxes.

Based on processor data, 638,000 acres were planted in Minnesota and North Dakota and 605,200 acres were harvested in 2021. The industry processed 16.9 million tons of sugarbeets over the fourth quarter 2021 through third quarter 2022.

Direct output (sales) of the industry in the tri-state region was estimated at $3.55 billion. About 44 percent of the industry's output was associated with sugarbeet production and research with the remaining 56 percent attributable to sugarbeet processing and sugar marketing.

Direct employment for sugarbeet production and research was 1,840 jobs, which included about 765 wage and salary jobs. The remaining jobs in sugarbeet production and research were self-employed farmers and sugarbeet producers. By comparison, direct employmet in the tri-state region for sugarbeet processing and marketing was 2,570 jobs. Direct employment for all components of the industry was 4,410 jobs. An additional 880 jobs were reported by the processors as seasonal contract employment during the harvest campaign, but the processors indicated those jobs did not represent employees. Seasonal onfarm labor for sugarbeet harvest was not estimated.

An important factor in how the industry affects the Minnesota and North Dakota economies is the purchase of goods and services. Processing and marketing segments of the industry purchased $851 million of goods and services, excluding payments to growers for sugarbeets, of which, of $261 million was spent in Minnesota and $192 million was spent in North Dakota. In addition to purchases of goods and services for operations, the industry spent $126 million on capital outlays, of which, $73 million were paid to entities in Minnesota and North Dakota.

Customized IMPLAN models were developed for Minnesota and North Dakota, and were used in conjunction with a multiple-region input-output analysis that included cross-state commerce among Minnesota, North Dakota, and South Dakota. The custom models and multi-state approach provided estimates of the secondary economic effects of the industry.

Secondary employment in the study's tri-state region was estimated at 11,900, which when combined with direct employment, indicated the industry supported 16,310 jobs. Labor income for the 11,900 secondary jobs was estimated at $844 million, which included wages, salaries, benefits, and income for sole-proprietors. Direct and secondary labor income for the industry was estimated at $1.6 billion.

Gross business volume for the industry, which represents sales revenue in all economic sectors in the tri-state region, was estimated at $6.1 billion. Revenues for sugarbeet growers, processors, and marketers represented 58 percent of the industry's gross business volume in the tri-state region, with the remaining 42 percent representing revenues to other economic sectors.

In Minnesota, the industry supported 10,260 direct and secondary jobs with $1 billion in labor income, and $3.9 billion in gross business volume. The industry contributed $2.2 billion to Minnesota's gross state product.

In North Dakota, the industry supported nearly 6,000 jobs with $568 million in labor income, and $2.3 billion in gross business volume. The industry contributed $435 million to the state's gross state product.

The sugarbeet industry in South Dakota supported 60 jobs with a labor income of $3.5 million in South Dakota. Business volume supported in South Dakota was estimated at $11 million.

The sugarbeet industry paid $43.6 million in state and local government taxes in tri-state region. Secondary economic activity attributable to the industry was estimated to generate another $152.6 million in state and local government tax collections. Overall, the industry was responsible for $196 million in state and local tax revenue.

In Minnesota, the sugarbeet industry was estimated to represent about 0.5 percent of the state's total labor income, gross state product, and gross business volume. The industry was responsible for about 0.3 percent of employment in Minnesota. By contrast, the industry was estimated to have a slightly larger relative contribution to the North Dakota economy despite the sugarbeet industry having a smaller economic footprint in North Dakota. The difference in the relative contribution is attributable to North Dakota having a much smaller state economy than Minnesota. In North Dakota, the industry represented about 1.5 percent of the state's total labor income, gross state product, and gross business volume, and about 1.1 percent of the state's overall employment.

To place the economic contribution of the sugarbeet industry into context, each planted acre of sugarbeets support about $2,500 in economy-wide labor income and $9,600 in gross business volume. Every 39 acres of planted sugarbeets supported one job (direct and secondary employment). Each ton of sugarbeets processed generated $93 in economy-wide labor income and $360 in gross business volume. For every 1,037 tons processed, one job was supported in the tri-state region.

Economic Contribution of the Sugarbeet Industry in Minnesota, North Dakota and South Dakota

Dean A. Bangsund and Nancy M. Hodur*

The economic contribution of the sugarbeet industry in Minnesota and North Dakota has been periodically assessed since 1987. Coon and Leistritz (1988), Bangsund and Leistritz (1993), Bangsund and Leistritz (1998b), Bangsund and Leistritz (2004), and Bangsund et al. (2012a,b) have provided periodic estimates of the economic contribution of the sugarbeet industry in North Dakota and Minnesota. However, continued debate over the future of national sugar policies has prompted a re-evaluation of the industry's economic importance. Of particular interest to the sugarbeet industry is an understanding of how the industry influences the state economies where production and processing facilities are co-located.

The per-acre value of sugarbeets is higher than the per-acre value of most other crops raised in the region. High-value crops require substantial amounts of production inputs and can generate sizable net revenues to producers, which accentuate production-related economic effects. Adding to the economic effects of sugarbeet production, sugarbeet processing plants are distributed among the sugarbeet growing regions in Minnesota and North Dakota. Sugarbeet processors provide consistent and high paying employment in rural areas where wage rates are often lower than urban centers and employment opportunities are limited.

The concentration of sugarbeet production and processing accentuate the industry's economic importance in rural economies in both Minnesota and North Dakota. Residents and stakeholders in sugarbeet producing regions largely understand the value of the industry. However, smaller relative acreage of sugarbeets compared to other regional crops, such as corn, soybeans, and small grains, can be misleading in terms of relative economic effect. Overcoming perceptions associated with relatively small physical footprint of the industry is one of the challenges associated with communicating the economic significance of the industry.

A reassessment of the industry's economic importance will demonstrate the economic implications of policy changes affecting domestic sugar industries and document the economic effect of current industry activities.

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Composition of the Sugarbeet Industry

Sugarbeet Production: This segment grows sugarbeets, and includes planting, harvesting, and delivery of sugarbeets to processing plants and piling stations.

Sugarbeet Processing: This segment processes sugarbeets into refined sugar, molasses, and other products.

Sugar and Sugarbeet Co-product Marketing: This segment acquires sugar and other sugarbeet-related commodities from processing firms and markets and distributes those products to end users (e.g., food manufacturing, grocery stores, livestock producers, export markets). Some sugarbeet-based feedstocks are sold directly to end users by the processing firms and were included in the processing segment.

Sugarbeet Research: This segment studies crop genetics, pathogens and diseases, plant pests, and other production-related issues associated with growing sugarbeets.

Data Collection and Study Methodology

All economic impact and contribution studies rely on financial and/or economic data. Data from secondary sources (e.g., other studies, statistical services, private data sets) can be used, but the most timely and defensible data relating to sales, employment, payroll and input purchase patterns comes directly from firms and associations. Other forms of data are typically available from government sources, such as employment and taxes, and often are combined with data from firms and associations.

Economic Contribution Analysis

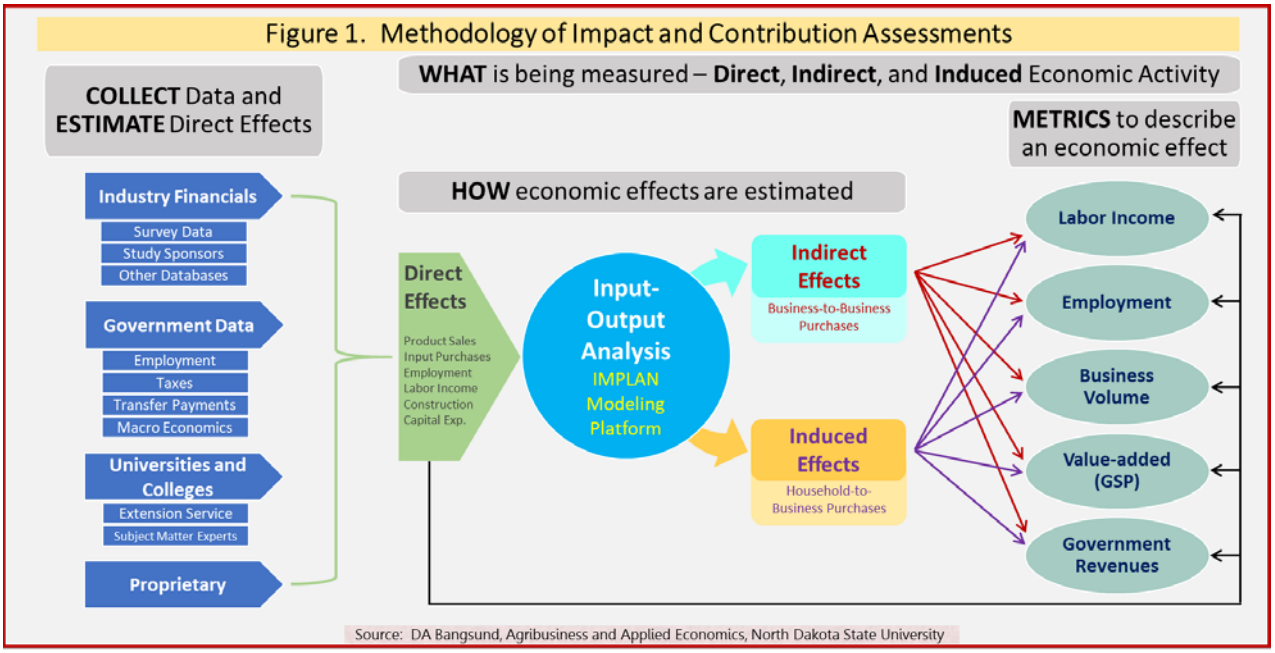
An economic contribution assessment measures the gross size of some component of an economy, and often makes comparisons of size to the overall composition of a given economy over a specified period. Size is estimated by combining direct or first-round effects (e.g., industry expenditures, business sales, employment) with economic modeling to estimate how first round effects generate business-to-business transactions and household spending for consumer goods and services. Economic effects are described in terms of labor income, employment, value-added, gross business volume and government revenues.

Input-Output (I-O) is a form of economic modeling often used in economic contribution assessments, and can be used to estimate both direct and secondary economic effects. I-O is a mathematical representation of the production and consumption of goods and services within a given economy and is premised on the notion of inter-industry transactions, where industries use products/services from other industries to generate their output, and outputs from one industry usually represent inputs to another industry (Appendix A). The basis for the interdependence (linkages) within input-output analysis between consuming and producing industries forms the foundation for development of multipliers. Multipliers are used to estimate

how changes in economic activity in a given sector or industry result in economy-wide secondary effects in other economic sectors.

Secondary economic effects result from changes in demand created by the first round (direct) effects and are delineated into indirect and induced economic effects. Both direct and secondary effects are describes in terms of labor income, employment, value-added, gross business volume and government revenues (Figure 1).

While input-output analysis is a popular methodology used by a host of different stakeholders, the methodology has a number of fundamental assumptions and limitations (see Appendix A for more discussion of input-output modeling). IMPLAN was the I-O platform used in this study.



Multiple Region Input-output Mapping

Input-output mapping refers to how modeling options and economic values are applied to an I-O matrix. The sugarbeet industry in the Red River Valley exists along a common border between Minnesota and North Dakota. The duality of the industry location and survey data identifying input purchases in each state was handled by applying a multiple region I-O (MRIO) analysis within the IMPLAN modeling platform. MRIO is a modeling process that assists in measuring cross-economy economic effects in both an originating and spillover economy(s), as opposed to measuring economic effects in a single, stand-alone economy typical of industry contribution analyses confined to a single state economy. Additional detail on the application of MRIO analysis for the sugarbeet industry is contained in Appendix B.

Developing Economic Sector Profiles

An industry balance sheet or economic profile is one of the most important elements in economic contribution studies. Nearly all key economic metrics have their origin within an industry's economic profile/sector. Information and data to create economic sector profiles were collected from survey data from industry firms, government agencies, farm production records and other secondary data.

While the IMPLAN modeling platform provides baseline economic profiles generated from proprietary estimation techniques applied to government data, this study relied on state-sourced data and industry input to create a customized I-O matrix. The process of developing study-specific economic profiles and modifying an I-O matrix is time consuming and requires considerable empirical analysis, but a customied I-O matrix produces a credible and transparent evaluation of an industry's role in an economy (Appendix B).

Sugarbeet Production

The following information related to sugarbeet production was collected for 2021:

- Revenue from processors
- Production acreage
- Production tonnage
- Insurance indemnities
- Government payments
- Input and service purchases
- Capital expenditures
- Cash rent
- Pre-tax net returns
- Wage and salary employment
- Number of sole-proprietors

Data for sugarbeet production was obtained from the survey of sugarbeet processors, Farm Financial Management Database (FINBIN), and National Crop Insurance Statistics. Sugarbeet production budgets are contained in Appendix C. While IMPLAN has a sugarbeet producing sector as part of its default I-O matrix, that sector was replaced with industry-based data.

Crop production generates economic effects from household spending of labor income (i.e., disposable income for laborers and sole proprietors), purchase of production inputs and services, and outlays for equipment, machinery and other capital acquisitions.

By definition within the IMPLAN modeling platform, capital expenditures arise from the use of Other Property Type Income (OPTI); however, OPTI does not generate indirect or induced effects. Capital expenditures were modeled independently from the custom sugarbeet production sector to estimate the economic effects from purchases of new buildings and structures, tractors, machinery, equipment, and other durable goods not consumed in one production cycle.

Cash rent can be included as proprietor income within a crop production sector profile, assigned to a real estate sector when treated as an intermediate input, or placed in OPTI. Cash rent (net of property tax) was placed in OPTI of the sugarbeet production sector profile. A share of cash rent paid by producers, net of property tax, was modeled as a revenue stream to in-state landowners. The revenue stream to in-state landowners represented a standalone event within IMPLAN, and manual adjustments were performed on IMPLAN output to avoid double counting of the portion of cash rent treated as landowner spending.

The importance of the cash rent adjustment is because IMPLAN's default treatment of cash rent assigns that production expense to a real estate sector as part of the sector's intermediate inputs, inferring rented cropland and the corresponding financial arrangements are facilitated by a third-party firm or company. This treatment by IMPLAN suggests that cropland rent generates a sizable amount of wage and salary employment in the real estate sector. Contrary to that situation, most cropland is rented with landowner-producer contracts, and is not facilitated via a land rental company. Another option is to treat cash rent as proprietor income within the crop production sector profile, but that technique distorts the economic profile of production.

Sugarbeet Processing

A confidential survey solicited operational expenditures and financial information from Minnesota and North Dakota (i.e., Red River Valley) sugarbeet processors (Appendix D). The survey had 100 percent participation from industry firms and represented economic activity associated with processing of the 2021 sugarbeet crop.

The following information was collected:

- Gross revenue (i.e., sugarbeet-based products produced in the tri-state region)
- Sugarbeet acreage
- Payments to sugarbeet growers
- Tons processed
- Wage and salary employment
- Wage and salary compensation
- Purchases of goods and services used for general operations and processing
- Taxes and government payments (e.g., licenses)
- Capital expenditures

Information on all financial questions, excluding gross revenue, included a total (i.e., total outlays for an expenditure regardless of where it was purchased) and a separate share of those total expenditures that were acquired from entities each of the study's three states (Minnesota, North Dakota, and South Dakota) (Appendix E).

Survey data was used to customize IMPLAN industry balance sheets for sugarbeet processing and marketing activities for Minnesota and North Dakota (see Appendix B for additional insights on customizing industry balance sheets). As part of the development of the economic profiles, customized spending patterns were developed for the industry

analysis. IMPLAN's MRIO analysis required a spending pattern to be applied to the linked state economies. For example, for processing operations in Minnesota, a separate spending pattern was developed and applied to the North Dakota matrix and another spending pattern was applied to the South Dakota matrix. The spending pattern for Minnesota processing activities used in the MRIO analysis included purchases made in the Minnesota economy (Appendix B).

Sugar Marketing and Sugarbeet Research

Sugar marketing was treated as a separate activity from processing even though marketing activities are closely associated with sugarbeet processing. Sugar marketers received a questionnaire similar to those for sugarbeet processors (Appendix D).

Data on sugarbeet research were obtained from inquiries to research staff at North Dakota State Unviersity (NDSU) and U.S. Department of Agriculture-Agricultural Research Service. Federal funding for sugarbeet research and approximated research program costs for sugarbeet research at NDSU were combined with IMPLAN data for wage rates and expenditure patterns for purchases of goods and services for related economic sectors. IMPLAN data were used to split research costs into labor income and input purchases.

Study Omissions and Limitations

A primary ommission and limitation in this study was information and statistics on the number of farm workers, growers, and co-op share holders. Government agencies do not track farm labor or sole-proprietors by farm commodity. The lack of official government estimates, by commodity, creates challenges for reporting employment relating to a single commodity or farm enterprise. Readily available secondary data (e.g., FINBIN database) also did not adequately address the unique use of seasonal labor by sugarbeet growers.

The U.S. Bureau of Economic Analysis (BEA) combines data from the Internal Revenue Service (IRS) to estimate sole proprietors (Appendix A). However, considerably ambiguity exists for on-farm employment. It is unknown to what degree short-term on-farm employment gets captured using the existing BEA and IRS criteria and measurement techniques. For example, if a person drives truck for a sugarbeet producer during harvest and receives sufficient compensation that the income must be reported on their personal income tax filings, it is unclear if that income is reported as trucking, farm labor, or filed in a manner that it does not get credited to production agriculture. If that individual also assists another producer during corn or bean harvest, income from multiple harvest activities may be reported as a single value on Schedule C or Schedule F federal income tax forms. In addition to these ambiguities, even if every individual that received short-term compensation related to harvest or other on-farm activites reported their 1099 income, there are no mechanisms to allocate employment reported by the BEA to specific farm commodities.

Sugarbeet harvest typically involves two 12-hour shifts of workers for several weeks. The manpower required to run harvesting equipment and transport beets to piling stations greatly exceeds the typical onfarm labor needs for farmers and producers and/or the contributions

made by extended family members during harvest. Seasonal labor, which consists consists of short term work during harvest is used to fill the harvest labor gap. In conversations with those familiar with the labor requirements for sugarbeet harvest, the temporary labor needed during harvest does not appear to be adequately represented in the Farm Financial Management Database (FINBIN). The inadequacy of the FINBIN data to address the harvest labor issue was discovered at the end of the study. Clearly, additional data is needed to generate accurate estimates of season employment related to the fall harvest.

Another challenge is providing estimates of direct employment for sugarbeet growers. The number of growers is considerably larger than would be the estimates of direct labor (i.e., sole proprietors) for sugarbeet production. IMPLAN's estimate of direct employment in sugarbeet production was used in this study, and represents those producers for which sugarbeet production is greater than half of their operation's gross revenues. Given typical operating acreage and typical crop rotations, that condition places a high threshold to count a sugarbeet grower as one direct job in sugarbeet production. From the perspective of how federal agencies measure employment, an individual farmer is counted as one job eventhough most farmers raise several crops.

A headcount of growers and individuals working during harvest would represent an alternative to labeling all onfarm labor as direct employment. However, head counts of growers and harvest laborers must be carefully articulated to not be confused with government definitions of employment. This limitation also extends to the number of share holders. Shareholders may in some instances be producers and in other instances simply hold the shares and rent/lease those shares to producers.

Contrary to some expectations, the Census of Agriculture does not count employment. Rather, the Census of Agriculture is a head count of individuals involved in production agriculture. In some cases a direct job may be occupied by one individual, but in other cases, several individuals could fill the role of one job during the course of a production cycle. Therefore, Census of Agriculture head counts cannot be defined as jobs.

Future assessments should include estimates of head counts of producers, growers, harvest laborers, and share holders; however, those estimates should be presented as separate statistics. Short-term labor might be more accurately described in full-time job equivalents.

Industry Direct Effects

Direct output (sales) of the industry in the tri-state region was estimated at $3.55 billion (Table 1). About 44 percent of the industry's output was associated with sugarbeet production and research with the remaining 56 percent attributable to sugarbeet processing and sugar marketing.

Total direct employment for sugarbeet production and research was 1,840 jobs, which included about 765 wage and salary jobs. By comparison, direct employmet in the tri-state region for sugarbeet processing and marketing was estimated at 2,560 jobs. Total direct employment in the industry was over 4,410 jobs (Table 1). An additional 880 jobs were reported by the processors as short-term seasonal employment during the harvest campaign, but the processing firms indicated those jobs do not represent employees, nor was it clear if those jobs were filled by more than one individual for any given job.

Table 1. Economic Sector Profiles, Sugarbeet Industry, Minnesota and North Dakota, 2021/2022

Sector Profile Components	Sugarbeet Processing and Marketing	Sugarbeet Production and Research
	---------- 000s nominal $ ----------	
Output (sales)	$2,475,432	$1,078,398
Employment (jobs)	2,561	765
Employment Compensation	$272,597	$46,282
Proprietors (jobs)	---	1,074
Sole Proprietor Income	---	$407,912
Property-type Income	$267,932	$100,200
Tax on Production and Inputs	$17,418	$15,046
Total Value-added	$557,946	$567,504
Intermediate Inputs	$1,917,486	$514,028
Intermediate Inputs purchased in MN, ND, and SD	$1,525,320	$510,894
Intermediate Inputs purchased in MN, ND, and SD, excluding payments to growers	$453,078	not applicable

Notes: Separate customized industry profiles for Minnesota and North Dakota were used in the analysis but have been combined for presenting survey data to avoid disclosing confidential information. Sector profile definitions are contained in Appendix A.

Sources: Farm Financial Management Data Base, Survey of Processors, IMPLAN (2022).

Labor income is the combination of direct compensation and employment-related benefits for wage and salary jobs and also includes income from self-employment. In the case of sugarbeet production, net returns from growing sugarbeets represent labor income for self-employed farmers and producers. Sole proprietor income was estimated at over $400 million. Aditional employment compensation for wage and salary workers in sugarbeet production and employment compensation for research staff was $46.3 million. Labor income for sugarbeet processing and marketing was $272.6 million (Table 1).

Purchases of goods and services also has substantial economic effects on Minnesota and North Dakota economies. The industry purchased over $2.4 billion in goods and services in 2021/2022, and of that total, $2 billion worth of goods and services were acquired from entities in the tri-state region (Table 1).

The majority, $1.9 billion, of all industry purchases were made by the processing and marketing segments of the industry. Purchases from entities and sources in the tri-state region were estimated at $1.5 billion and purchases outside of the study states was estimated at $398 million. Of the $1.5 billion spent in the study states, nearly $1.1 billion represented payments to producers in Minnesota and North Dakota (Table 1). The processors did not list any producers raising sugarbeets in South Dakota. Of the remaining $453 million spent in the tri-state region that excludes payments to growers, $261 million was spent in MN and $192 was spent in ND (Table 2).

Table 2. Distribution of Input Purchases and Capital Expenditures, Sugarbeet Processing and Sugar Marketing, Minnesota and North Dakota, 2021/2022

	Purchases of Goods and Services by Sugarbeet Processors					
	Operations in MN			Operations in ND		
Generalized Spending Category	Purchases in MN	Purchases in ND	Purchases in Other States	Purchases in MN	Purchases in ND	Purchases in Other States
	000s nominal $					
Administration and General Operations	29,052	15,756	41,134	10,802	15,485	26,730
Inbound/outbound Freight	70,604	35,449	58,565	18,392	16,712	9,228
Miscellaneous	1,172	354	2,616	664	230	3,498
Plant Maintenance	22,661	23,964	25,812	14,502	27,273	16,255
Processing Materials	33,582	12,267	139,295	9,939	17,572	72,220
Sugarbeets	390,627	192,453	0	290,304	192,553	0
Utilities	38,105	5,764	3,120	11,189	21,585	0
Total	585,806	286,007	270,542	355,792	291,410	127,930
Capital Expenditures	32,816	14,402	32,069	18,854	7,186	20,217

Notes: Processors did not reveal any direct purchases in South Dakota. Purchases in other states represent geography outside the three-state region. Operations were defined by location of processing plants.
Source: Survey of Processors

Industry Contribution

The economic contribution of the sugarbeet industry in Minnesota, North Dakota, and South Dakota was based on production year 2021 and the processing campaign encompassing the last quarter of 2021 and the first three quarters of 2022.

Industry Size

Sugarbeet acreage in 2021 was 638,200 planted and 605,200 harvested acres in Minnesota and North Dakota. Sugarbeets were not raised in South Dakota. The industry processed 16.9 million tons of sugarbeets.

Direct employment in the three states for all segments of the industry was estimated to be 4,410 jobs, which includes labor at processing plants and processing firms, sole proprietors and hired workers for sugarbeet production, employment in sugar marketing firms, and technicians associated with sugarbeet research. Indirect and induced economic activity supported 11,900 jobs (Table 3). Total employment associated with the industry was estimated at 16,310 jobs. Seasonal labor, as reported by the processors, was considered a standalone metric and was reported to be 882 jobs. Seasonal labor, as reported by the processing firms, does not represent employees of the processing firms.

Table 3. Direct, Indirect, and Induced Economic Effects, Key Economic Metrics, Sugarbeet Industry, Minnesota, North Dakota, and South Dakota, 2021/2022

Type of Economic Effect	Employment[1]	Labor Income	Value-added	Output
		millions nominal $		
Direct	4,410	726.8	2,167.6	3,558.9
Indirect	5,660	472.1	766.5	1,463.7
Induced	6,240	372.2	636.1	1,107.6
Total	16,310	1,571.2	3,570.2	6,130.2

[1]Employment does not include seasonal jobs. Processors estimated seasonal employment, not considered employees of the processing firms, to be 494 jobs in MN and 388 in ND. Compensation for seasonal labor is contained in indirect effects.

Labor income for direct employment, which includes wages, salaries, paid benefits, and sole proprietor's income, was $727 million (Table 3). Labor income from indirect and induced effects was estimated at $840 million. Labor income from all economic effects was $1.57 billion. Based on industry survey data, compensation for seasonal labor was reported to be $28 million and was included as labor income for indirect economic effects.

Value-added from direct operations of the industry was nearly $2.2 billion in North Dakota, Minnesota and South Dakota. Indirect and induced economic effects contributed another $1.4 billion in value-added. The sugarbeet industry contributed nearly $3.6 billion to the gross state products of North Dakota, Minnesota and South Dakota.

Direct output of the industry was estimated at nearly $3.6 billion. Indirect and induced economic effects added another $2.5 billion in output. Direct and secondary output (gross business income) was estimated at $6.1 billion.

Economic Contribution by Economic Sector

As would be expected, output for all segments of the industry in the three states revealed a heavy concentration in the agriculture and manufacturing sectors (Figures 2 through 4). Wholesale trade also had high levels of economic activity, due in part to sugar marketing and input purchases by producers and processors.

Gross business volume in the remaining sectors is largely comprised of indirect and induced effects. Economic sectors with noticeable levels of indirect and induced economic activity included transportation, finance and insurance, real estate and leasing, health care, retail trade, utilities, and professional services.

Figure 2. Sugarbeet Industry Direct and Supported Employment, by Economic Sector, Minnesota, North Dakota, and South Dakota

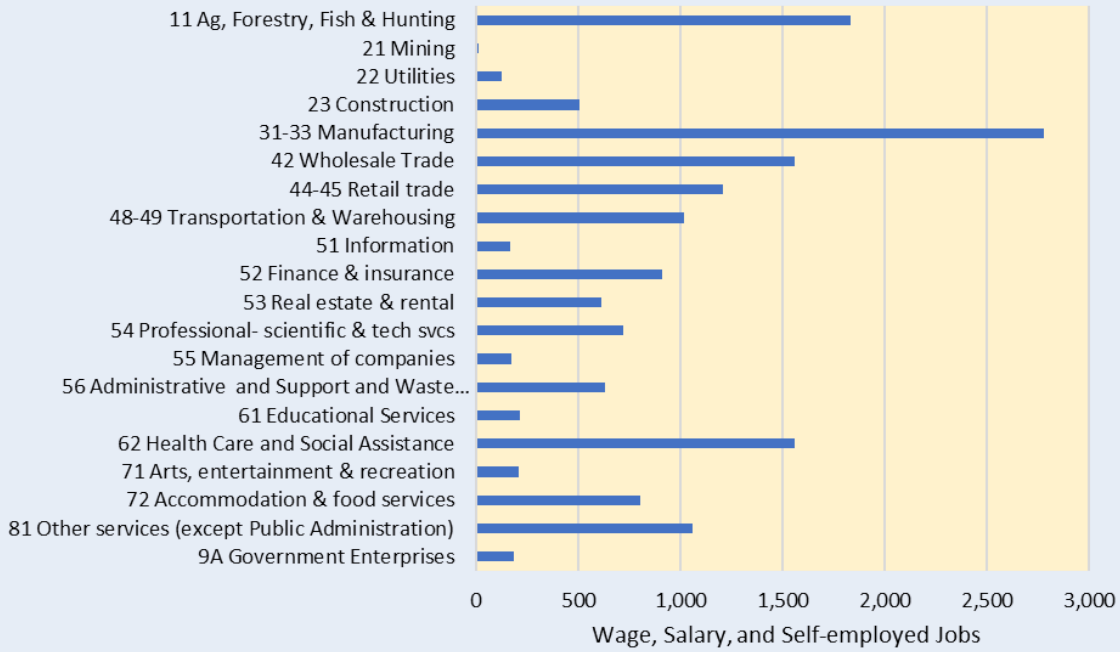


Figure 3. Sugarbeet Industry Direct and Supported Labor Income, by Economic Sector, Minnesota, North Dakota and South Dakota

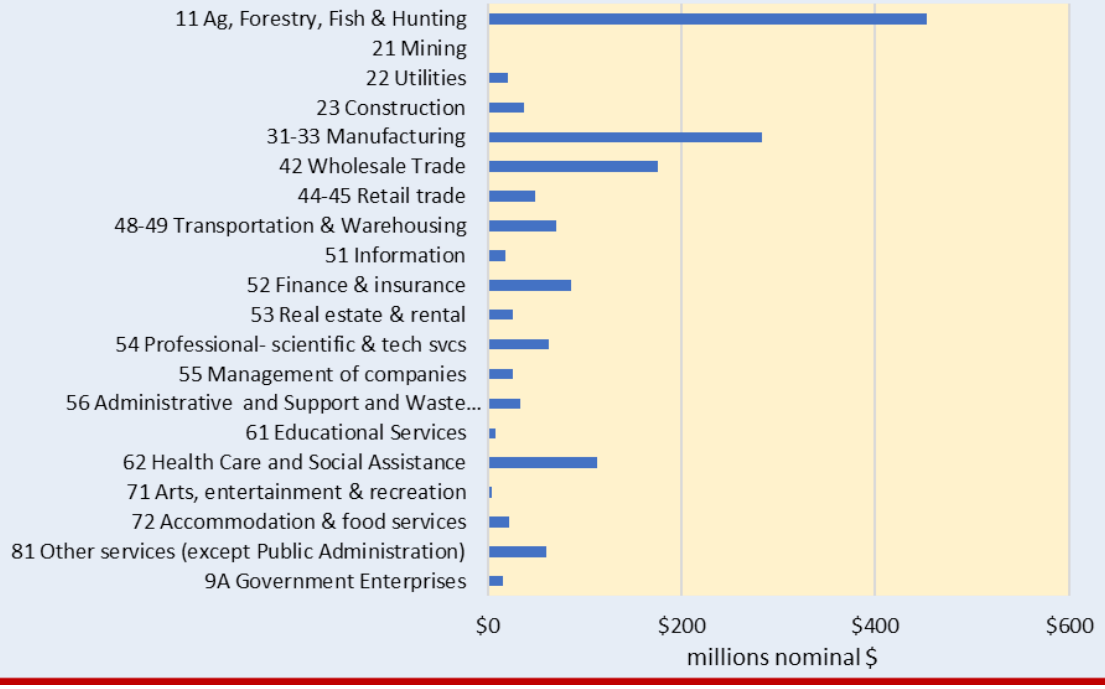
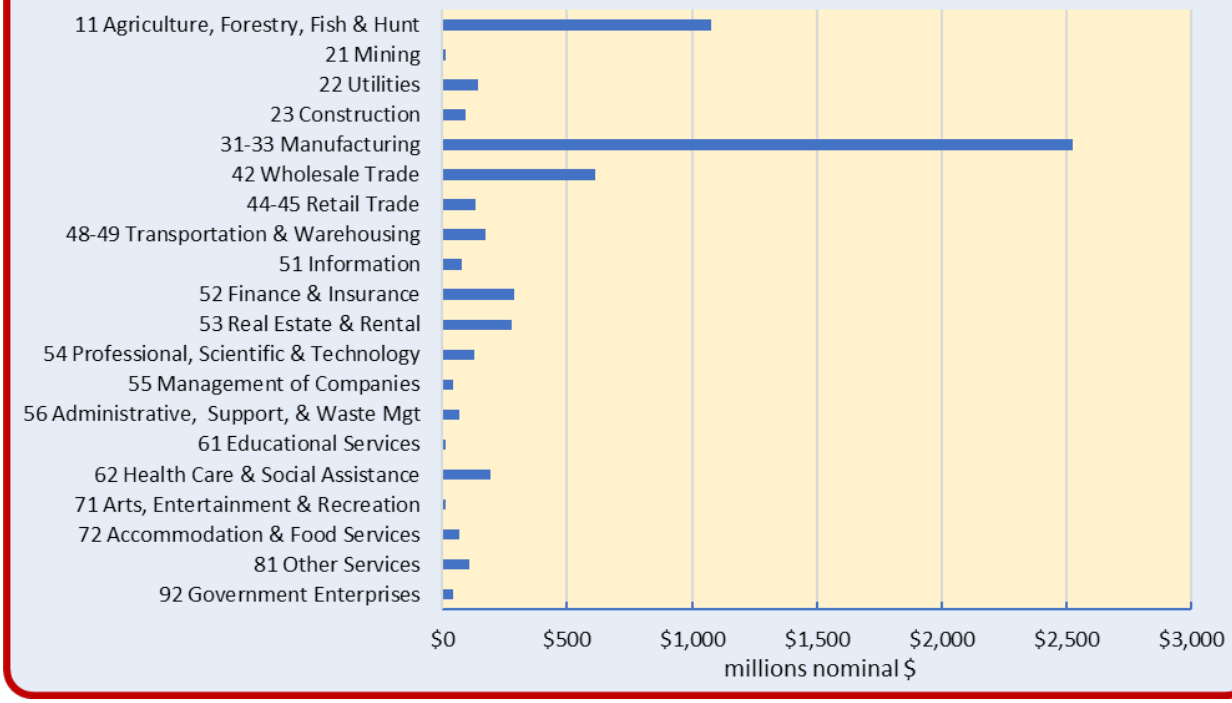


Figure 4. Sugarbeet Industry Direct and Supported Business Volume, by Economic Sector, Minnesota, North Dakota and South Dakota



Economic Contribution by State

State-level economic contribution was calculated by combing economic effects associated with all industry segments. Individual industry segments by state are not reported to protect confidentiality of individual firms.

Minnesota

In Minnesota, the industry had 2,610 direct jobs during the 2021-2022 study period. Total employment (direct and secondary) was estimated at 10,260 jobs (Table 4). Labor income associated with direct employment was $434 million. Indirect and induced economic effects were responsible for another $566 million in labor income. The industry contributed $2.2 billion to the state's gross state product. Gross business volume for the industry was $3.85 billion (Table 4).

Table 4. Direct, Indirect, and Induced Economic Effects, Key Economic Metrics, Sugarbeet Industry, Minnesota, 2021/2022

Type of Economic Effect	Employment[1]	Labor Income	Value-added	Output
		millions nominal $		
Direct	2,610	433.6	1,246.8	2,171.2
Indirect	3,430	303.0	488.5	908.7
Induced	4,220	263.0	454.4	773.7
Total	10,260	999.6	2,189.7	3,853.5
Share of Industry[2]	62.9%	63.6%	61.3%	62.9%

[1]Employment does not include seasonal jobs. Processors estimated seasonal employment, not considered employees, to be 494 jobs in MN. Compensation for seasonal labor is contained in indirect Labor Income.

[2]Industry defined as production, processing, marketing, and research in Minnesota, North Dakota, and South Dakota. Sidney Sugars was not included in the study.

North Dakota

In North Dakota, the industry had 1,800 direct jobs during the 2021-2022 study period. Total industry employment (direct and secondary) was estimated at nearly 6,000 jobs (Table 5). Labor income associated with direct employment was estimated at $293 million. Indirect and induced economic effects contributed another $274 million to labor income. The industry contributed $435 million to gross state product. Gross business volume for the industry in North Dakota was nearly $2.26 billion.

Table 5. Direct, Indirect, and Induced Economic Effects, Key Economic Metrics, Sugarbeet Industry, North Dakota, 2021/2022

Type of Economic Effect	Employment[1]	Labor Income	Value-added	Output
		millions nominal $		
Direct	1,800	293.2	920.9	1,387.7
Indirect	2,200	167.5	275.5	549.4
Induced	1,990	107.4	178.4	328.1
Total	5,990	568.1	1,374.8	2,265.2
Share of Industry[2]	36.7%	36.2%	38.5%	37.0%

[1]Employment does not include seasonal jobs. Processors estimated seasonal employment, not considered employees, to be 388 jobs in ND. Compensation for seasonal labor is contained in indirect Labor Income.

[2]Industry defined as production, processing, marketing, and research in Minnesota, North Dakota, and South Dakota. Sidney Sugars was not included in the study.

South Dakota

Study sponsors requested an estimate of the economic activity generated by the industry in South Dakota, despite the industry having no direct activities in the state. Therefore, the economic contribution of the sugarbeet industry in South Dakota was limited to indirect and induced economic activities that resulted from industry operations in North Dakota and Minnesota. Industry survey data indicated that marketers acquired some goods and services in South Dakota, but since those acquisitions originated from operations in either North Dakota or Minnesota, those purchases are classified as indirect economic effects for South Dakota's economy.

Indirect and induced economic effects in South Dakota were estimated to support 60 jobs, generate labor income of $3.5 million, and a gross business volume of $11 million (Table 6).

Table 6. Direct, Indirect, and Induced Economic Effects, Key Economic Metrics, Sugarbeet Industry, South Dakota, 2021/2022

Type of Economic Effect	Employment	Labor Income	Value-added	Output
		millions nominal $		
Direct	---	---	---	---
Indirect	25	1.6	2.5	5.6
Induced	35	1.9	3.2	5.8
Total	60	3.5	5.7	11.4
Share of Industry[1]	0.37%	0.22%	0.16%	0.19%

[1]Industry defined as production, processing, marketing, and research in Minnesota, North Dakota, and South Dakota. Sidney Sugars was not included in the study.

Economic Contribution by Industry Segment

Sugar marketing was combined with sugarbeet processing for purposes of reporting study results. Similarly, sugarbeet research was combined with sugarbeet production. Individual state results were combined to examine the relative contribution of sugarbeet production versus sugarbeet processing.

Sugarbeet processing supported 52 percent of all employment compared to 48 percent for production-related activities. (Table 7). The primary difference was in direct employment as secondary employment between the two segments was similar.

Table 7. Direct, Indirect, and Induced Economic Effects, Key Economic Metrics, by Industry Segment, Sugarbeet Industry, Minnesota, North Dakota, and South Dakota, 2021/2022

Industry Segment / Type of Economic Effect	Employment[1]	Labor Income	Value-added	Output
Processing and Marketing		millions nominal $		
Direct	2,560	272.6	1,598.2	2,475.4
Indirect	3,060	241.4	367.6	753.9
Induced	2,890	172.1	294.0	512.4
Total	8,510	686.2	2,259.8	3,741.8
Share of Totals	52.2%	43.7%	63.3%	61.0%
Production and Research				
Direct	1,840	454.2	569.5	1,083.5
Indirect	2,600	230.7	398.9	709.8
Induced	3,350	200.1	342.1	595.2
Total	7,790	885.0	1,310.5	2,388.5
Share of Totals	47.8%	56.3%	36.7%	39.0%

[1]Employment does not include seasonal jobs. Processors estimated seasonal employment, not considered employees, to be 494 jobs in MN and 388 in ND. Compensation for seasonal labor is contained in indirect effects for Labor Income.

While sugarbeet processing supported more employment, sugarbeet production generated more labor income, $454 million in labor income for production and research compared to $273 million for processing and marketing. The primary reason was high net returns for sugarbeet production in 2021.

In contrast to labor income, sugarbeet processing contributed more to gross state product than sugarbeet production. Due to the definition of what constitutes value-added affects, production agriculture typically does not generate relatively large contributions to gross state product.

Sugarbeet processing had 61 percent of the industry's gross business volume, $3.7 billion compared to $2.4 billion for sugarbeet production (Table 7). Secondary business volume was similar between the two segments. The primary difference in gross business volume between the industry segments was direct output associated with sugarbeet processing.

Government Revenues

Government revenues demonstrate an industry's support for public services. In North Dakota, the most common sources of in-state public revenues are severance taxes, sales and use taxes, property taxes, and income taxes. Minnesota does not collect severance taxes to the degree found in North Dakota, and has greater reliance on personal income and corporate income taxes. South Dakota does not have an income tax, but does rely on sales tax and other government revenues. Local governments in all three states rely heavily on property taxes.

All Government Revenues

The sugarbeet industry was estimated to contribute $43.7 million in government revenues directly from the individuals working in the industry and from firms in the industry (Table 8). Tax revenues from secondary business activity were estimated to generate an additional $152.6 million in state and local government revenues. A total of $196.2 million in state and local tax revenues was generated by the sugarbeet industry in Minnesota, North Dakota, and South Dakota (Table 8)

Table 8. State and Local Government Revenues, Sugarbeet Industry, Minnesota, North Dakota, South Dakota, 2021/2022

Source of Information and Type of Government Revenue	Paid Directly by the Industry	Collected from Indirect and Induced Activity	Total Collections
	---------- 000s nominal $ ----------		
Survey of Industry Firms			
Sales, Property, and Corporate Income Taxes	21,390.2	---	21,390.2
Non-taxes	1,214.8	---	1,214.8
IMPLAN Analysis and Other Secondary Sources			
Social Insurance Tax	622.4	1,197.9	1,820.3
Personal Income Tax	18,193.7	21,655.4	39,849.1
Sales Tax	grouped above	59,857.1	59,857.1
Property Tax	110.7	52,544.2	52,654.9
Corporate Income Tax	grouped above	6,409.8	6,409.8
Other Taxes	1,512.4	8,116.1	9,328.5
Non-Taxes	612.0	2,796.8	3,408.8
Totals	43,656.2	152,577.3	196,233.5

Government Revenues by State

State and local government revenues were compiled for Minnesota and North Dakota. Government revenues in South Dakota were estimated at $377,000 and are not presented in the following tables.

Minnesota

The sugarbeet industry in Minnesota was estimated to directly contribute $31.7 million in government revenues as a result of payroll, income and other taxes on individuals working in the industry and tax payments made directly from processing and marketing firms (Table 9). Tax revenues from secondary business activity were estimated to generate an additional $126 million in state and local government collections. A total of $157.8 million in state and local government revenues was generated by the sugarbeet industry in Minnesota.

Table 9. State and Local Government Revenues, Sugarbeet Industry, Minnesota, 2021/2022

Source of Information and Type of Government Revenue	Paid Directly by the Industry	Collected from Indirect and Induced Activity	Total Collections
	---------- 000s nominal $ ----------		
Data from Survey of Industry Firms			
Sales, Property, and Corporate Income Taxes	13,537.9	---	13,537.9
Non-taxes	951.1	---	951.1
IMPLAN Analysis and Other Secondary Sources			
Social Insurance Tax	53.3	144.4	197.7
Personal Income Tax	15,894.0	19,680.0	35,574.0
Sales Tax	grouped above	48,520.4	48,520.4
Property Tax	110.7	43,825.3	43,936.0
Corporate Income Tax	grouped above	5,403.7	5,403.7
Other Taxes	981.1	6,325.8	7,306.9
Non-Taxes	213.7	2,205.9	2,419.6
Totals			
Totals	31,741.8	126,105.5	157,847.3

North Dakota

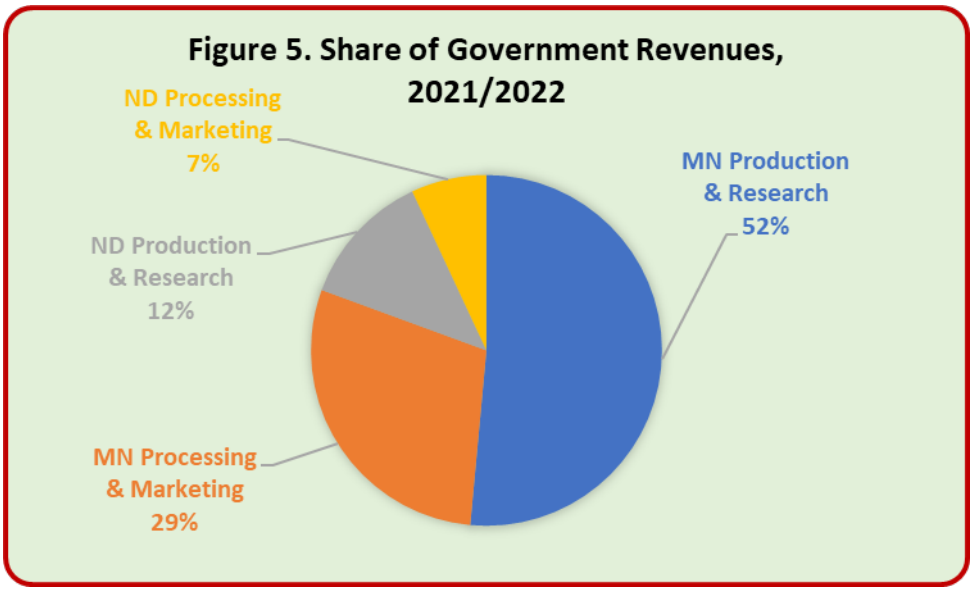
The sugarbeet industry in North Dakota was estimated to directly contribute $11.9 million in government revenues from payroll, income and other taxes on individuals working in the industry and payments made directly from processing firms (Table 10). Tax revenues arising from secondary business activity were estimated to generate an additional $26 million in state and local government collections. A total of $38 million in state and local government revenues was generated by the sugarbeet industry in North Dakota (Table 10).

Table 10. State and Local Government Revenues, Sugarbeet Industry, North Dakota, 2021/2022

Source of Information and Type of Government Revenue	Paid Directly by the Industry	Collected from Indirect and Induced Activity	Total Collections
	---------- 000s nominal $ ----------		
Data from Survey of Industry Firms			
Sales, Property, and Corporate Income Taxes	7,852.3	---	7,852.3
Non-taxes	263.7	---	263.7
IMPLAN Analysis and Other Secondary Sources			
Social Insurance Tax	569.1	1,053.5	1,622.6
Personal Income Tax	2,299.7	1,975.4	4,275.1
Sales Tax	grouped above	11,132.7	11,132.7
Property Tax	grouped above	8,581.8	8,581.8
Corporate Income Tax	grouped above	1,006.1	1,006.1
Other Taxes	531.3	1,762.4	2,293.7
Non-Taxes	398.3	582.7	981.0
Totals	11,914.4	26,094.6	38,009.0

Government Revenues by Industry Segment

When evaluated by industry segment, nearly two-thirds (64 percent) of local and state government revenues were generated by sugarbeet production activities. Excluding government revenues generated in South Dakota, over 80 percent of government revenues for the entire industry were generated in Minnesota compared to 19 percent in North Dakota (Figure 5).



Share of State Economy

Describing industry activities as a share of a statewide economy is helpful to put an industry's contribution into context. The sugarbeet industry is one of only a few agricultural industries in North Dakota and Minnesota where production and processing are contained in-state. While acreage and economic output from sugarbeet production is smaller than that of major crops like corn and soybeans, regionally, the industry generates substantial economic activity with a relatively small amount of acreage.

Minnesota

Across the key economic metrics measured in this assessment, the sugarbeet industry in Minnesota represented about 0.5 percent of the state's economy. The industry represented 0.4 percent of the state's labor income and 0.5 percent of the state's gross state product and gross business volume (Table 11). Industry activities supported about 0.3 percent of the state's total employment, wage and salary jobs, and self-employed individuals (Table 12).

Table 11. Annual Share of State Totals, Sugarbeet Industry, Minnesota, 2021				
Industry Segment	Labor Income	Value-added (GSP)	Total Output	State and Local Government Revenues
State-level Values for 2021	$266.2 billion	$417.3 billion	$761.4 billion	$59.6 billion
Processing and Marketing	0.2%	0.3%	0.3%	0.1%
Production and Research	0.2%	0.2%	0.2%	0.2%
All Segments	0.4%	0.5%	0.5%	0.3%

Table 12. Annual Share of State Employment, Sugarbeet Industry, Minnesota, 2021			
Industry Segment	Total Employment	Wage and Salary	Self-employed
State-level Values for 2021	3,640,796	2,925,423	715,373
Processing and Marketing	0.15%	0.11%	0.14%
Production and Research	0.13%	0.21%	0.14%
All Segments	0.27%	0.32%	0.28%

North Dakota

Across the key economic metrics measured in this assessment, the sugarbeet industry in North Dakota ranged from 1.5 to 1.8 percent of the state economy. The industry represented 1.5 percent of the state's labor income and 1.8 percent of the state's gross state product (Table 13). Industry activities supported 1 percent of the state's total employment, wage and salary jobs, and self-employed individuals (Table 14).

Table 13. Annual Share of State Totals, Sugarbeet Industry, North Dakota, 2021

Industry Segment	Labor Income	Value-added (GSP)	Total Output	State and Local Government Revenues
State-level Values for 2021	$37.3 billion	$77.0 billion	$142.7 billion	$9.954 billion
Processing and Marketing	0.7%	1.2%	1.0%	0.1%
Production and Research	0.8%	0.6%	0.6%	0.2%
All Segments	1.5%	1.8%	1.6%	0.4%

Table 14. Annual Share of State Employment, Sugarbeet Industry, North Dakota, 2021

Industry Segment	Total Employment	Wage and Salary	Self-employed
State-level Values for 2021	557,702	434,811	122,691
Processing and Marketing	0.6%	0.7%	0.4%
Production and Research	0.5%	0.4%	0.6%
All Segments	1.1%	1.1%	1.0%

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Appendix A

Economic Impact and Contribution Assessments

Outline for Economic Impact and Contribution Assessments

Overview

Input-Output Analysis

Types of Economic Evaluations

- Impact Assessments
- Contribution Assessments

Types of Economic Causality

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- Indirect Effects
- Induced Effects

Types of Economic Activity

- Value Added
- Total Economic Output
- Employment and Employment Compensatoin
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IMPLAN Economic Modeling

- Industry Change
- Industry Spending Patterns
- Labor Income Change
- Household Income Change
- Institutional Spending Patterns

IMPLAN Fiscal Methodology

IMPLAN Fiscal Data Sources and Treatment of Tax Data

- National Income and Product Account Tables
- Consumer Expenditure Survey (CES).
- Annual Survey of State and Local Government Finances (SLGF)
- Regional Economic Accounts (REA)
- Employee-paid portion for State/Local social insurance
- Employer-paid portion for State/Local social insurance funds.
- State/Local social insurance paid by self-employed.
- Sales Taxes on “Other Property Type Income” (TOPI) paid to State and Local Governments
- TOPI property taxes paid to State and Local Governments
- TOPI motor vehicle license taxes paid to State and Local Governments
- TOPI severance taxes paid to State and Local Governments

IMPLAN Fiscal Data Sources and Treatment of Tax Data (continued)

TOPI other taxes paid to State and Local Governments
TOPI non-taxes paid to State and Local Governments
Personal income tax payments to State and Local Governments
Personal non-tax payments to State and Local Governments
Personal motor vehicle fee payments to State and Local Governments
Personal property tax payments to State and Local Governments
Personal other tax payments to State and Local Governments
State/Local Government Dividends
State/Local Government corporate profits tax
Employee-paid portion for Federal social insurance
Employer-paid portion for Federal social insurance
Self-Employed contribution to Federal social insurance
TOPI Federal Excise Taxes
TOPI Federal Custom Duties
TOPI Federal Non-taxes
Personal Income taxes paid to the Federal Government
Federal Corporate profits tax

Employment Sources and Measures

Covered Employment

Uncovered Employment

Overview

Economic impact and contribution assessments measure the economic activity from a project, program, policy, or activity. Economic activity is categorized into direct and secondary impacts. Direct impacts are those changes in output, employment, or income that represent the initial or first-round effects of a project, program, or event. Secondary impacts result from subsequent rounds of spending and re-spending within an economy.

Direct economic impacts are usually measured as injections (or reductions) of money into a specified economy. Direct impacts therefore represent inputs into an economic model to trace linkages among sectors of an economy and calculate various forms of business activity resulting from a direct impact in an economic sector.

Input-Output Analysis

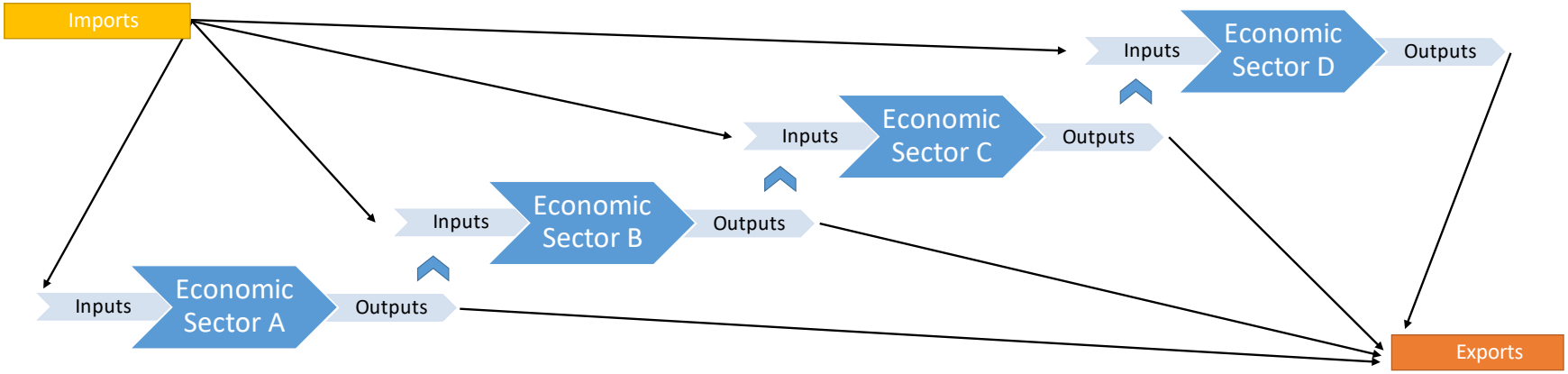
Input-output (I-O) analysis is a mathematical representation of the production and consumption of goods and services within a given economy. The basic premise to I-O modeling can be traced to economic base theory, or the understanding that a given economy is comprised of both 1) economic sectors or industries which produce goods/services for export outside the economy (basic sectors) and 2) economic sectors which produce goods/services within the economy for use by those exporting industries (non-basic sector). However, most current I-O modeling platforms do not limit economic activity in non-basic sectors to be driven or determined entirely by basic sector output.

Input-output analysis is premised on the notion of inter-industry transactions, where industries use products/services from other industries to generate their output, and outputs from one industry usually represent inputs to another industry. The basis for the interdependence (linkages) within I-O analysis between consuming and producing industries forms the foundation for development of multiplier effects. Multiplier effects can then be used to estimate how initial changes in economic activity result in economy-wide changes in a given area and represent the core component of input-output analysis.

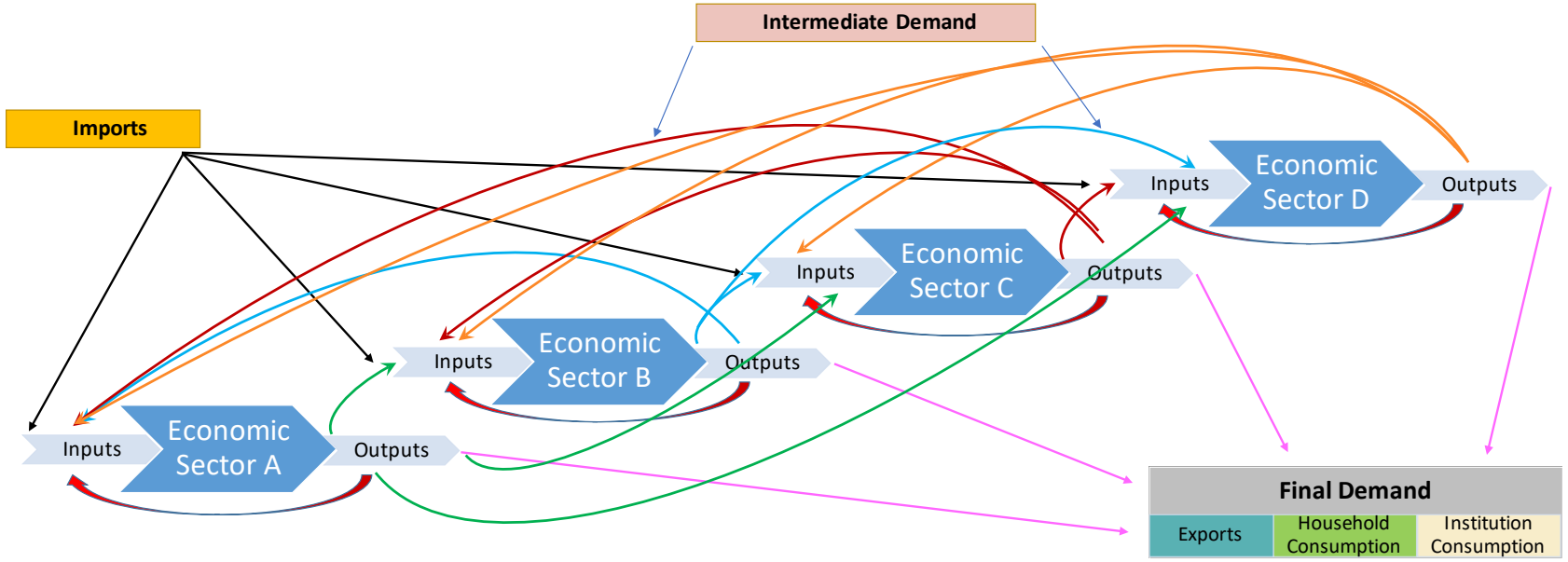
While I-O analysis is a popular methodology used by a host of different stakeholders, the methodology has a number of fundamental assumptions or limitations. Key assumptions in I-O methodologies include 1) the economy is in equilibrium, 2) any expansion or contraction is linear, constant, and fixed, 3) no price and substitution effects, and 4) no supply constraints. This means that I-O models are a static representation of an economy and do not provide for dynamic adjustments that are likely to occur in an economy, especially those relating to large, fundamental changes in the size or structure of an area's key industries.

Since I-O models are widely available and used, output from those models is often accepted without much scrutiny. Despite development and use of other modeling processes (e.g., general equilibrium models) to mitigate the limitations and shortcomings of I-O modeling, I-O analysis remains the most widely used approach to conducting economic impact and contribution assessments.

Economic sectors are linked through production and consumption and economies are not self-contained



Tracking consumption and production is best handled using a matrix



		List of Consuming Sectors (called **Industries**)						Institutions (considered **Final Users**)				
		Industry A	Industry B	Industry C	Industry D	Industry E	Industry (n)	Private Consumption	Private Investment	Net Exports	Gov't	Total
List of Producing Industries (called **Commodities**)	Industry A	**Intermediate Inputs**						**Final Use (Final Demand)**				**Total Gross Output**
	Industry B											
	Industry C											
	Industry D											
	Industry E											
	Industry (n)											
	Labor Compensation	**Value-added**						**GDP**				
	Taxes											
	Gross Surplus											
	Total	**Total Gross Output**										

-) Each industry is measured for its production and for its consumption.

-) Rows are dollars spent on commodities (goods and services) by other economic sectors, households, and government.

-) Total gross output is the market value of all commodities and goods produced—total production must equal total consumption.

-) Column totals are expenditures (purchases) for commodities (goods and services), labor, and taxes for all consuming industries.

-) GDP can be measured by examining consumption (sum of rows) or through the net value-added from production (sum of columns).

Types of Economic Evaluations

Input-Output analysis provides a tool for economists to perform ***economic impact*** and ***economic contribution*** analyses. These analyses can be applied to programs, projects, developments, industries, and other economic activities. Key macro-economic indicators such as employment, employment compensation, labor income, value-added output, gross business activity, selected government tax volume, and secondary (indirect and induced) economic effects using the above metrics can be estimated using input-output analysis.

Economic impact analysis estimates the change in key economic indicators resulting from 'new' dollars (either gained or lost) associated with economic conditions within a given economy. An economic impact analysis measures the net effect of two possible situations–often these situations would be the presence or absence of some type of economic activity, development, or program. Measures of the business activity generated in secondary industries are included in economic impact figures.

Economic contribution analysis differs in that it includes all relevant revenues and expenditures in the generation of the amount of economic activity created in an economic unit. Economic contribution analyses attempt to capture all economic activity without regard to the net change or value of alternative economic activities; therefore, economic contribution assessments provide measures of the gross effects. Typically, an economic contribution analysis will show more economic activity than found in an economic impact study for the same industry or activity. Measures of the business activity generated in secondary industries are included in economic contribution figures.

Types of Economic Causality

Direct Economic Effects: Direct economic effects represent the first-round of payments for services, labor, and materials. Direct effects can be interpreted to represent jobs, labor income, and business activity that comprise an industry.

Indirect Economic Effects: Indirect economic effects arise from the additional consumption of goods and services triggered by businesses that supply inputs to firms in a given sector/industry. Indirect effects can be interpreted as the additional economic activity created through purchases by businesses.

Induced Economic Effects: Induced economic effects arise from the additional spending by households from changes in personal income associated with direct effects and indirect effects. Changes in personal income can come from payrolls of businesses that are directly impacted, changes in payroll from businesses that supply goods and services to an impacted sector (induced effects), and proprietor income resulting from a change in business volume. Induced effects measure the additional business activity that is triggered as changes in personal income are translated into the purchase of goods and services for personal consumption.

Types of Economic Activity

Value-added Effects: Value-added economic activity is a measure of the payment to labor and capital, and includes labor income, business taxes, and business/proprietor income (profit). This economic effect is sometimes referred to a measure of the value that is added to purchased inputs by a business or industry, and is analogous to gross state product. The use or consumption of goods and services in the production of another good or service is not included in value-added measures.

Total Economic Output: Total output is a measure of the business activity created by summing direct economic effects, indirect economic effects, and induced economic effects. This economic measure is sometimes called *gross business volume*. Total output therefore represents the sum of gross receipts of all economic sectors.

Employment and Employment Compensation: Employment is perhaps one of the most important economic measures associated with impact and contribution assessments. Direct employment represents the jobs employed by the business or economic sector for which the activity or event is being modeled. I-O analysis also estimates employment associated with indirect and induced economic effects. Changes in employment compensation include wages, salaries, and employment benefits linked to changes in employment levels.

Proprietor Income: Income to individuals associated with sole proprietorships, partnerships, tax-exempt cooperatives, or other self-employment. Does not include any dividends, interest, or rental income, but does include capital consumption allowance found on Federal Tax form 1040C. Individuals receiving Tax Forms 1099 would be counted as sole-proprietors and compensation would be treated as proprietor income.

Labor Income: Labor income is often interchanged with employment compensation, but labor income is a broader measure of payments to labor since it includes employment compensation and proprietor income.

Government Revenue: Changes in revenues to state and local governments are another important measure in most contribution studies. I-O models estimate changes in selected government revenues such personal income, sales and use, corporate income, severance, and property taxes, and a variety of miscellaneous revenues such as permits, fees, licenses, and dividends. Government revenues are not generally additive to economic effects, as most government revenues are either imputed internally or directly comprise a component of an industry balance sheet.

Property-type Income: These economic values can be defined as Gross Operating Surplus less Proprietor Income (BEA defines GOS as gross output less intermediate inputs, employee compensation, and taxes on production and imports less subsidies). The consumption of fixed capital (i.e., capital outlays for most depreciable assets) is included, along with corporate profits and business transfer payments (net of government subsidizes).

Taxes on Production and Imports. In the IMPLAN venacular, this category used to be call indirect business taxes. Taxes on production and imports can be generally considered as the sum of sales, property, and excise taxes. This category also includes fines, licenses, permits, and fees. Another perspective is that the category of indirect business taxes are those taxes/nontax liabilities (i.e., any business liability to governments than are treated like a tax) that can be included as business expenses when estimating business profit.

Selection of Input-output Model

The Department of Agribusiness and Applied Economics at NDSU developed an I-O model for North Dakota dating back to the 1960s and was an important tool examining energy development in the state during the 1970s. The basic data for the model came from surveys of firms and businesses in the state, and key economic statistics included a corresponding data set defining state-level net exports (economic base), employment productivity ratios, and tax coefficients. The model and supporting economic data were widely-used for examining economic impact and economic contribution effects in the region. Use of the North Dakota Input-output Model was suspended in 2018 as personnel and resources were no longer available to support the model. This prompted the impact assessment research team, spearheaded jointly by Dean Bangsund, Department of Agribusiness and Applied Economics, and Dr. Nancy Hodur, Director, Center for Social Research, to adopt a new modeling platform.

A number of commonly used input-output models are available for conducting impact assessments for North Dakota. Publicly available models include RIMS II (Regional Input-Output Modeling System), IMPLAN (Impact Analysis for Planning), REMI (Regional Economic Models Inc.), and EMSI Analytics (Economic Modeling Specialists). There are other commercial models that are 1) not available for state-level analysis (e.g., REdyn, which combines I-O factors with CGE processes but is only used for the U.S. national economy), 2) specialized in fiscal effects and do not provide the same degree of impact assessment as the more common I-O models (e.g., LOCI, which only examines government costs of various types of impacts), and 3) built with varying degrees of sophistication primarily targeting subject-matter issues (e.g., JEDI-NREL that examines some economic impacts of constructing and/or operating energy-based facilities).

REMI was considered the best option from an empirical capacity, but the cost of acquiring the model and subscribing to annual baseline data updates was prohibitive. RIMs II is inexpensive, but the analytical capacity is substantially limited, and does not have any baseline or supporting data sets. IMPLAN was chosen as the modeling system is supported with detailed baseline data, and cost was not prohibitive.

IMPLAN Modeling System

IMPLAN modeling system is a popular I-O methodology because of its flexibility and customizability for structuring economic scenarios and ease of access to key data sets used in the modeling process (IMPLAN Group, LLC 2020). IMPLAN can be structured to evaluate economic effects through a number of model operations. Those operations range from change in sales for an entire industry to personal spending patterns for households with a specific income level. The flexibility to structure an assessment using multiple economic criteria, along with customization of baseline data, allow IMPLAN to be tailored to most economic conditions.

IMPLAN modeling system uses a variety of data sets to construct the I-O model. In general, those data sets begin with federal data, work through regional and state-level economic statistics, and if available, attempt to combine information for counties or other smaller geographic units. [see www.implan.com for more detail regarding data sets used to construct the model].

Agency	Program	Data Set(s)
U.S. Bureau of Labor Statistics	Unemployment Insurance Covered Employment and Wages Program	CEW (ES-202)
	Consumer Expenditure Survey	CE LABSTAT
U.S. Bureau of Economic Analysis	National Income and Product Accounts Regional Economic Accounts Benchmark I-O Accounts	SA7, SA27, SA06, SA05, SA25, CA05, CA06, CA25, KLEM
U.S. Census Bureau	Numerous Census Surveys and Programs	ACES, ARTS, ASE, ASM, APES, ASPP, STC, AWTS, BES, COG, CBP, CIR, EC, IA, GUS, ICT, MHS, NES, QTAX, SAS
	Construction Definitions and Spending	
	Decennial Census and Population Surveys	CPS, Decennial Census, ACS
USDA -- National Agricultural Statistics Service, and Economic Research Service	Quinquennial Assessments and Annual Surveys	Census of Agriculture Annual Agricultural Statistics Agriculture Resource Management Survey

Source: IMPLAN (2020).

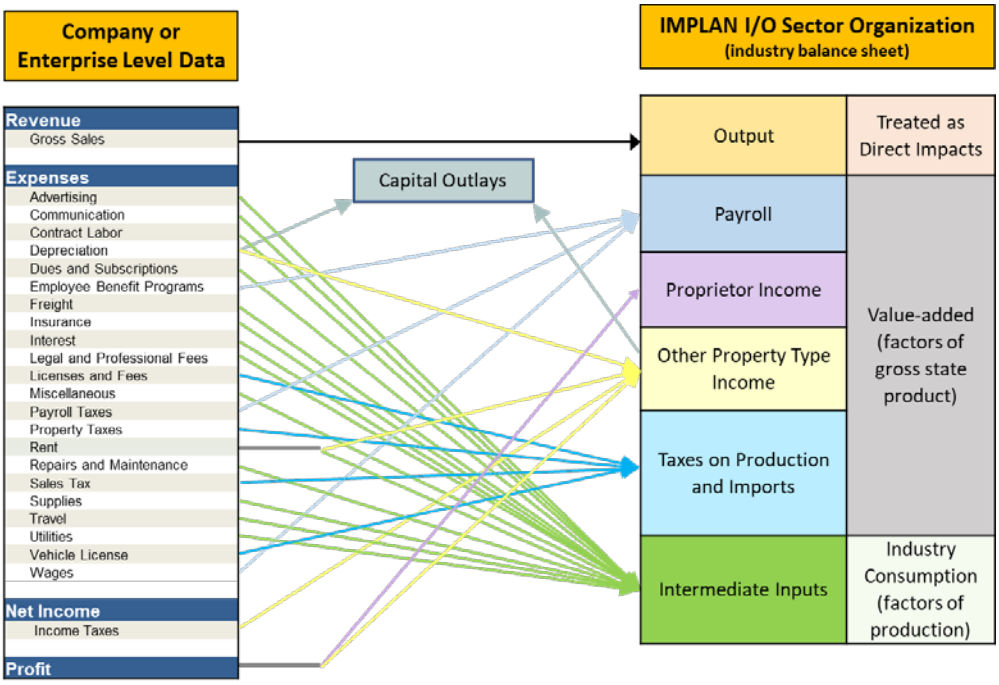
IMPLAN modeling system is a widely used and well-recognized source of economic data—this process is desirable because it allows for consistency and compatibility across regional, state, and sub-state economies. However, not all industries within all economies are accurately represented using federal, state, and local secondary data in combination with IMPLAN baseline data generation techniques (Bangsund and Hodur 2018a,b; Bangsund and Hodur 2012; Downes 2012; Taylor 2013; Booz Allen 2008). To address potential problems, IMPLAN has built flexibility into the modeling system so that local or other primary data can be substituted for default values within the model.

IMPLAN uses a Double Constrained Gravity Model, along with several databases to estimate trade flows in various economic geographies. In the most general sense, gravity models work with the mass of demand and supply of commodities, and are constrained so that imports into a region do not exceed demand and exports from a region do not exceed available supply.

IMPLAN uses data from the Center for Transportation Analysis at Oak Ridge National Laboratory (ORNL) on travel impedances (based on a commodity's modal mix as reported by the Commodity Flow Survey) to serve as the distances in IMPLAN's gravity model. ORNL also provides the circle distances between county centroids — those are used to calibrate the gravity model to Commodity Flow Survey data. Commodity Flow Survey (CFS) and Freight Analysis Framework (FAF) data are used to calibrate the gravity model to estimate trade flows between economic geographies. The two data sets contain information on the value, weight, distance traveled, transportation mode, and origin and destination (i.e., state) of the shippable commodities. These commodities are classified according to the standard classification of transported goods (SCTG) system, and the survey data are typically reported at the two-digit SCTG level.

Constructing or Adjusting Industry Balance Sheets

IMPLAN organizes financial information for industries in a manner different from traditional enterprise budgets or income statements. Despite these seemingly unrelated financial data, financial data for any particular business or economic sector can be used to customize an industry balance sheet. For some industries, such as production agriculture, cost-of-production budgets can be helpful in constructing industry balance sheets. Financial statements for firms or businesses also can serve to adjust or construct an industry balance sheet; however, accounting terms, income and expense categories, and treatment of debt, capital outlays, and taxes will not necessarily match perfectly to industry balance sheet components.



General Transposition of Financial Information into IMPLAN Economic Sector Profiles

Source: Bangsund, Department of Agribusiness and Applied Economics, NDSU

Components of Economic Sector	What is included?	What does it do in I-O models?	Counted in which economic measures?
Output	The value of an industry's production for the year: ▪Sales to final users (sales to final demand) ▪Sales to other industries (intermediate inputs) ▪Change in inventory	▪Sets the share or level of an economic sector used in impact and contribution assessments ▪Sets in motion jobs, employment compensation, and industry consumption (sector spending)	▪Direct effects ▪Often forms the basis for multiplier applications
Payroll (wages, salaries, benefits)	Includes all wages and salaries, all benefits, and all payroll taxes for employees	▪Sets in motion a series of transfers within the SAM from households to government (taxes), households to non-circulated monies (savings, investments), and remaining income applied to household spending patterns (households to economic sectors) for purchases of consumer goods and services. Household spending patterns account for share of household spending by geography (spending in the study region and spending outside the study region)	▪Direct effects for jobs ▪Direct effects for labor compensation ▪Is a 'payer type' for estimates of tax revenues ▪Household spending is counted as **induced** effects and is part of gross business volume ▪Labor income is part of Gross State Product (GSP)
Proprietor Income	Consists of payments received by self-employed individuals and unincorporated business owners. However, additional items include income of partnerships and tax-exempt cooperatives, dividends (payments in cash or other assets, monetary interest received by nonfinancial business, and rental income received by persons not primarily engaged in the real estate business).		
Other Property Type Income	Represents gross operating surplus minus proprietor income, and includes consumption of fixed capital, corporate profits, business current transfer payments (net), income derived from dividends, royalties, corporate profits, interest income, and is a source of income for households, business, and governments.	▪Treated as leakage ▪Does not produce any additional economic activity or output	▪Counted as part of GSP
Taxes on Production and Imports	Includes sales and excise taxes, customs duties, property taxes, motor vehicle licenses, severance taxes, other taxes, and special assessments. This category is net of subsidies and therefore can be negative for an industry in a given year if that industry received more subsidies from the government than it paid out in the above taxes in that year. Social insurance taxes are placed in payroll and income taxes are part of Other Property Type Income	▪Treated as leakage ▪Does not produce any additional economic activity or output	▪Counted as part of GSP
Intermediate Inputs	Purchases of goods and services used for the production of other goods and services rather than used for final consumption. These inputs do not include capital purchases nor do they include the expenses for capital and labor.	▪Sets in motion the cycle of spending for business inputs	▪Counted as **indirect** effects and is part of gross business volume

IMPLAN Economic Modeling

IMPLAN uses a variety of mechanisms, or economic triggers, to introduce a direct effect into a specified economy. Using a variety of mechanisms is one of the key attributes of the model that provide substantial flexibility in tailoring assessments to match expected economic changes.

An *Industry Change* represents adjusting the demand for the goods and services produced by an economic sector by varying that sector's revenue. Within this context, changes in sector gross revenues automatically result in changes in required labor, goods and services used to produce the sector's output (intermediate inputs), taxes on production and inputs (e.g., sales tax, property tax), labor income, and value-added.

Industry Spending Patterns can be used to change an economic sector's use of intermediate inputs without triggering changes in revenues, employment, labor income or value-added effects. The specific input is the sum of the total expenses that are expected to be changed by that economic sector.

Labor Income Change is not specific to an economic sector, rather it introduces an increase in the payment for labor inputs within an economy. This approach also by-passes the need to change other aspects of an industry's balance sheet to achieve a change in labor income; however, the *Labor Income Change* requires a manual (i.e., calculated outside of the IMPLAN model) estimate of the change in direct employment based on assumptions for payroll expenses per job.

Household Income Change is used when personal spending capacity within an economy is changed, but there is not necessarily any direct link to output changes in any particular economic sector or when personal spending capacity is not directly linked changes in labor income. These types of changes in household income might be represented by income from royalties, trusts, easements, gifts, inheritances, lotteries, and social transfer payments.

Institutional Spending Patterns are used to estimate how changes in public sector revenues influence the consumption of goods and services by government entities, educational institutions, non-profits and other non-governmental organizations. *Institutional Spending Patterns* also provide options for household spending patterns by income levels, which can be used to approximate the consumption of goods and services by households.

Commodity Events are used when there is an anticipated change in the demand for a good or service or a change in the supply of that good or service but it is unknown which economic sectors would meet the change in demand or produce the change in supply.

Industry Contribution Events are IMPLAN's first tool to estimate the value of an economic sector or industry by considering its current level of output. When using this event type, the size of the industry being measured is limited to its current size and will not be

adjusted by secondary purchases (buybacks) from other economic sectors. Contribution events also can be used in combination with other event types to prevent an economic sector or industry from being influenced by an analyis that considers a broader change in another economic sector or industry. For example, in ND, a change in a manufacutring sector is likely to reqire additional electricity consumption; however, electricyt from lignite coal is not going to materially change due to the potential increase in demand for electricty as this industry operates at a fixed capacity.

Mechanisms for Introducing Economic Effects into an Economy, IMPLAN Modeling Platform

IMPLAN Activity	Description
Industry Change	Represents a change in sales or revenue to an economic sector. Increases/decreases in sales, unless manually overrode within the model, will automatically produce increases/decreases in employment, employment compensation, purchases of intermediate inputs, and gross operating surplus based on the economic sector's balance sheet.
Industry Spending Pattern	Represents the expenses for goods and services used by an economic sector, and provides for adjustments in the percentage of those individual goods and services acquired within a specified economy.
Labor Income Change	Represents a general change in wages, salaries, and benefits within a specified economy.
Household Income Change	Represents a general change in the amount of personal income available to households in the specified economy.
Institutional Spending Pattern	Represents the proportional consumption of goods and services by governments, schools, and non-profits per unit of revenue. Includes spending patterns estimating personal consumption of goods and services by households.
Commodity Event	Model the change that might occur in an economy when the demand for a particular good or service changes but it is unknown what economics might change output to meet the change in demand
Contrtibution Event	When using this event type, the size of the industry being measured is limited to its current size or can be limited to predetermined share of its existing size.

Source: Bangsund, Agribusiness and Applied Economics, NDSU

IMPLAN Fiscal Methodology

IMPLAN estimates fiscal impacts by examining total government revenues from a variety of data sources. The model then estimates the share of government revenues based on the individual source of revenue (e.g., sales tax, income tax, severance tax, fees, and licenses). IMPLAN compares total government revenues, from all sources, with total industry output from all sectors in the economy. That process produces an estimate of tax revenue per unit of average industry output (e.g., gross sales, state gross product). The model does not estimate tax collections stemming from individual economic sectors or industries. Therefore, to estimate the fiscal impacts of a project, program, or activity, IMPLAN estimates the change in economy-wide business output, and then estimates the fiscal effects by multiplying that change in business output by the ratio of government revenues to economy-wide output. This process produces a direct relationship between expected new government revenues and a change in industrial or economic output.

Shortcomings and limitations of IMPLAN's fiscal impact methodology in North Dakota include:

A. IMPLANs fiscal impact methodology is locked on the premise that all government revenues are intrinsically linked to changes in economy-wide economic output. This relationship is embedded within IMPLANs default tax ratios and leads IMPLAN to generate large changes in some tax revenues even when direct causation is not contained in the economic assessment (i.e., without linking an economic impact to a specific change in a tax base or tax rate, or linking tax revenues on a per-sector basis). For some tax revenues, such as severance taxes, that methodology produces erroneous estimates. For other tax revenues, general economic output is a reasonable proxy for estimated changes in tax revenues.

B. IMPLAN's fiscal impact methodology cannot be adjusted internally to reflect state rules and stipulations affecting the specific taxes relating to unique conditions or special treatment that adjusts the tax base or tax rate. For example, the default matrix cannot be instructed to only generate coal conversion taxes if the electricity from fossil fuels sector is modeled or include changes in severance taxes when the changes in oil and gas production are modeled.

IMPLAN Fiscal Data Sources and Treatment of Tax Data

The following discussion of data sources is provided by IMPLAN Group LLC (2020).

IMPLAN's tax impact report values are based on the existing relationships of the data found in the IMPLAN database. The sources for these data are listed below, followed by description of each data element in the tax impact report.

- **NIPA Tables.** All items in the IMPLAN data sets are ultimately controlled to the U.S. level values from the Bureau of Economic Analysis' (BEA) National Income and Product

Accounts (NIPA). Section 3 of the NIPA tables covers Government Current Receipts and Expenditures.

- **Consumer Expenditure Survey (CES).** The U.S. Census Bureau annually conducts surveys and daily samplings of household expenditure patterns (the CES). The survey data are reported for nine different categories of household income, which we control to the NIPA's Personal Consumption Expenditure (PCE) totals (which are not split out by income category). From these data, we can establish the tax-to-income relationships for the nine different household income categories. It is based on these relationships that we can distribute many of the national-level tax data to states and state-level tax data to counties, using the number of households in each of the nine household categories in the state or county.

- **Annual Survey of State and Local Government Finances (SLGF).** The U.S. Census Bureau also collects annual State/Local Government receipts and expenditures data. These data act as preliminary controls for state-level values (subject to controlling to the national NIPA values). They also provide the proportional split of the TOPI value amongst the various types (sales, property, etc.). The actual value of total TOPI (at the state level) comes from the BEA's Regional Economic Accounts series.
    - The annual survey also provides local government collections by tax type. We use these data to estimate, for the total state/local tax receipts, the share of each type of tax that belongs to local government. We then use data for each local government to apportion that local total (at the state level) to each county. Since we know the local total for each county, we can distinguish the state and local tax revenue in the tax impact report. In IMPLAN Online, the tax impact report includes four types of governments that compose State/Local Government:
        - State government
        - County government
        - Sub-county general government, which includes city and township governments, for example
        - Sub-county special government, examples include fire and public school districts
    - IMPLAN supplements gaps in the SLGF with 5-year Census of Governments data, and supplements the SLGF state tax revenue with current-year state tax collections data from Census.

- **Regional Economic Accounts (REA).** The Bureau of Economic Analysis collects and reports income, wealth, tax, and employment data on a regional, state and county basis. The REA data from these two tables are used to distribute the U.S. NIPA values to states and counties:
        - Table CA05 -- Personal Income by Major Source and Earnings by Industry
        - Table SA50 -- Personal Tax and Non-tax Payments

IMPLAN Tax Identification Scheme						
	Description	**Employee Compens-ation**	**Proprietor Income**	**Tax on Production and Import**	**House holds**	**Corpor-ations**
State and Local Taxes						
	Dividends					O
	Social Insurance Tax- Employee Contribution	A	C			
	Social Insurance Tax- Employer Contribution	B				
	Tax on Production and Imports: Sales Tax			D		
	Tax on Production and Imports: Property Tax			E		
	Tax on Production and Imports: Motor Vehicle License			F		
	Tax on Production and Imports: Severance Tax			G		
	Tax on Production and Imports: Other Taxes			H		
	Tax on Production and Imports: S/L NonTaxes			I		
	Corporate Profits Tax					P
	Personal Tax: Income Tax				J	
	Personal Tax: NonTaxes (Fines- Fees				K	
	Personal Tax: Motor Vehicle License				L	
	Personal Tax: Property Taxes				M	
	Personal Tax: Other Tax (Fish/Hunt)				N	
Federal Taxes						
	Social Ins Tax- Employee Contribution	Q	S			
	Social Ins Tax- Employer Contribution	R				
	Tax on Production and Imports: Excise Taxes			T		
	Tax on Production and Imports: Custom Duty			U		
	Tax on Production and Imports: Fed NonTaxes			V		
	Corporate Profits Tax					X
	Personal Tax: Income Tax				W	
Source: IMPLAN Group LLC (2020).						

The following definitions and sources are provided by IMPLAN Group LLC (2020) and correspond with labeling in the IMPLAN Tax Identification Scheme.

- **Employee-paid portion for State/Local social insurance.** This represents retirement plans and temporary disability insurance. The U.S. value comes from National Income and Products Accounts (NIPA) Table 3.6. This value is distributed to states based on each state's share of the following items from the State and Local Government Finances report (SLGF).

  Employee Retirement – Local Employee Contribution;
  Employee Retirement – State Employee Contribution;
  Workers Compensation – Other Contributions.

These state values are distributed to counties based on each county's proportion of the state's State/Local Government Non-Education Employee Compensation. The county-level State/Local Employee Compensation figures come from U.S. Bureau of Economic Analysis. These are then split into Education vs. Non-Education using various data from the U.S. Census Bureau and the U.S. Department of Education.

- **Employer-paid portion for State/Local social insurance funds**. This represents workers' compensation and temporary disability insurance. The U.S. value comes from NIPA Table 3.6. This value is distributed to states and based on each state's share of the following items from the SLGF:

  Employee Retirement – From Local Government;
  Employee Retirement – From State Government;
  Unemployment Compensation – Contribution;
  Workers Compensation – Own Contributions.

County distribution is based on county portion of state and local government non-education employee compensation from IMPLAN.

- **State/Local social insurance paid by self-employed**. Self-employed individuals do not make payments to State/Local government, so this entry will always have a value of $0.

- **Sales Taxes on "Other Property Type Income" (TOPI) paid to State and Local Governments.** The U.S. value comes from NIPA Table 3.5. The U.S. value is distributed to states based on each state's proportion of Total General Sales Tax from the SLGF. State government values are then distributed to counties based on total retail output.

- **TOPI property taxes paid to State and Local Governments.** The U.S. value comes from NIPA Table 3.5. The U.S. value is distributed to states based on each state's proportion of Total Property Tax from the SLGF. State government values are then distributed to counties based on total Personal Income from the BEA's CA05 table.

- **TOPI motor vehicle license taxes paid to State and Local Governments.** The U.S. value comes from NIPA Table 3.5. The U.S. value is distributed to states based on each state's proportion of Motor Vehicle Operator's License Tax and Motor Vehicle License Tax from the SLGF. State government values are then distributed to counties based on total Personal Income from the BEA's CA05 table.

- **TOPI severance taxes paid to State and Local Governments.** The U.S. value comes from NIPA Table 3.5. The U.S. value is distributed to states based on each state's proportion of Severance Tax from the SLGF. State government values are then distributed to counties based on total Personal Income from the BEA's CA05 table.

- **TOPI other taxes paid to State and Local Governments.** This item consists largely of business licenses and documentary and stamp taxes. The U.S. value comes from NIPA Table 3.5. The U.S. value is distributed to states based on each state's proportion of the following tax items from the SLGF: Corporation License; Amusement License; Other License; Documentary & Stock Transfer; Public Utility License; Alcoholic Beverage License; Occupation & Business License, NEC; and NEC. State government values are then distributed to counties based on total Personal Income from the BEA's CA05 table.

- **TOPI non-taxes paid to State and Local Governments.** This item includes rents and royalties, special assessments, fines, settlements, and donations. The U.S. value comes from NIPA Table 3.5. The U.S. value is distributed to states based on each state's proportion of the following tax items from the SLGF: Miscellaneous – Rents; Miscellaneous – Special Assessments; Miscellaneous – Royalties; and Miscellaneous – Donations from Private Sources. State government values are then distributed to counties based on total Personal Income from the BEA's CA05 table.

- **Personal income tax payments to State and Local Governments**. The U.S. value comes from NIPA Table 3.3. The U.S. value is distributed to states based on Individual Income Tax from the SLGF. State government values are then distributed to counties based on total Personal Income from the BEA's CA05 table.

- **Personal non-tax payments to State and Local Governments.** This item includes payments for fines and donations. The U.S. value comes from NIPA Table 3.3. The U.S. value is distributed to states based on Motor Vehicle License Tax from the SLGF. State government values are then distributed to counties based on total Personal Income from the BEA's CA05 table.

- **Personal motor vehicle fee payments to State and Local Governments**. The U.S. value comes from NIPA Table 3.4. The U.S. value is distributed to states based on Miscellaneous – Fines & Forfeits from the SLGF. State government values are then distributed to counties based on total Personal Income from the BEA's CA05 table.

- **Personal property tax payments to State and Local Governments**. The U.S. value comes from NIPA Table 3.4. The U.S. value is distributed to states based on Property Tax from the SLGF. State government values are then distributed to counties based on total Personal Income from the BEA's CA05 table.

- **Personal other tax payments to State and Local Governments.** This item consists largely of hunting, fishing, and other personal licenses. The U.S. value comes from NIPA Table 3.4. The U.S. value is distributed to states based on Hunting and Fishing License Tax from the SLGF. State government values are then distributed to counties based on total Personal Income from the BEA's CA05 table.

- **State/Local Government Dividends.** This item represents net dividend payments to government by corporations from investments. The U.S. value comes from NIPA Table 3.3. The U.S. value is distributed to states based on the following items from the SLGF:

    Employee Retirement – Securities – Mortgages
    Employee Retirement – Securities – Corporate Stocks
    Employee Retirement – Securities – Corporate Bonds
    Employee Retirement – Total Other Securities

State government values are distributed to counties is based on their proportion of state Other Property Income (from IMPLAN database).

- **State/Local Government corporate profits tax.** The U.S. value comes from NIPA Table 3.3. The U.S. value is distributed to states based on Corporate Net Income Tax from the SLGF. State government values are then distributed to counties is based on counties based on their proportion of the state's Other Property Income (from IMPLAN database).

- **Employee-paid portion for Federal social insurance**. This item includes social security, survivors insurance, disability insurance, hospital insurance, supplemental medical insurance, unemployment insurance, veterans' life insurance, and railroad retirement plans. The U.S. value comes from NIPA Table 3.6. The U.S. value is distributed to states and counties based on Personal Contribution for Social Insurance from the BEA's CA05 table.

- **Employer-paid portion for Federal social insurance**. This item includes social security, survivors insurance, disability insurance, hospital insurance, military medical insurance, unemployment insurance, pension benefit guaranty, veterans' life insurance, and railroad retirement plans. The U.S. value comes from NIPA Table 3.6. The U.S. value is distributed to states and counties based on Personal Contribution for Social Insurance from the BEA's CA05 table.

- **Self-Employed contribution to Federal social insurance**. This item includes social security, survivors insurance, disability insurance, and hospital insurance. The U.S. value comes from NIPA Table 3.6. The U.S. value is distributed to states and counties based on Personal Contribution for Social Insurance from the BEA's CA05 table.

- **TOPI Federal Excise Taxes.** This item includes federally levied excise taxes on alcohol, tobacco, telephones, coal, fuels, air transportation, vehicles, etc. The U.S. value comes from NIPA Table 3.2. The U.S. value is distributed to states and counties based on IMPLAN estimates of total TOPI for all industries in relationship to U.S. total TOPI.

- **TOPI Federal Custom Duties.** These are gross collections less refunds. The U.S. value comes from NIPA Table 3.2. The U.S. value is distributed to states and counties based on IMPLAN estimates of total TOPI for all industries in relationship to US total TOPI.

- **TOPI Federal Non-taxes.** This item includes rents and royalties4. The U.S. value comes from NIPA Table 3.2. The U.S. value is distributed to states and counties based on IMPLAN estimates of total TOPI for all industries in relationship to U.S. total TOPI.

- **Personal Income taxes paid to the Federal Government.** These are taxes paid through withholding, declarations and final settlement less refunds. The U.S. value comes from NIPA Table 3.2. The same value can also be found in NIPA Table 3.4. The U.S. value is distributed to states

based on each state's value of "Federal government: Individual Income taxes (net of refunds)" from the BEA's SA50 table. State values are then distributed to counties based on total Personal Income from the BEA's CA05 table.

- **Federal Corporate profits tax**. The U.S. value comes from NIPA Table 3.2. The U.S. value is distributed to states and counties based on their proportion of U.S. Other Property Income (from IMPLAN database).

Definition of Government Revenues Produced by IMPLAN	
Government Unit and Applicable Government Revenue	**Definition**
State and Local Government Revenues	
Dividends	State and Local government dividends represent dividend payments to government by corporations from investments.
Social Insurance Taxes: Employee Contribution	The social insurance contributions paid by state employees towards State sponsored pensions, in lieu of social security.
Social Insurance Taxes: Employer Contribution	The social insurance contributions paid by the State towards State sponsored pensions, in lieu of social security.
Indirect Business Tax: Sales Tax	Sales taxes paid to State and Local government.
Indirect Business Tax: Property Tax	Real estate-based property taxes paid by firms to State and Local governments. Because of the special situation encountered with Sector 361, this includes payments of property taxes made on homes.
Indirect Business Tax: Motor Vehicle	Motor vehicle license taxes paid by firms to State and Local governments.
Indirect Business Tax: Severance Tax	Taxes imposed by a State on the extraction of natural resources.
Indirect Business Tax: Other Taxes	Other taxes paid to State and Local governments include business licenses, documentary and stamp taxes.
Indirect Business Tax: S/L Non-taxes	IBT state and local non-tax payments include fines (such as parking and speeding tickets), fees (State and County park passes or day fees) and donated funds.
Corporate Profits Tax	Corporate profits taxes paid to State and Local governments.
Personal Tax: Income Tax	Income taxes paid by individuals to State and Local Government through withholding, declarations and final settlement, less refunds.
Personal Tax: Non-taxes (fines and fees)	Household personal nontax payments to State and Local governments include fines, donations, passport and immigration fees, and migratory bird-hunting stamps.
Personal Tax: Motor Vehicle Licenses	Household personal motor vehicle fee payments to State and Local governments.
State and Local Government Revenues	
Personal Tax: Property Taxes	Household personal property tax payments to State and Local governments. Dividend, interest, and rental income of persons with capital consumption adjustment are sometimes referred to as property income.
Personal Tax: Other Tax (Fishing/Hunting)	Other taxes consist of miscellaneous fees and licenses (such as hunting and fishing licenses, marriage licenses, registration of pleasure boats, and licenses for pets) to State and Local governments.

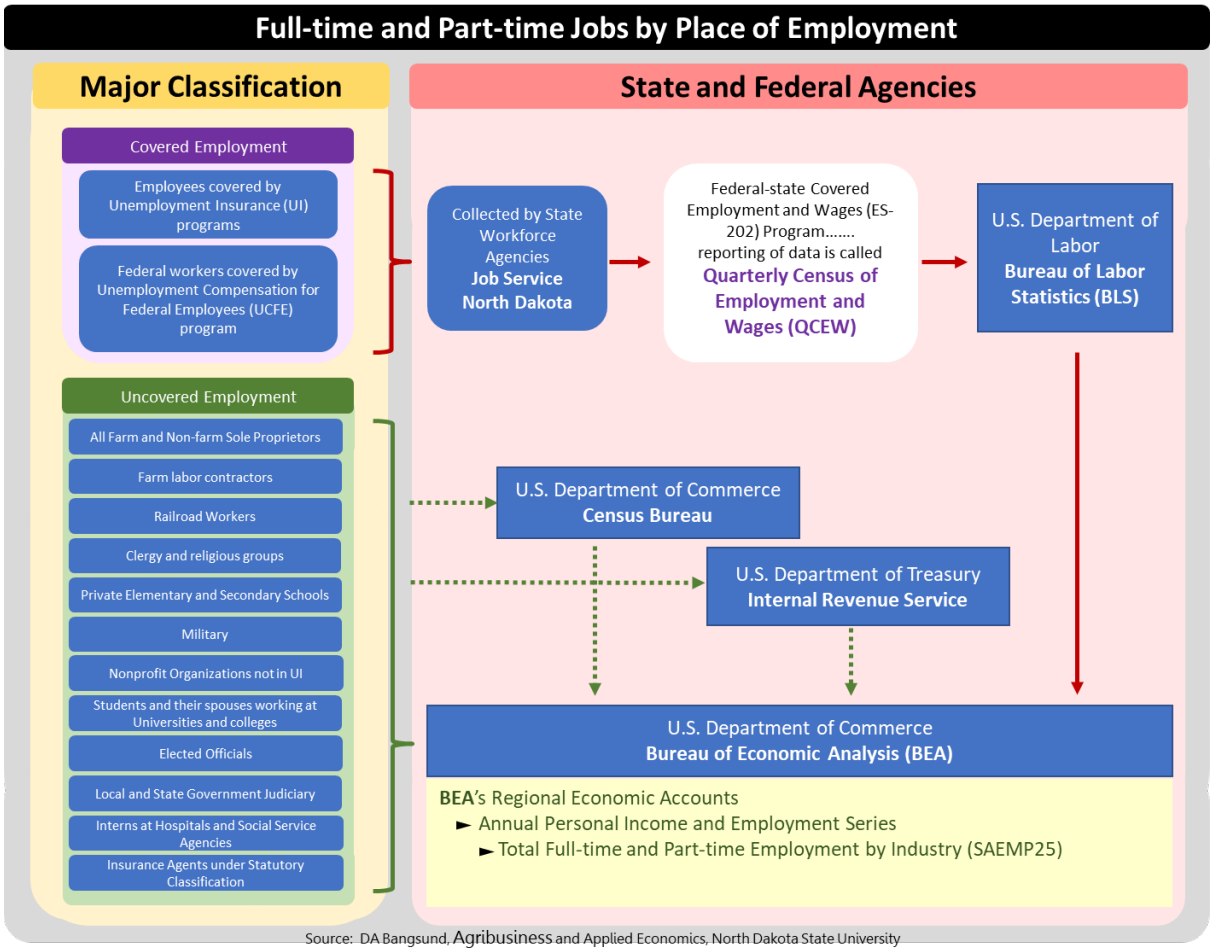
Federal Government Revenues	
Social Insurance Taxes: Employee Contribution	The employee paid portion for Federal social insurance. These contributions include payments by employees, the self-employed, and other individuals who participate in the following government programs: Old-age, survivors, and disability insurance (social security, FICA); hospital insurance; supplementary medical insurance; unemployment insurance; railroad retirement; veterans life insurance; and temporary disability insurance.
Social Insurance Taxes: Employer Contribution	The employer paid portion for Federal social insurance. This includes social security, unemployment insurance, medical and retirement plans.
Indirect Business Tax: Excise Taxes	Includes Federally levied excise taxes on alcohol, tobacco, telephones, coal, fuels, air transportation, vehicles, etc.
Indirect Business Tax: Custom Duty	Custom duties are gross collections net refunds.
Indirect Business Tax: Non-Taxes	IBT Federal non-tax payments include petroleum royalties, fines, regulatory fees, forfeitures and donated funds.
Corporate Profits Tax:	Corporate profits taxes paid to Federal governments.
Personal Income Tax	Income taxes paid by individuals to the Federal Government through withholding, declarations and final settlement, less refunds.
Source: IMPLAN Group LLC (2020).	

Employment Sources and Measures

Government measures of employment are broadly measured in two distinct categories: covered and uncovered. Further, the responsibilities of employment measurements are shared among several government agencies and programs.

Covered Employment

Covered workers are those that are employed by a business, institution, or government agency, receive a wage or salary, and are subject to unemployment insurance (UI). Jobs that fall under an UI program are called 'covered' employment. Quarterly Census of Employment and Wages (QCEW) employment reported by Job Service North Dakota and by Minnesota Department of Employment and Economic Development is 'covered' employment. QCEW data are collected for each state and reported by the U.S. Bureau of Labor Statistics (BLS). Therefore, employment statistics for self-employed individuals cannot be derived from QCEW data.



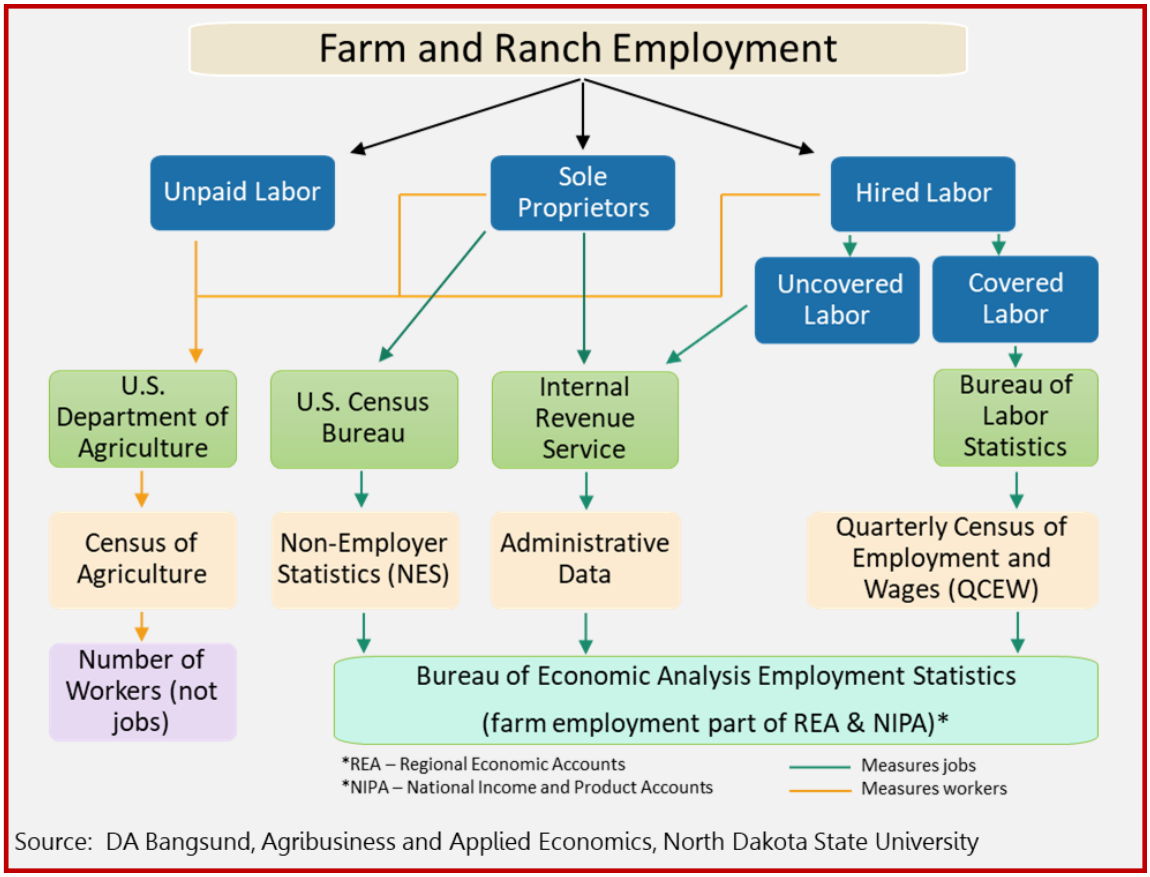
Source: DA Bangsund, Agribusiness and Applied Economics, North Dakota State University

Uncovered Employment

By contrast, 'uncovered' employment largely includes self-employed and sole-proprietors not enrolled in a state's UI program (enrollment is voluntary for self-employed individuals). The majority of on-farm employment is self-employed with only a small portion of on-farm employment qualifying as covered employment.

The U.S. Bureau of Economic Analysis (BEA) reports uncovered employment in conjunction with QCEW employment from BLS. The only source of on-farm employment that includes covered and uncovered hired labor, self-employed, and sole proprietors is the BEA's Regional Economic Accounts. The U.S. Department of Agriculture's Census of Agriculture collects information on individuals, not jobs, and cannot be directly substituted for BEA employment statistics.

For most 'industries', sole proprietors are not the predominate form of employment, and QCEW is often used to measure employment in those industries. In some economic 'sectors', sole proprietors represent a meaningful level of employment, such as independent truckers, construction and repair, retail shops, personal service providers, among others, but do not represent a meaningful share of employment at a broader 'industry' level. Crop production is largely unique among industries in that the majority of employment is represented by sole proprietors



Source: DA Bangsund, Agribusiness and Applied Economics, North Dakota State University

BEA's Regional Economic Accounts contain data for on-farm employment; however, the criteria for counting self-employment can perhaps distort the employment picture for a given economy. In classification by legal form of organization in the National Income and Product Accounts, sole-proprietorships comprise all entities that are required to file IRS Schedule C (Profit or Loss from Business) or Schedule F (Profit or Loss From Farming) or would be if the proprietor met the filing requirements (Bureau of Economic Accounts 2020). These definitions are appropriate for measuring on-farm employment when combined with other data (e.g., QCEW); however, those criteria cast a broad measure of self-employment in other industries. Most farmers and ranchers would easily qualify their farming and ranching as their primary occupation. However, the BEA's use of the Internal Revenue Service's requirement for filing Schedule C captures employment that is likely not an individual's primary occupation. Essentially anyone receiving an IRS Form 1099 over the legal dollar amount for filing ($600 in 2019), excluding income reported in Schedule E, can be counted as a job. However, a considerable difference exists between those whose IRS filing represents full-time or primary employment versus those individuals earning extra money aside from their primary occupation.

Despite these definitions, considerably ambiguity exists for on-farm employment. It is unknown to what degree short term on-farm employment gets captured using the existing BEA and IRS criteria and measurement techniques. For example, if a person drives truck for a sugarbeet producer during harvest and receives sufficient compensation such that the income must be reported on their personal income tax filings, is that income reported as trucking, farm labor, or filed in a manner that it does not get credited to production agriculture.
BEA's employment data captures on-farm employment but also greatly expands the number of jobs within an economy when compared to covered employment reported by the QCEW. IMPLAN provides estimates of covered employment and self-employment by economic sector, which can identify sectors that contain relatively large shares of self-employment. Another adjustment to the BEA data is converting total employment (covered and uncovered jobs) to full-time equivalents. IMPLAN's FTE coefficients unfortunately do provide separate estimates of part-time versus full-time for self-employment and separate estimates for covered employment.

Appendix B

IMPLAN Customization and Model Development

IMPLAN Customization

For sake of brevity, industry financial data collected from a survey conducted by the Department of Agribusiness and Applied Economics at North Dakota State University are labeled as 'survey data.'

The following discussion highlights the process used to re-calibrate various IMPLAN sectors using survey data, government information, and other secondary materials.

Sugarbeet Processing Sector

1) Reconstruct the Sugarbeet Processing Sector Profile

Survey data formed the basis to re-construct the economic profile in IMPLAN. The reconstruction required changing the size of industry sales, total employment, employment compensation, sole proprietors, proprietor income, property-type income, taxes on production and imports, and intermediate inputs.

Economic Sector Profile, Sugarbeet Processing, IMPLAN Default Data and Survey Data, Minnesota and North Dakota, 2021/2022

Sector Profile Components	IMPLAN Default Data (combined MN and ND)	NDSU Survey Data
Output (sales)	$1,424,964,005	$2,387,599,184
Employment	2,373	2,479
Employment Compensation	$206,624,488	$258,823,691
Proprietors	85	---
Sole Proprietor Income	$15,497,110	---
Property-type Income	$156,061,364	$353,028,185
Tax on Production and Inputs	$5,716,794	$16,486,101
Total Value-added	$368,402,646	$628,337,977
Intermediate Inputs	$1,038,064,249	$1,759,261,207
Intermediate Inputs purchased in MN, ND, and SD	$664,771,180	$1,434,064,130

Notes: Separate customized industry profiles for Minnesota and North Dakota were used in the analysis but have been combined for presenting survey data to avoid confidential disclosure. IMPLAN default data based on calendar year 2021. Survey data based on operations in 4th quarter 2021 and the first three quarters of 2022.
Source: Survey of Processors, IMPLAN (2022).

The listing of "intermediate inputs" within IMPLAN represents all the goods and services consumed in the production of a good or service. Intermediate inputs are sometimes referred to as an industry production function and are a component of an economic sector's profile. The importance of having accurate spending patterns is fundamental to generating realistic economic impacts for any activity, policy, program, or event. Appendix A contains the technical definitions for financial information relating to IMPLAN's economic profiles and additional detail on industry purchases of goods and services.

2) Organize Survey Expenditure Data into 2-digit North American Industrial Classification System (NAICS) Codes

Survey data are collected using expenditure categories that loosely align to either Standard Industrial Classification (SIC) definitions or NAICS codes, although some firms prefer to provide expenditure data based on the actual expense or purchase. Survey data on industry expenditures are placed into NAICS 2-digit groupings. Each 2-digit grouping has an estimate of the industry's total expenditures, in-state expenditures, and expenditures made in the study's neighboring states.

3) Examine Survey Data and Other Information from IMPLAN's Default Intermediate Inputs

In some cases, the default production function within IMPLAN for the target industry may contain inputs that are not relevant or appropriate for the industry in a given region. This condition has been observed with several industries in North Dakota. These conditions are fixed by either eliminating the purchase within the industry production function or adjusting it to a level that more appropriately matches study information. In the case of eliminating a purchase, all gross absorption coefficients are normalized after the adjustment before exporting expenditure data for the next step in the customization process.

4) Adjust Gross Inputs and Regional Inputs for the Target Industry

IMPLAN's intermediate inputs are first identified as gross inputs, which represent the total amount of goods and services used by the target industry within the defined study area. The amount of goods or services purchased within the study area (i.e., purchases from local sources) is called regional inputs. Information from the survey of sugarbeet processing and marketing firms was used to estimate gross and regional inputs (expenditures) (Appendix E contains summarized survey data).

Survey-based financial data are used to adjust the industry spending profile using two adjustments. The first adjustment is to change internal coefficients for individual sectors so that the industry's production function has the correct level of gross inputs (total expenditures) and the second adjustment sets the level of regional inputs (typically considered in-state expenditures when evaluating an industry within an entire state). These adjustments ensure the target industry purchases the correct amount of goods and services from in-state sources.

However, while those circumstances would appear to be straightforward, IMPLAN does not use an expenditure value which is typically considered when examining a production

budget or expenditure sheet. Instead, the total expenditure for any particular good or service is represented by a coefficient that is the dollar value of the expenditure divided by the level of sales for the target industry. Appendix A contains additional insights on how IMPLAN's model platform handles total expenditures and in-state expenditures.

IMPLAN's default spending profiles for any particular industry can include purchases or acquisitions from any of the matrix's 540 distinct economic sectors, which necessitates grouping IMPLAN data and survey data into comparable categories. IMPLAN default data for the target industry's production function are assigned a 2-digit NAICS code.

The targeted level of overall expenditures (gross absorption coefficients) and in-state share of total expenditures that are made in the state (regional purchase coefficients) for each economic sector contained in the target industry's production function is approximated using an optimization process. The process of changing the level of gross inputs within IMPLAN's production functions requires proportional adjustments to each input that is included in any of the 2-digit NAICS codes. For example, expenditures for communications (2-digit NAICS code 51) for intermediate inputs for IMPLAN Sector XYZ may contain $30 for Internet, $50 for phone, and $20 for data processing, for a total of $100. However, if survey data suggest that Sector XYZ's total inputs for communications should more closely approach $200, then a new allocation of expenditures among the production function for Sector XYZ would be $60 for Internet, $100 for phone, and $40 for data processing. The optimization process converts IMPLAN's default data into dollar volumes, compares those dollar volumes to the targeted level, and then adjusts (proportionally) the gross absorption coefficients for all IMPLAN sectors within the 2-digit NAICS group until the desired level of gross inputs is achieved. The adjustment of gross absorption coefficients is performed using coefficients derived from the new industry balance sheet.

The optimization process then adjusts the individual IMPLAN sectors contained within each 2-digit NAICS grouping in a proportional manner until the regional purchase coefficients approximate the amount those expenditures made in North Dakota using the newly estimated gross absorption coefficients.

5) Adjusting Employment and Employment Compensation

IMPLAN combines wages and salaries and employee benefits into 'employment compensation.' Survey data for wages, salaries and employee benefits were combined to be consistent with the IMPLAN modeling system. Both the level of employment and employment compensation were adjusted within IMPLAN to match survey data. In some economic sectors, proprietor income and sole proprietors are present and would need to be treated separately; however, those conditions are not present in any substantive capacity in the sugarbeet processing sector.

IMPLAN Default Data and Survey Data on Intermediate Inputs, Beet Sugar Manufacturing, Minnesota and North Dakota, 2021/2022

Selected Economic Measures	IMPLAN Default Data[1] Minnesota	IMPLAN Default Data[1] North Dakota	NDSU Study Data[1] Minnesota	NDSU Study Data[1] North Dakota
Data and calculations based on only in-state expenditures for operations in each state				
Intermediate Inputs (000s $)	593,183	444,881	984,130	775,131
In-state Intermediate Inputs (000s $	423,513	241,259	523,981	291,410
Gross Absorption	72.5%	73.6%	70.6%	77.9%
Regional Absorption	51.8%	39.9%	37.6%	29.3%
Regional Purchase Coefficient	72.0%	54.2%	53.2%	37.6%
Data and calculations based on expenditures made in MN and ND for operations in each state				
Intermediate Inputs (000s $)	na	na	984,130	775,131
Intermediate Inputs Purchased in MN and ND (000s $)	na	na	786,863	647,201
Gross Absorption	na	na	70.6%	77.9%
Regional Absorption	na	na	56.5%	65.1%
Regional Purchase Coefficient	na	na	80.0%	83.5%

na=not applicable.
[1] IMPLAN default data based on calendar year 2021. Survey data based on operations in 4th qtr 2021 and the first 3 qtrs of 2022. Processors did not indicate any direct purchases in South Dakota.
Sources: IMPLAN (2022), Survey of Processors.

IMPLAN Default Data and Survey Data on Employment and Employee Compensation, Beet Sugar Manufacturing, Minnesota and North Dakota, 2021

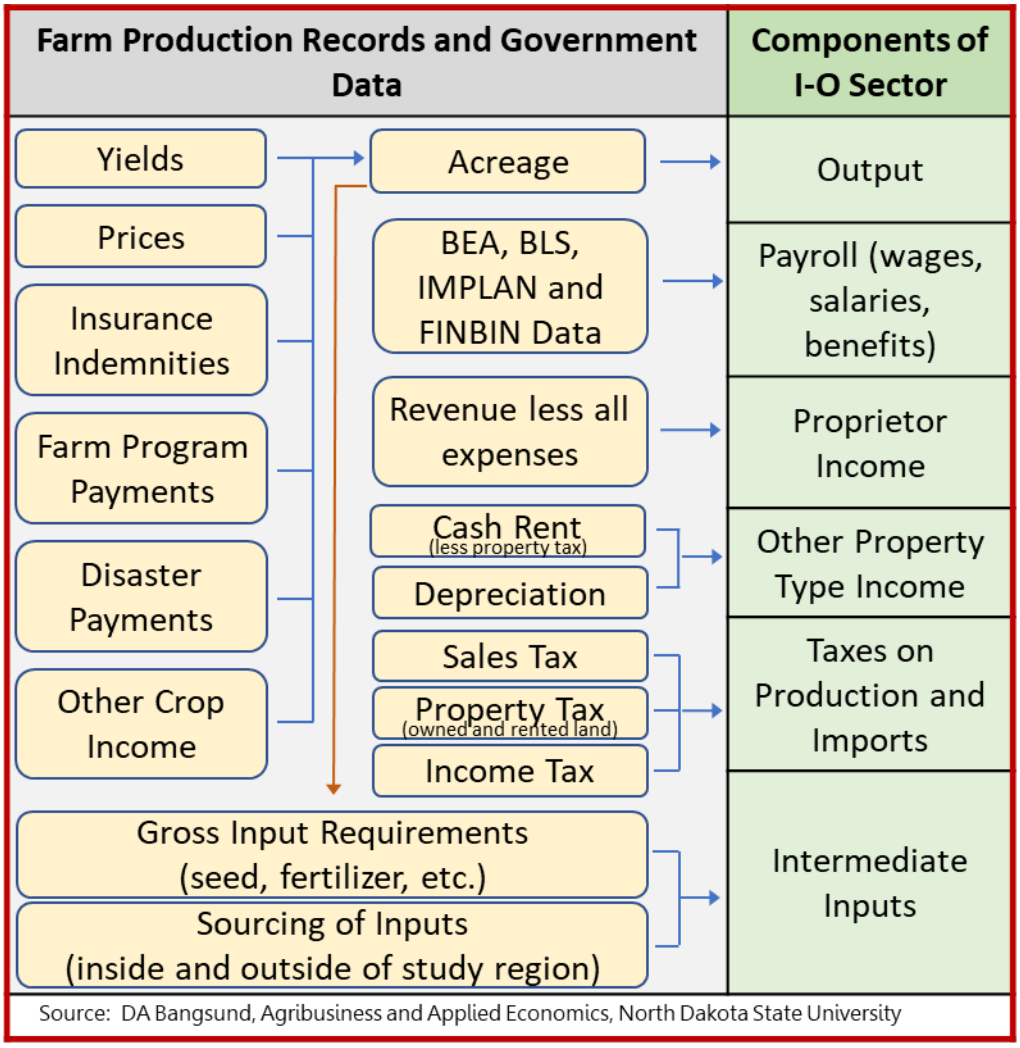
Selected Economic Measures	IMPLAN Default Data[1] Minnesota	IMPLAN Default Data[1] North Dakota	NDSU Study Data[1] Minnesota	NDSU Study Data[1] North Dakota
Wage and Salary Employment	1,359	1,014	1,344	1,135
Employee Compensation (000s $)	123,264	83,361	144,251	114,573
Seasonal Employment[2]	na	na	494	388
Seasonal Employment Compensation (000s $)	na	na	160,607	120,207

na=not applicable.
[1] IMPLAN default data based on calendar year 2021. Survey data based on operations in 4th qtr 2021 and the first 3 qtrs of 2022. Employment is measured at place of work.
[2] Sugarbeet processing firms indicated seasonal employment are not employees of the firms.
Sources: IMPLAN (2022), Survey of Processors.

Sugarbeet Production

1) Reconstruct the Sugarbeet Production Profile

Farm production information, payment values obtained from the survey of processors, and IMPLAN data formed the basis to re-construct the economic profile. The reconstruction required changing the size of industry sales, wage and salary employment, employment compensation, proprietor income, property-type income, taxes on production and imports, and intermediate inputs.



IMPLAN Default Data and Study Data, Economic Sector Profile, Sugarbeet Production, Minnesota and North Dakota, 2021		
Sector Profile Components	IMPLAN Default Data	Study Estimates
Output (sales)	$546,408,000	$1,078,397,932
Employment	1,591	750
Employment Compensation	$94,205,405	$44,338,508
Proprietors	1,074	1,074
Sole Proprietors Income	$64,821,539	$407,919,278
Property-type Income	$98,519,425	$100,199,776
Tax on Production and Inputs	($14,133,678)	$15,045,994
Total Value-added	$243,412,692	$567,503,557
Intermediate Inputs	$302,995,308	$510,894,375
Intermediate Inputs purchased in MN and ND	$166,827,984	$510,894,375

Notes: Separate customized industry profiles for sugarbeet production in Minnesota and North Dakota were used in the analysis but have been combined for presenting producer revenues to avoid confidential disclosure. Differences in composing the industry balance sheets between IMPLAN default and study estimates included treatment of federal farm program payments, insurance indemnities, gross cash rent, property taxes paid on cash rent land, and share of intermediate expenses expected to be purchased within each state.
Sources: Farm Financial Management Database, Survey of Processors, IMPLAN (2022).

2) Adjust Gross Inputs and Regional Inputs for the Target Industry

Intermediate purchases and shares of input purchases made in the sector's respective state were adjusted using the optimization process identified for the sugarbeet processing sectors. However, only one spending pattern was customized as production was assumed to purchase all intermediate inputs within their own state.

Capital Outlays

The survey of processing and marketing firms solicited expenditures for capital improvements, new construction, and other outlays for materials and equipment that would construed as capital purchases. The data provided by the firms was based on expenditures made to entities in Minnesota, North Dakota, and South Dakota.

A generalized portfolio of selected economic sectors was used to model construction-related expenditures and acquisitions of capital machinery and equipment. IMPLAN contains several construction sectors proprietary to IMPLAN's sector descriptions. IMPLAN creates

construction sectors based on U.S. Census definitions for the type of structures built and Census definition differs from the NAICS treatment of construction sectors. The following sectors comprised a custom industry spending pattern to model capital outlays.

IMPLAN Sector 55: Newly Constructed Commercial Structures
IMPLAN Sector 235: Prefabricated Metal Buildings and Components
IMPLAN Sector 395: Wholesale Trade: Machinery, Equipment, and Supplies
IMPLAN Sector 402: Retail Trade: Motor Vehicle and Parts
IMPLAN Sector 405: Retail Trade: Building Material and Garden Equipment and Supplies

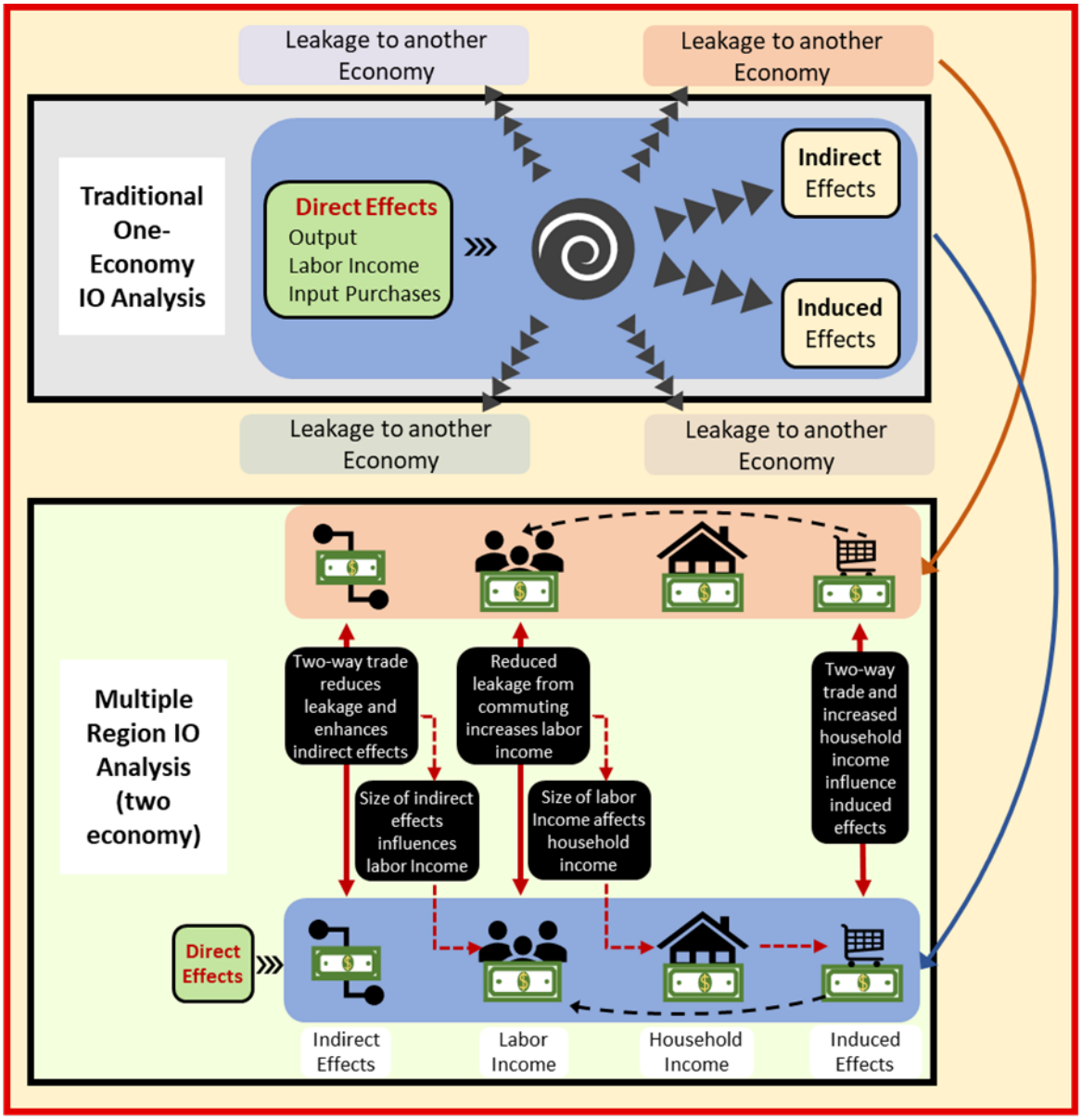
Depreciation associated with sugarbeet production was used as a proxy for capital outlays. The following sectors comprised a custom industry spending pattern for capital outlays based on distributions to those sectors developed by Bangsund and Hodur (2023).

IMPLAN Sector 55 Newly Constructed Commercial Structures, including Farm Structures
IMPLAN Sector 56 Newly Constructed Nonresidential Structures
IMPLAN Sector 235 Prefabricated Metal Buildings and Components
IMPLAN Sector 290 Industrial Trucks, Trailers, and Stackers
IMPLAN Sector 341 Light Trucks and Utility Vehicle
IMPLAN Sector 342 Heavy Duty Trucks
IMPLAN Sector 344 Truck Trailers
IMPLAN Sector 392 Wholesale Trade - Motor vehicle and Motor Vehicle Parts and Supplies
IMPLAN Sector 395 Wholesale Trade - Machinery, equipment, and supplies
IMPLAN Sector 396 Wholesale Trade - Other Durable Goods Merchant Wholesalers
IMPLAN Sector 402 Retail Trade - Motor Vehicle and Parts Dealers
IMPLAN Sector 405 Retail Trade - Building Material and Garden Equipment and Supplies

To ensure that the sectors receiving capital outlays do not make additional purchases to sugarbeet production (sector 9) or sugarbeet processing (sector 72), economic contribution controls were used in the capital expenditure analysis.

Multiple Regional Input-output Modeling and Input Purchases in Multiple Economies

The sugarbeet industry in the Red River Valley exists along a common border between Minnesota and North Dakota. The duality of the industry location and survey data identifying input purchases in each state was handled by applying a multiple region I-O (MRIO) analysis within the IMPLAN modeling platform. MRIO is a modeling process that assists in measuring cross-economy economic effects in both an originating and spillover economy(s), as opposed to measuring economic effects in a single, stand-alone economy, which is typical of industry contribution analyses confined to a single state economy.

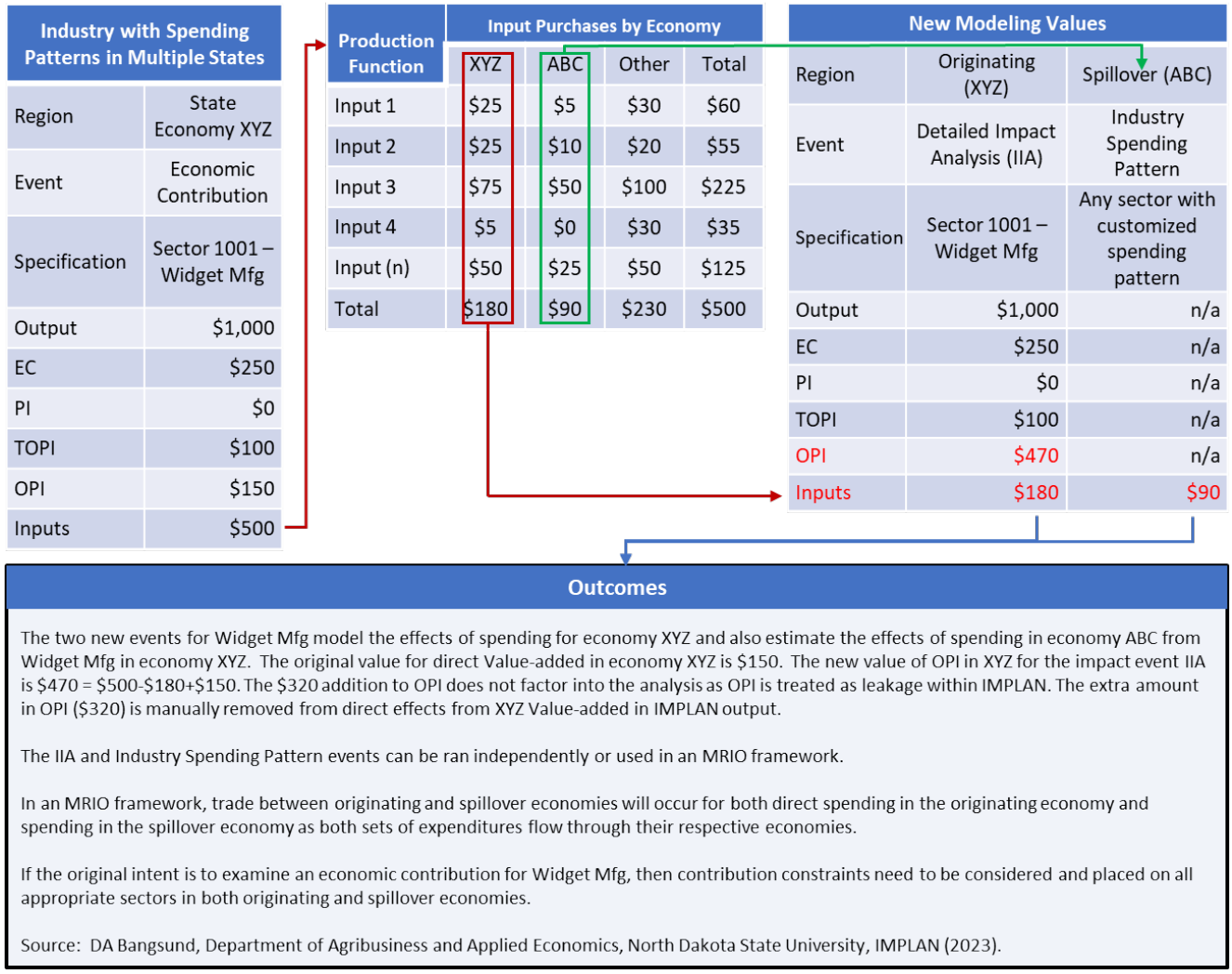


Sources: DA Bangsund, Agribusiness and Applied Economics, North Dakota State University, and IMPLAN LLC (2023).

Survey data provided the type and amount of intermediate inputs and capital expenditures in Minnesota, North Dakota, and South Dakota. Typically, industry contribution assessments focus on spending in one geography and survey data generally match that geography. However, the unique circumstances associated with the sugarbeet industry and availability of spending information for more than one state required adjustments from traditional one-economy modeling.

Intermediate purchases and capital expenditures were adjusted for separate spending patterns in both originating and spillover states. For example, the sugarbeet processing sector in Minnesota (originating economy) was modeled as an industry contribution event with the intermediate inputs portion of the balance sheet omitting inputs purchased in North Dakota

and South Dakota. Industry purchases in North Dakota and South Dakota from the processing sector in Minnesota were modeled as an industry spending pattern specific to each state (spillover economies). The same approach was implemented for the sugarbeet processing sector in North Dakota (i.e., industry contribution with customized intermediate inputs in North Dakota with industry spending patterns applied to Minnesota and South Dakota.



Industry with Spending Patterns in Multiple States	
Region	State Economy XYZ
Event	Economic Contribution
Specification	Sector 1001 – Widget Mfg
Output	$1,000
EC	$250
PI	$0
TOPI	$100
OPI	$150
Inputs	$500

Production Function	Input Purchases by Economy			
	XYZ	ABC	Other	Total
Input 1	$25	$5	$30	$60
Input 2	$25	$10	$20	$55
Input 3	$75	$50	$100	$225
Input 4	$5	$0	$30	$35
Input (n)	$50	$25	$50	$125
Total	$180	$90	$230	$500

New Modeling Values		
Region	Originating (XYZ)	Spillover (ABC)
Event	Detailed Impact Analysis (IIA)	Industry Spending Pattern
Specification	Sector 1001 – Widget Mfg	Any sector with customized spending pattern
Output	$1,000	n/a
EC	$250	n/a
PI	$0	n/a
TOPI	$100	n/a
OPI	$470	n/a
Inputs	$180	$90

Outcomes

The two new events for Widget Mfg model the effects of spending for economy XYZ and also estimate the effects of spending in economy ABC from Widget Mfg in economy XYZ. The original value for direct Value-added in economy XYZ is $150. The new value of OPI in XYZ for the impact event IIA is $470 = $500-$180+$150. The $320 addition to OPI does not factor into the analysis as OPI is treated as leakage within IMPLAN. The extra amount in OPI ($320) is manually removed from direct effects from XYZ Value-added in IMPLAN output.

The IIA and Industry Spending Pattern events can be ran independently or used in an MRIO framework.

In an MRIO framework, trade between originating and spillover economies will occur for both direct spending in the originating economy and spending in the spillover economy as both sets of expenditures flow through their respective economies.

If the original intent is to examine an economic contribution for Widget Mfg, then contribution constraints need to be considered and placed on all appropriate sectors in both originating and spillover economies.

Source: DA Bangsund, Department of Agribusiness and Applied Economics, North Dakota State University, IMPLAN (2023).

Sugarbeet production and sugarbeet research also were modeled using an MRIO analysis but, unlike the I-O setup for processing and marketing, production and research segments did not contain industry spending patterns in the neighboring states. The MRIO structure allowed for spillover effects of production in Minnesota to be captured with cross-economy trade with North Dakota and South Dakota. Production in North Dakota was modeled in a similar capacity with the Minnesota and South Dakota economies.

MRIO analyses can produce complicating causality when interpreting and consolidating output from IMPLAN, especially if more than two economies are linked. Economic values were delineated by indirect and induced effects in total for each state for each industry segment as produced in a traditional analysis. The source of economic effects was not listed for each set of

values for each state. For example, an industry spending pattern applied to North Dakota from the processing sector in Minnesota will produce indirect effects in Minnesota due to linking those two economies in an MRIO framework. Indirect effects also will be generated from direct spending in Minnesota by the processing sector located in Minnesota. Therefore, at least two sets of indirect effects are generated in the analysis. The indirect effects in Minnesota from the processing sector in Minnesota were presented as one value rather than showing each state's share. A similar treatment of MRIO results was applied to sugarbeet production, sugarbeet marketing and sugarbeet research.

IMPLAN Mapping, Sugarbeet Industry, Minnesota, North Dakota, and South Dakota, 2021/2022					
Industry Segment with Corresponding Industry Activity	Event Type	Event Specification	Customized Coefficients	Destination State	MRIO States
Sugarbeet Production					
Growing Sugarbeets	Industry Impact Analysis (detailed IIA)	Sector 9 – Sugarcane and Sugarbeet Farming	Yes	MN	ND, SD
Growing Sugarbeets	Industry Impact Analysis (detailed IIA)	Sector 9 – Sugarcane and Sugarbeet Farming	Yes	ND	MN, SD
Cash Rent	Labor Income	6001-Proprietors Income	No	MN	ND, SD
Cash Rent	Labor Income	6001-Proprietors Income	No	ND	MN, SD
Capital Expenditures	Industry Spending Pattern (customized to reflect capital outlays)	Sector 9 – Sugarcane and Sugarbeet Farming	Yes	MN	ND, SD
Capital Expenditures	Industry Spending Pattern (customized to reflect capital outlays)	Sector 9 – Sugarcane and Sugarbeet Farming	Yes	ND	MN, SD
Contribution Control	Industry Contribution Analysis	Sector 9 – Sugarcane and Sugarbeet Farming	No	MN	---
Contribution Control	Industry Contribution Analysis	Sector 9 – Sugarcane and Sugarbeet Farming	No	ND	---
Contribution Control	Industry Contribution Analysis	Sector 72—Beet Sugar Manufacturing	No	MN	---
Contribution Control	Industry Contribution Analysis	Sector 72—Beet Sugar Manufacturing	No	ND	---
Sugarbeet Processing					
Manufacturing Sector (input purchases in host state)	Industry Impact Analysis (detailed IIA)	Sector 72—Beet Sugar Manufacturing	Yes	MN	ND, SD
Manufacturing Sector (input purchases in host state)	Industry Impact Analysis (detailed IIA)	Sector 72—Beet Sugar Manufacturing	Yes	ND	MN, SD

Manufacturing Sector (input purchases in neighboring states)	Industry Spending Pattern	Sector 72—Beet Sugar Manufacturing	Yes	MN	ND, SD
Manufacturing Sector (input purchases in neighboring states)	Industry Spending Pattern	Sector 72—Beet Sugar Manufacturing	Yes	ND	MN, SD
Manufacturing Sector (capital outlays in host state)	Industry Spending Pattern (customized to reflect capital outlays)	Sector 72—Beet Sugar Manufacturing	Yes	MN	ND, SD
Manufacturing Sector (capital outlays in host state)	Industry Spending Pattern (customized to reflect capital outlays)	Sector 72—Beet Sugar Manufacturing	Yes	ND	MN, SD
Manufacturing Sector (capital outlays in neighboring states)	Industry Spending Pattern (customized to reflect capital outlays)	Sector 72—Beet Sugar Manufacturing	Yes	MN	ND, SD
Manufacturing Sector (capital outlays in neighboring states)	Industry Spending Pattern (customized to reflect capital outlays)	Sector 72—Beet Sugar Manufacturing	Yes	ND	MN, SD
Seasonal income	Labor Income	5001 – Employee Compensation	No	MN	ND, SD
Seasonal income	Labor Income	5001 – Employee Compensation	No	ND	MN, SD
Contribution Control	Industry Contribution Analysis	Sector 9 – Sugarcane and Sugarbeet Farming	No	MN	---
Contribution Control	Industry Contribution Analysis	Sector 9 – Sugarcane and Sugarbeet Farming	No	ND	---
Contribution Control	Industry Contribution Analysis	Sector 72—Beet Sugar Manufacturing	No	MN	---
Contribution Control	Industry Contribution Analysis	Sector 72—Beet Sugar Manufacturing	No	ND	---

Sugar Marketing					
Operations (input purchases in host state)	Industry Impact Analysis (detailed IIA)	Sector 72—Beet Sugar Manufacturing	Yes	MN	ND, SD
Direct spending for inputs in ND	Industry Spending Pattern	Sector 72—Beet Sugar Manufacturing	Yes	ND	MN, SD
Direct spending for inputs in SD	Industry Spending Pattern	Sector 103 – All Other Food Manufacturing	Yes	SD	MN, ND
Marketing Operations (capital outlays in host state)	Industry Spending Pattern (customized to reflect capital outlays)	Sector 72—Beet Sugar Manufacturing	Yes	MN	ND, SD
Marketing Operations (capital outlays in neighboring state)	Industry Spending Pattern (customized to reflect capital outlays)	Sector 72—Beet Sugar Manufacturing	Yes	ND	MN, SD
Contribution Control	Industry Contribution Analysis	Sector 9 – Sugarcane and Sugarbeet Farming	No	MN	---
Contribution Control	Industry Contribution Analysis	Sector 9 – Sugarcane and Sugarbeet Farming	No	ND	---
Contribution Control	Industry Contribution Analysis	Sector 72—Beet Sugar Manufacturing	No	MN	---
Contribution Control	Industry Contribution Analysis	Sector 72—Beet Sugar Manufacturing	No	ND	---
Sugarbeet Research					
Employment Compensation for Research Personnel	Labor Income	5001 – Employee Compensation	No	ND	MN, SD
Research Activities input purchases	Industry Spending Pattern	Sector 464—Scientific, Research, Development Services	Yes	ND	MN, SD
Contribution Control	Industry Contribution Analysis	Sector 9 – Sugarcane and Sugarbeet Farming	No	MN	---

Contribution Control	Industry Contribution Analysis	Sector 9 – Sugarcane and Sugarbeet Farming	No	ND	---
Contribution Control	Industry Contribution Analysis	Sector 72—Beet Sugar Manufacturing	No	MN	---
Contribution Control	Industry Contribution Analysis	Sector 72—Beet Sugar Manufacturing	No	ND	---

Appendix C

Sugarbeet Production Budgets

Composition Sugarbeet Production Expenditures

Sugarbeet production budgets were compiled for the two main growing regions: Red River Valley in North Dakota and Minnesota and west central Minnesota. Production budgets were used to estimate the economic contribution of sugarbeet production, and were used to develop a custom industry balance sheet and industry spending patterns for intermediate inputs.

Revenues

Payments to farmers and planted acreage in each major growing area were obtained from the survey of sugarbeet processors (Appendix E). Estimates of per-acre federal farm program payments and miscellaneous revenues were obtained from the Farm Financial Management Database. Insurance indemnities were obtained from National Crop Insurance Services. Payments from sugarbeet processors, farm program payments, and insurance indemnities were combined to estimate gross revenues from sugarbeet production. Gross revenues were not shown to prevent revealing payments by individual processors.

Expenses

Expenses for sugarbeet production in the River Valley were obtained separately for owned and rented land from the Farm Financial Management Database. Similarly, expenses for sugarbeet production in west central Minnesota were obtained from the Farm Financial Management Database). Expenses available from the Farm Business Management Database represent an average of actual production costs incurred by the farmers/producers enrolled in the management program. The ratio of rented to owned land in the Red River Valley and west central Minnesota sugarbeet growing regions was obtained from the 2017 Census of Agriculture and used to create weighted-average production costs using owned and rented land expenses. Property taxes paid on owned land were used to estimate property taxes for rented land. Land rental expenses therefore represented revenues to land owners net of property taxes. Property taxes were estimated for all acreage and were placed in Indirect Taxes on Production and Imports when constructing the industry balance sheets. Rental payments were placed in Other Property Type Income. The potential spending of cash rent by landowners in the three states was handled as a stand-alone analysis.

Net Returns

Producer net returns from sugarbeet production were estimated by subtracting variable and fixed costs from gross revenue. All expenses represented cash costs, except depreciation charges, which were used as proxy for capital outlays. As a result, the budgets excluded non-cash costs associated with owned land, return on invested equity, management charges, and income tax liability. The producer net returns estimated in the budgets should not be confused

with economic profit. Instead, the returns to unpaid labor, management, and equity simply represent gross revenues less cash expenses. Economic costs of production were not estimated. Net returns are not presented to prevent revealing payments by individual processors.

Sugarbeet Production Expenses, Red River Valley, Minnesota and North Dakota, 2021

								Red River Valley		
								North Dakota	Minnesota	Total
							Acreage Allocation by State	41.1%	58.9%	
							Acreage Planted	212,547	304,253	516,800
							Rented Land Acreage	129,471	185,333	314,804
							Owned Land Acreage	83,076	118,920	201,996
Expenses	Owned Land ND	Owned Land MN	Rented Land ND	Rented Land MN	Owned Land Average	Rented Land Average	All Acre Average			
Variable										
Seed	223.46	226.44	227.73	229.02	225.21	225.21	227.21	48,292,670	69,129,132	117,421,802
Fertilizer	85.76	86.07	87.12	87.3	85.94	85.94	86.72	18,432,652	26,385,644	44,818,296
Chemical	138.00	129.03	141.51	140.95	132.72	132.72	137.87	29,304,532	41,948,330	71,252,862
Insurance	34.32	32.31	34.84	33.04	33.14	33.14	31.47	7,034,551	9,229,249	16,263,800
Fuel & Oil	51.20	51.07	55.21	56.40	51.12	51.12	54.04	11,485,932	16,441,678	27,927,610
Repairs	110.60	111.91	110.75	109.05	111.37	111.37	110.38	23,461,611	33,584,409	57,046,020
Custom Hire	32.10	33.28	36.20	34.87	32.79	32.79	34.39	7,309,926	10,463,883	17,773,809
Hired Labor	19.57	22.42	24.62	25.38	21.25	21.25	23.57	5,010,693	7,172,618	12,183,311
Land Rent	0	0	124.41	120.72	0	0	74.46	15,826,230	22,654,651	38,480,881
Stock Quota	65.38	90.93	103.00	111.87	80.42	80.42	97.36	20,692,742	29,620,878	50,313,620
Machinery & Equipment Leases	1.10	0.44	2.41	1.02	0.71	0.71	1.25	265,179	379,594	644,773
Hauling and Trucking	18.55	13.59	12.68	7.47	15.63	15.63	11.96	2,543,043	3,640,270	6,183,313
Interest	14.99	13.02	17.06	16.27	13.83	13.83	15.51	3,297,518	4,720,273	8,017,791
Misc	5.93	3.59	4.70	4.39	4.55	4.55	4.53	963,078	1,378,610	2,341,689
Fixed										
Custom Hire	0.16	0.22	0.88	0.94	0.20	0.92	0.63	134,735	192,867	327,602
Hired Labor	48.97	55.41	54.34	57.90	52.76	56.44	55.00	11,690,013	16,733,811	28,423,824
Machinery Lease	19.27	19.05	11.26	11.15	19.14	11.20	14.30	3,039,573	4,351,034	7,390,607
Building Lease	1.14	1.58	1.35	1.46	1.40	1.41	1.41	299,397	428,575	727,972
Property Tax	30.43	28.12	0.06	0.08	29.07	0.07	11.41	2,424,315	3,470,315	5,894,629
Farm Insurance	16.62	15.52	14.27	14.43	15.987	14.36	14.99	3,186,670	4,561,598	7,748,268
Utilities	10.61	10.45	10.09	10.13	10.52	10.11	10.27	2,183,022	3,124,914	5,307,936
Dues/Fees	9.58	8.68	9.39	9.69	9.05	9.57	9.36	1,990,450	2,849,253	4,839,703
Interest	62.76	66.41	10.64	10.73	64.91	10.69	31.88	6,776,796	9,700,728	16,477,524
Depreciation	101.26	99.00	93.21	97.29	99.93	95.61	97.30	20,680,722	29,603,673	50,284,395
Misc	8.91	8.65	14.12	13.36	8.76	13.67	11.75	2,497,808	3,575,518	6,073,327
Sugarbeet Research	1.15	1.15	1.15	1.15	1.15	1.15	1.15	244,313	349,725	594,037
Total Expenses	1,111.81	1,128.34	1,203.00	1,206.06	1,121.54	1,204.80	1,170.17	248,823,858	355,341,507	604,165,365

Notes: Cash rent is net of property tax. Property tax on cash rent land is added to property tax in fixed expenses for purposes of showing budget expenses. Sugarbeet research expenses were approximated from information from the Red River Valley Sugarbeet Growers Association.

Sources: Survey of Processors, Farm Financial Management Data Base, 2017 Census of Agriculture, and Red River Valley Sugarbeet Growers Association.

Sugarbeet Production Expenses, South Central, Minnesota, 2021

				South Central Minnesota		
				North Dakota	Minnesota	Total
			Acreage Allocation by State	0.0%	100%	
			Acreage Planted		105,198	105,198
			Rented Land Acreage		61,596	61,596
			Owned Land Acreage		43,602	43,602
Expenses	Owned Land MN	Rented Land MN	All Acre Average			
Variable						
Seed	213.61	215.61	214.66		22,581,803	22,581,803
Fertilizer	88.20	89.49	88.96		93,58,414	93,58,414
Chemical	166.42	157.44	161.16		16,953,710	16,953,710
Insurance	40.46	49.35	45.67		5,056,014	5,056,014
Fuel & Oil	49.90	44.02	46.46		4,887,499	4,887,499
Repairs	89.59	103.02	97.45		10,251,545	10,251,545
Custom Hire	34.34	53.93	45.81		4,819,120	4,819,120
Hired Labor	14.48	11.05	12.47		1,311,819	1,311,819
Land Rent	0	180.73	105.82		11,132,052	11,132,052
Stock Quota	1.76	11.91	7.70		810,025	810,025
Machinery & Equipment Leases	36.93	44.15	41.16		4,329,950	4,329,950
Hauling and Trucking	0.99	0.75	0.85		89,418	89,418
Interest	16.76	18.64	17.86		1,878,836	1,878,836
Misc	13.07	7.77	9.97		1,048,824	1,048,824
Fixed						
Custom Hire	0	0	0		0	0
Hired Labor	27.53	19.80	23.00		2,419,554	2,419,554
Machinery Lease	17.73	17.13	17.38		1,828,341	1,828,341
Building Lease	0	0	0		0	0
Property Tax	38.33	0	15.89		1,671,596	1,671,596
Farm Insurance	21.38	13.95	17.03		1,791,522	1,791,522
Utilities	11.59	10.12	10.73		1,128,775	1,128,775
Dues/Fees	9.45	9.01	9.19		966,770	966,770
Interest	11.59	9.60	30.80		3,240,098	3,240,098
Depreciation	101.62	69.94	83.07		8,738,798	8,738,798
Misc	10.36	11.21	10.86		1,142,450	1,142,450
Sugarbeet Research	1.15	1.15	1.15		120,978	120,978
Total Expenses	1,066.41	1,149.57	1,115.10		117,436,933	117,436.93

Notes: Cash rent is net of property tax. Property tax on cash rent land is added to property tax in fixed expenses for purposes of showing budget expenses. Sugarbeet research expenses were approximated from information from the Red River Valley Sugarbeet Growers Association.

Sources: Survey of Processors, Farm Financial Management Data Base, 2017 Census of Agriculture, Red River Valley Sugarbeet Growers Association.

Appendix D

Industry Questionnaires

NDSU AGRIBUSINESS AND APPLIED ECONOMICS

Economic Contribution of the Sugarbeet Industry

Sugarbeet Processors

Confidentiality

This is a confidential request -- only the immediate research team has access to this information, and the information is never shared with any interests during or after the study. A confidentiality agreement has been approved with NDSU.

Guidelines and Instructions

Please use the following guidelines.

1. Please provide information for sugarbeet production year 2021 and processing for FY 2022.

2. When information is not available, please estimate.

3. Please email the questionnaire to Dean Bangsund at the address below.

Study Contacts

Dean Bangsund (701-231-7471)
d.bangsund@ndsu.edu

Dr. Nancy Hodur (701-231-8621)
nancy.hodur@ndsu.edu

Survey of Sugarbeet Processors

Company: _____

Contact Person: _____

Email: _____ Phone: _____

I. Revenues for FY 2022 (values can be rounded to thousands of dollars).

Sources	Revenues
Sugar	$
All other sugarbeet-related revenues	$

II. Employment and Payroll for FY 2022 (please include all jobs located in Minnesota and North Dakota).

Employment and Payroll	Distribution by State	
	Minnesota	North Dakota
Jobs		
Full-time		
Part-time		
Seasonal (e.g., additional jobs during harvest campaign)		
Employment Compensation		
Wages, salaries, bonuses	$	$
Employee/Payroll benefits	$	$

Definitions:

Wages and Salaries: Wages, salaries, and bonuses for part-time, seasonal, and full-time employees. Any pensions paid to retired employees. Please exclude payroll benefits.

Employee/Payroll Benefits: Includes payments for health, dental, and vision insurance, retirement contributions (e.g., 401k, company pension funds) for active employees, unemployment taxes, Workforce Safety Insurance (WSI), and employer FICA contributions.

III. Sugarbeet Production for 2021 Growing Season.

Production Statistics	Minnesota	North Dakota
Planted acreage		
Harvested acreage		
Sugarbeets processed (tonnage for processing plants located in each state)	tons	tons
Payments to producers e.g., payments for 2021 beet crop and any other payments (patronage dividends) made to producers during FY 2022 operations	$	$
Note: If your firm had any acreage and/or payments in South Dakota, please list separately.		

IV. Expenditures for FY 2022 (financial values can be estimated and rounded to thousands).

If a major expense does not align with the categories below, please list under 'Other'.

Categories	Total Expense in FY2022	Percentage from Sources in	
		Minnesota	North Dakota
Example: repairs	$21,000	10%	70%
Processing Materials			
Lime	$	%	%
Coal and/or coke	$	%	%
Bagging and packaging supplies	$	%	%
Other (please specify)	$	%	%
	$	%	%
	$	%	%
Utilities			
Electricity	$	%	%
Natural Gas	$	%	%
Water	$	%	%
Sewer and Garbage	$	%	%
Other (please specify)	$	%	%
	$	%	%
	$	%	%

Categories	Total Expense FY2022	Percentage from Sources in	
		Minnesota	North Dakota
Administration and General Operations			
General office (e.g., computers, software, office furniture, printer cartridges, paper, other supplies)	$	%	%
Communications (e.g., internet, satellite, cell phone, land line)	$	%	%
Equipment and building leases/rent	$	%	%
Insurance (e.g., property and liability insurance for buildings, facilities, vehicles)	$	%	%
Loan interest and banking/brokerage fees/charges	$	%	%
Business services (e.g., advertising and promotion, computer services, security services, tax and auditing preparation, automotive repairs, janitorial services, landscaping and grounds keeping, catering and event hosting)	$	%	%
Business travel (e.g., lodging, meals, entertainment, mileage, conferences, airfare)	$	%	%
Others (please specify)	$	%	%
	$	%	%
	$	%	%
Plant Maintenance and Upkeep (note: please include expenses for new equipment and pre-built machinery in the Capital Expenditures section)			
Manufacturing related to annual upkeep (e.g., on-site or contracted fabrication)	$	%	%
Contract construction related to annual upkeep	$	%	%
Engineering and technical services	$	%	%
Contracted repairs	$	%	%
Other (please specify)	$	%	%
	$	%	%
	$	%	%
Inbound and Outbound Freight and Transportation			
Truck	$	%	%
Rail tariffs	$	%	%
Contracted beet hauling (piling stations to plants)	$	%	%
Other (please specify)	$	%	%
	$	%	%
	$	%	%

Categories	Total Expense FY2022	Percentage from Sources in	
		Minnesota	North Dakota
Miscellaneous Expenses			
Memberships and Dues	$	%	%
Employee Training	$	%	%
Sugarbeet Research	$	%	%
Educational Scholarships	$	%	%
Charitable Contributions	$	%	%
Other (please specify)	$	%	%
	$	%	%
	$	%	%
Local and State Governments (please exclude payroll taxes)			
Property Tax	$	%	%
Sales and Use Tax	$	%	%
Corporate Income Tax	$	%	%
Licenses, fees, permits, fines	$	%	%
Other (please list)	$	%	%
	$	%	%
	$	%	%
Capital Expenditures			
Expansion/Upgrades/New Construction New facilities, buildings, structures Major improvements, remodeling, renovations, and structural alternations to existing buildings/facilities Note: please exclude purchases of land and purchases of existing buildings	$	%	%
New and replacement equipment and machinery Examples include vehicles, augers, electric motors, processing machinery, boilers, slicers, storage tanks, bins, material handling, scales, sensors, monitoring and control systems, payloaders, vehicles, trailers	$	%	%
Other (please specify)	$	%	%
	$	%	%
	$	%	%

Feel free to add any supporting materials or comments that will help with the study.

Thank You for completing this questionnaire

Please email an electronic copy to one of the study researchers.

NDSU AGRIBUSINESS AND APPLIED ECONOMICS

Economic Contribution of the Sugarbeet Industry

Sugar Marketing

Confidentiality

This is a confidential request -- only the immediate research team has access to this information, and the information is never shared with any interests during or after the study. A confidentiality agreement has been approved with NDSU.

Guidelines and Instructions

Please use the following guidelines.

2. Please provide information for FY 2022.

2. When information is not available, please estimate.

3. Please email the questionnaire to Dean Bangsund at the address below.

Study Contacts

Dean Bangsund (701-231-7471)
d.bangsund@ndsu.edu

Dr. Nancy Hodur (701-231-8621)
nancy.hodur@ndsu.edu

Survey of Sugar Marketing

Company: _____

Contact Person: _____

Email: _____ Phone: _____

I. Revenues for FY 2022 (values can be rounded to thousands of dollars)

Sources	Revenues
Sales of Sugar	$
Sales of other sugar-related revenues	$

II. Employment and Payroll for FY 2022 (please include all jobs located in the following states).

Employment and Payroll	Distribution by State			
	Minnesota	North Dakota	Montana	South Dakota
Jobs				
Full-time				
Part-time				
Employment Compensation				
Wages, salaries, bonuses	$	$	$	$
Employee/Payroll benefits	$	$	$	$

Definitions:

Wages and Salaries: Wages, salaries, and bonuses for part-time, seasonal, and full-time employees. Any pensions paid to retired employees. Please exclude payroll benefits.

Employee/Payroll Benefits: Includes payments for health, dental, and vision insurance, retirement contributions (e.g., 401k, company pension funds) for active employees, unemployment taxes, Workforce Safety Insurance (WSI), and employer FICA contributions.

III. Expenditures for FY 2022 (financial values can be estimated and rounded to thousands)

If a major expense does not align with the categories below, please list under 'Other'.

Categories	Total Expense FY2022	Percentage from Sources in			
		Minnesota	North Dakota	Montana	South Dakota
Example: storage rental	$21,000	60%	5%	5%	0%
Product Procurement					
Purchases of sugar from processors	$	%	%	%	%
Purchases of all other sugar-related products from processors	$	%	%	%	%
Other (please specify)	$	%	%	%	%
	$	%	%	%	%
	$	%	%	%	%
Administration and General Operations					
General office (e.g., computers, software, office furniture, printer cartridges, paper, other supplies)	$	%	%	%	%
Communications (e.g., internet, satellite, cell phone, land line)	$	%	%	%	%
Equipment and building leases/rent	$	%	%	%	%
Insurance (e.g., property and liability insurance for buildings, facilities, vehicles)	$	%	%	%	%
Loan interest and banking/brokerage fees/charges	$	%	%	%	%
Business services (e.g., advertising and promotion, computer services, security services, tax and auditing preparation, automotive repairs, janitorial services, landscaping and grounds keeping, catering and event hosting)	$	%	%	%	%
Business travel (e.g., lodging, meals, entertainment, mileage, conferences, airfare)	$	%	%	%	%
Warehousing and Storage	$	%	%	%	%
Freight – Trucking	$	%	%	%	%
Freight – Rail	$	%	%	%	%
Other (please specify)	$	%	%	%	%
	$	%	%	%	%
	$	%	%	%	%
	$	%	%	%	%
	$	%	%	%	%

Categories	Total Expense FY2022	Percentage from Sources in			
		Minnesota	North Dakota	Montana	South Dakota
Miscellaneous Expenses					
Memberships and Dues	$	%	%	%	%
Employee Training	$	%	%	%	%
Sugarbeet Research	$	%	%	%	%
Educational Scholarships	$	%	%	%	%
Charitable Contributions	$	%	%	%	%
Other (please specify)	$	%	%	%	%
	$	%	%	%	%
	$	%	%	%	%
	$	%	%	%	%
Local and State Governments (please exclude payroll taxes)					
Property Tax	$	%	%	%	%
Sales and Use Tax	$	%	%	%	%
Corporate Income Tax	$	%	%	%	%
Licenses, fees, permits, fines	$	%	%	%	%
Other (please list)	$	%	%	%	%
	$	%	%	%	%
	$	%	%	%	%
	$	%	%	%	%
Capital Expenditures					
Expansion/Upgrades/New Construction New facilities, buildings, structures Major improvements, remodeling, renovations, and structural alternations to existing buildings/facilities Note: please exclude purchases of land and purchases of existing buildings	$	%	%	%	%
Other (please specify)	$	%	%	%	%
	$	%	%	%	%
	$	%	%	%	%
	$	%	%	%	%

Feel free to add any supporting materials or comments that will help with the study.

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Thank You for completing this questionnaire

Please email an electronic copy to one of the study researchers.

Appendix E

Survey Data from Sugarbeet Processors

Survey Data, Sugarbeet Processors, Minnesota and North Dakota, 2021/2022			
Spending Category / Itemized Expense	Value	Spending Category / Itemized Expense	Value
Revenues		Utilities	
Sugar	$2,193,218,103	Electricity	$36,651,439
Other	$353,848,700	Natural Gas	$23,556,063
		Water	$2,183,346
Employment		Sewer and Garbage	$519,662
FT	2,454	Other	$16,852,850
PT	25		
Seasonal	882	Plant Maintenance and Upkeep	
Wage, Salary, Bonuses	$188,355,460	Manufacturing	$51,128,296
		Contract Construction and Engineering/Technical Services	$34,682,485
Employee Benefits	$70,468,231	Repairs	$28,041,550
Compensation (seasonal)	$28,081,436	Other	$16,614,013
Production			
Planted Acres	638,186	Freight	$151,842,378
Harvested Acres	605,243		
Tons Processed	16,895,489	Miscellaneous	
Grower Payments	$1,065,936,421	Memberships/Dues	$5,228,517
		Training	$999,832
		Sugarbeet Research, Scholarships, Other	$1,920,602
Processing Materials			
Lime, Coal, Coke	$90,374,000		
Chemicals, Supplies, Bags, Packaging, Misc	$101,130,874	Local and State Government	
		Property Tax	$3,531,369
Administration and General Operations		Sales and Use	$871,154
General Office	$6,014,658	Corporate Income	$11,440,388
Communications	$866,376	Licenses/Fees/Permits	$643,190
Equipment	$11,099,117		
Insurance	$11,801,916	Capital Expenditures	
Banking/Interest	$31,057,097	Construction	$65,597,294
Business Services	$10,882,666	Equipment	$49,864,101
Travel	$3,262,772	Other	$5,335,160
Beet Seed and Trials	$11,115,396		
Labor Contractors	$4,226,275		
Other	$41,353,011		