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Economic Contribution of the Dry Bean Industry in Minnesota and North Dakota

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Executive Summary

Dry beans represent an important regional crop in Minnesota and North Dakota. The industry is primarily comprised of crop production and associated processing facilities located within crop producing areas.

Information for the study was compiled from crop enterprise budgets, government agencies, and a survey of dry bean processors. The industry survey obtained information on gross revenues, employment, payroll, gross and in-state purchases of goods and services, and tax payments made by dry bean processors. Input-output analysis was used to estimated indirect and induced economic effects.

Dry Bean Production in Minnesota and North Dakota (annual average 2020 through 2022)

- 898,800 planted acres
- 1,570 million pounds of production
- $1.3 billion gross business volume
- 4,350 direct and secondary jobs
- $402 million in direct and secondary labor income
- $663 million in value-added (contribution to gross state product)

Dry Bean Processing in Minnesota and North Dakota (2023)

- $765 million in direct output
- $911 million gross business volume
- 1,250 direct and secondary jobs
- $103 million in labor income
- $318 million in value-added (contribution to gross state product)

Dry Bean Industry in Minnesota and North Dakota

- 5,600 jobs
- $505 million in labor income
- $980 million in value-added economic activity
- $2.2 billion gross business volume
- $76 million in state and local government revenues

Dry Bean Industry in **Minnesota**

- Farm Production
  - 241,700 planted acres
  - 527 million pounds of production
  - 1,700 direct and secondary jobs
  - $154 million in direct and secondary labor income
  - $502 million gross business volume from production
  - $258 million in value-added (contribution to gross state product)
- Bean Processing
  - 440 direct and secondary jobs
  - $36 million in direct and secondary labor income
  - $284 million gross business volume from processing
  - $104 million in value-added (contribution to gross state product)
- Combined Production and Processing
  - 2,140 direct and secondary jobs
  - $190 million in direct and secondary labor income
  - $786 million gross business volume from processing
  - $362 million in value-added (contribution to gross state product)
  - $38.6 million in state and local government revenues

Dry Bean Industry in **North Dakota**

- Farm Production
  - 657,000 planted acres
  - 1,043 million pounds of production
  - 2,654 direct and secondary jobs
  - $248 million in direct and secondary labor income
  - $812 million gross business volume from production
  - $405 million in value-added (contribution to gross state product)
- Bean Processing
  - 810 direct and secondary jobs
  - $67 million in direct and secondary labor income
  - $628 million gross business volume from processing
  - $214 million in value-added (contribution to gross state product)
- Combined Production and Processing
  - 3,470 direct and secondary jobs
  - $315 million in direct and secondary labor income
  - $1.4 billion gross business volume from processing
  - $619 million in value-added (contribution to gross state product)
  - $37.6 million in state and local government revenues

Economic Contribution of the DryBean Industry in Minnesota and North Dakota

Dean A. Bangsund and Nancy M. Hodur*

The economic contribution of various crops and related processing activities in Minnesota and North Dakota has been periodically assessed, either as part of larger industry assessments or commodity-specific studies. Dry beans is a regionally important crop in both states, yet assessments on the economic contributions from this crop and related processing remain limited.

As is the case with dry beans, regionally important crops tend to be overlooked as focus of economic importance within the two-state regional economy gravitates to high acreage and high value crops. In Minnesota, corn and soybean dominate crop production, both in acreage and overall economic contribution. Likewsie, in North Dakota, corn and soybeans, combined with wheat, represent a substantial share of the value of all crop production and crop processing.

The concentration of dry bean production and processing accentuate the industry's economic importance in rural economies in both Minnesota and North Dakota. The vast majority of dry beans undergo some processing prior to shipping to export markets and domestic food manufacturing. The economic effects of co-locating production and processing increases the crop's regional footprint.

Policy debates relating to crop insurance, federal farm programs, international trade, and other issues for dry beans have prompted industry regpresentatives to examine the crop's economic contribution to the economies of Minnesota and North Dakota. The purpose of this study is to identify the economic size of dry bean production and dry bean processing in the two states.

* Bangsund, Research Scientist, Department of Agribusiness and Applied Economics and Hodur, Director, Center for Social Research, North Dakota State University.

Composition of the Dry Bean Industry

Dry Bean Production: This segment grows dry beans and includes planting, harvesting, and delivery of dry beans to processing facilities.

Dry Bean Processing: This segment provides cleaning, grading, packaging of dry beans and processes dry beans into various products.

Dry Bean Brokers: This segment matches dry beans from processors to domestic and international buyers.

Dry Bean Seed: This segment produces dry beans for use as seed for growing dry beans.

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 operating in the study region. 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. Components of an economy typically include 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 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 described 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.

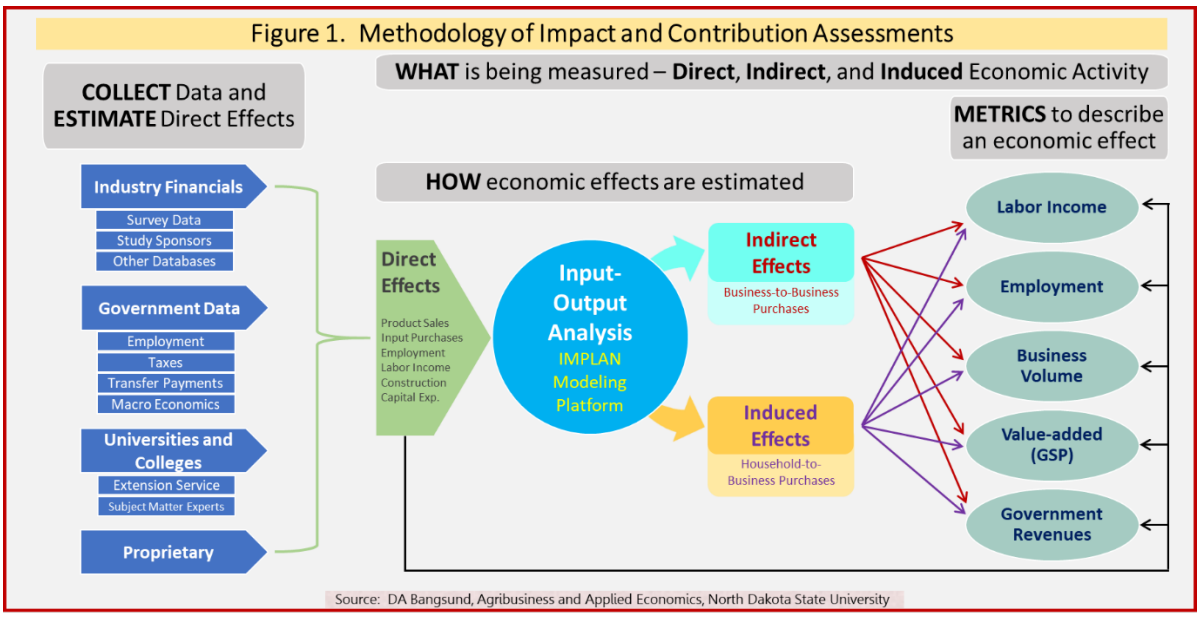


Figure 1. Methodology of Impact and Contribution Assessments

Multiple Region Input-output Mapping

Input-output mapping refers to how modeling options and economic values are applied to an I-O matrix. In Minnesota and North Dakota, dry bean production and processing are concentrated in reasable proximity in the two states. The duality of the industry location and survey data identifying input purchases in Minnestota and North Dakota 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 statelevel industry contribution analyses. Additional detail on the application of MRIO analysis for the dry bean 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. 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).

Dry Bean Production

The following information related to dry bean production was collected for 2020 through 2022:

- Crop price
- Production acreage
- Production yield
- 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 dry bean production was obtained from producer records in the Farm Financial Management Database (FINBIN), NDSU Extension Service, National Crop Insurance Statistics, Farm Service Agencyt, Census of Agriculture, and ND Office of the State Tax Commissioner. Dry bean production budgets are contained in Appendix C. While IMPLAN has a grain 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 dry bean 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 dry bean 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 since that does not account for payments made to out-of-state landowners.

Dry Bean Processing

A confidential survey solicited operational expenditures and financial information from dry bean processors in Minnesota and North Dakota (Appendix D). The survey solicited information for activity in 2023.

The following information was collected:

- Gross revenue (i.e., only related to crop processing)
- Quantity 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 most financial questions, excluding gross revenues if operating in more than one state, included a total (i.e., total outlays for an expenditure) and separate shares of an expenditure acquired from entities in Minnesota and North Dakota (Appendix C).

Survey data was used to customize IMPLAN industry balance sheets for dry bean processing 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, the spending pattern for Minnesota processing activities used in the MRIO analysis included purchases made in the Minnesota economy and a separate spending pattern was developed and applied to the North Dakota economy (Appendix B).

Study Omissions and Limitations

Dry bean brokers and dry bean seed producers were identified as two segments to be included in the dry bean industry in Minnesota and North Dakota. Firms for both segments were surveyed to obtain financial information relating to the dry bean industry. Both industry segments were excluded from the industry assessment as participation in the industry survey was insufficient to produce useable information for the study.

Dry Bean Production

Dry bean production averaged 610,000 planted acres in North Dakota and 182,000 planted acres in Minnesota from 2009 through 2023 (Table 1). From 2021 through 2023, planted dry bean acreage averaged 587,000 acres in North Dakota and 221,000 acres in Minesota. Minnesota and North Dakota combined for 808,000 planted acres from 2021 through 2023 (Figures 2).

Table 1. Dry Bean Production, Minnesota and North Dakota, 2020 through 2022

	2020	2021	2022	Average
Minnesota				
Planted Acreage	270,000	240,000	215,000	241,667
Production (cwt)	5,662,888	4,922,371	5,236,476	5,273,912
Price ($/cwt)	33.95	38.14	37.08	36.39
Farm Gate Value (000s $)	192,255	187,542	194,169	191,322
North Dakota				
Planted Acreage	783,700	638,500	549,300	657,167
Production (cwt)	13,688,772	6,752,977	10,847,124	10,429,624
Price ($/cwt)	28.90	41.00	37.90	34.63
Farm Gate Value (000s $)	395,606	276,872	411,106	361,195
Combined				
Planted Acreage	1,053,700	878,500	764,300	898,834
Production (cwt)	19,351,660	11,675,348	16,083,600	15,703,536
Price ($/cwt)	30.38	39.78	37.63	35.18
Farm Gate Value (000s $)	587,861	464,414	605,274	552,516

Source: NDSU Extension Service, National Agricultural Statistics Service, Farm Service Agency.

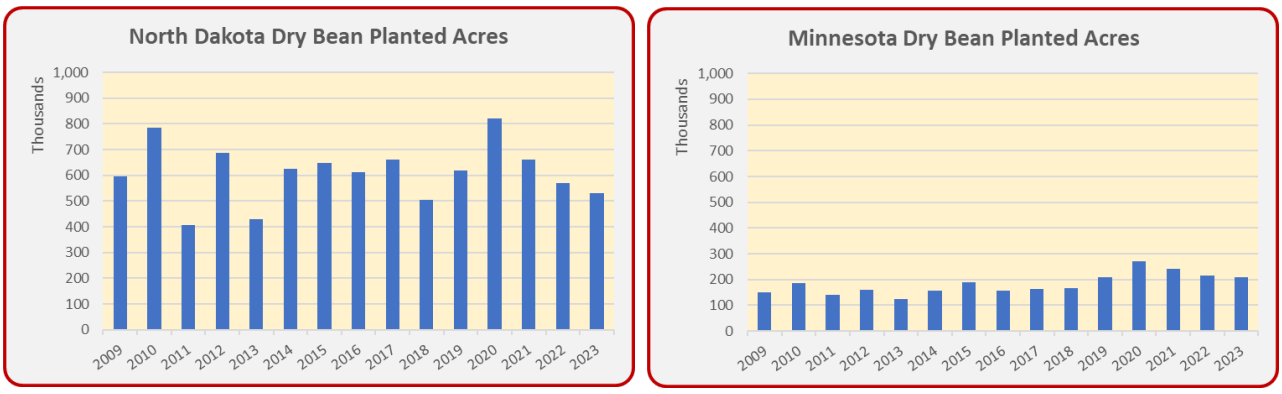


Figure 2. Dry Bean Planted Acreage, Minnesota and North Dakota, 2009 through 2023
Source: National Agricultural Statistics Service.

Dry bean production averaged 930.8 million pounds per year in North Dakota and 367.2 million pounds in Minnesota from 2009 through 2023. From 2021 through 2023, average annual

dry bean production was 926.0 million pounds in North Dakota and 478.9 million pounds in Minnesota. Minnesota and North Dakota combined for 1,404.9 million pounds annually from 2021 through 2023 (Figures 3).

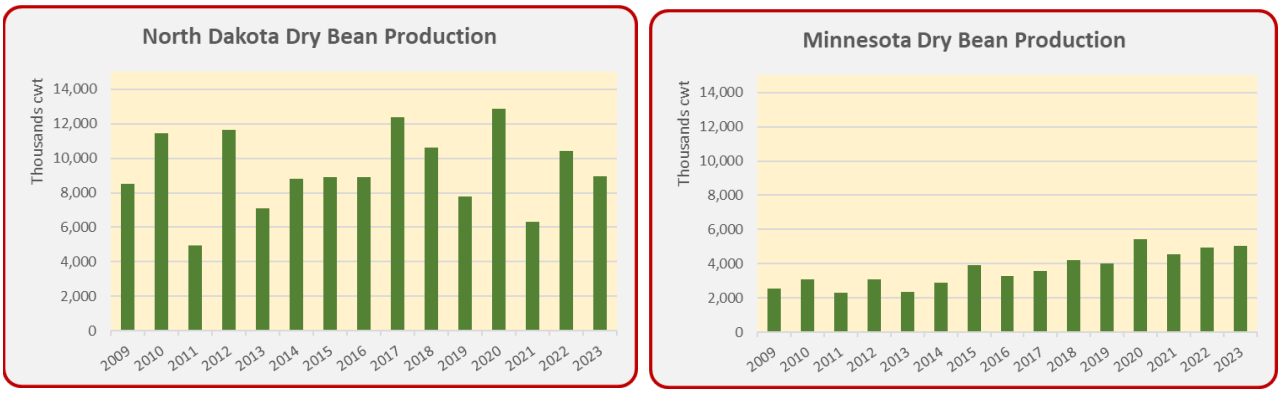


Figure 3. Dry Bean Production, Minnesota and North Dakota, 2009 through 2023
Source: National Agricultural Statistiics Service.

Dry bean production in North Dakota is concentrated in the northest quadriant of the state (Figure 4). In Minnesota, dry bean production is concentrated in the Red River Valley and central counties (Figure 5).

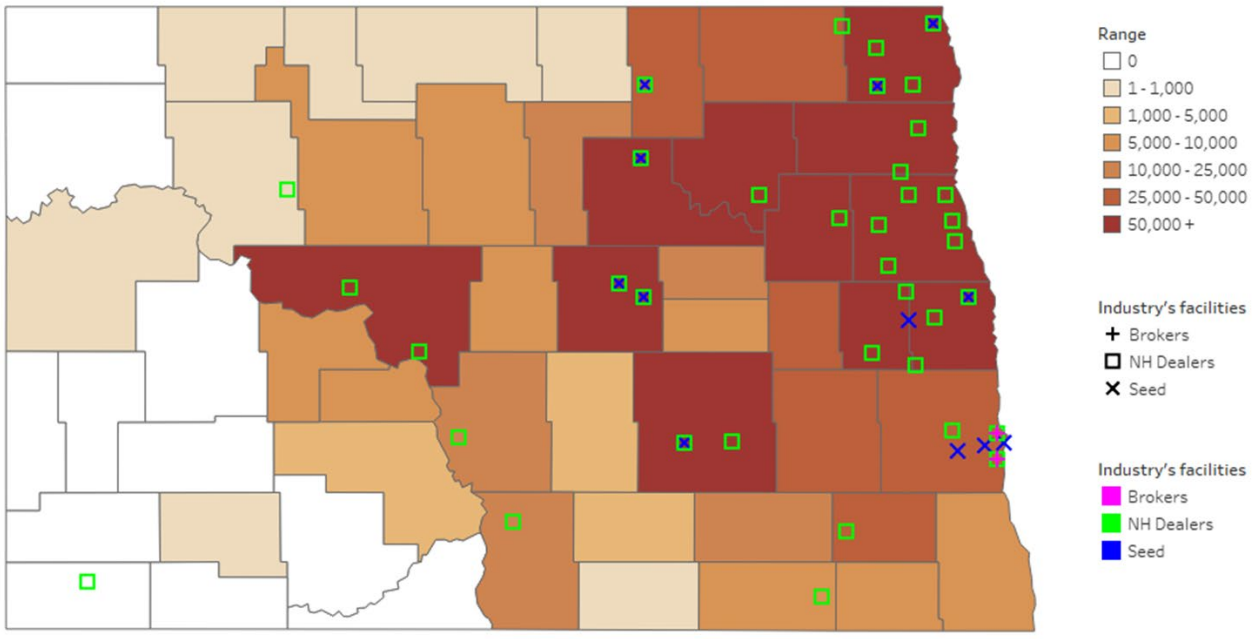


Figure 4. Dry Bean Planted Acreage, by County, North Dakota, Average 2021 through 2023.

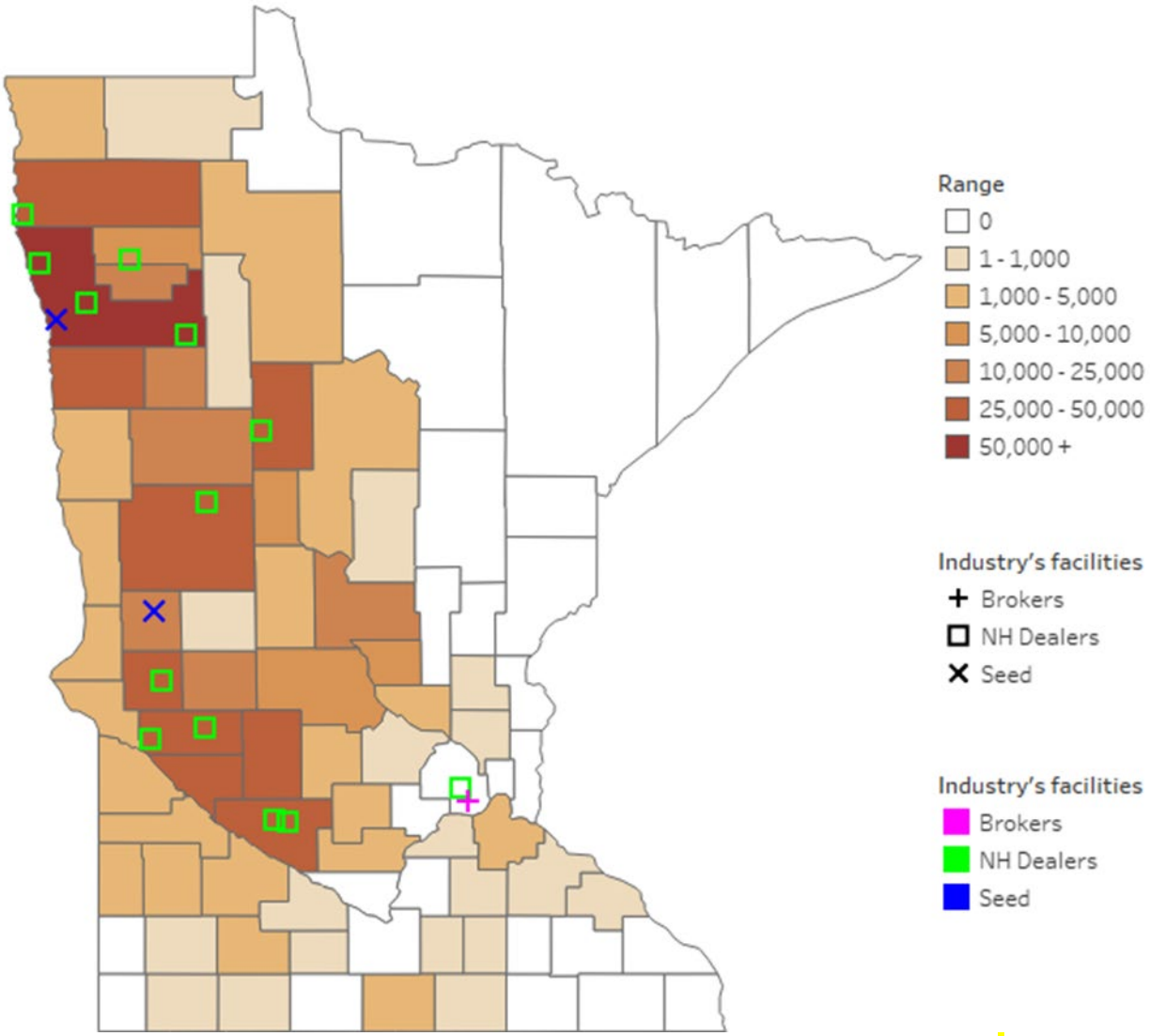


Figure 5. Dry Bean Planted Acreage, by County, Minnesota, Average 2021 through 2023.

Direct Effects for Crop Production

Direct output for dry bean production was estimated at $212.9 million and $423.0 million in Minnesota and North Dakota, respectively (Table 2). The combined value of dry bean production averaged $636 million from 2020 through 2022 (Figure 6). Production for 2023 was available at the time the analysis was conducted, but financial information for crop production was not available.

Average direct employment for dry bean production was estimated at nearly 730 jobs, which included about 620 sole proprietors. In the case of dry bean production, net returns from growing dry beans in Minnesota and North Dakota represent labor income for self-employed farmers and producers. Sole proprietor annual income was estimated at $190 million. Additional employment compensation for wage and salary workers in dry bean production was $10.1 million. Dry bean production in the two states had average annual direct labor income of $200 million. Labor income is the combination of direct compensation and employment-related benefits for wage and salary jobs and also includes income from self-employment.

Purchases of goods and services also has substantial economic effects on Minnesota and North Dakota economies. Crop production was responsible for over $329 million in goods and services annually from 2020 through 2022 in both states

Table 2. Economic Sector Profiles, Dry Bean Production, Minnesota and North Dakota, Average 2020 through 2022

Sector Profile Components	Minnesota	North Dakota	Combined
	---------- 000s nominal $ ----------		
Value of Production	204,010	394,262	598,271
Employment (jobs)	111	75	103
Employment Compensation	6,046	4,101	10,147
Proprietors (jobs)	168	456	624
Sole Proprietor Income	43,619	108,539	152,158
Property-type Income	29,547	53,740	83,287
Tax on Production and Inputs	5,294	18,030	23,324
Total Value-added	84,506	184,410	268,916
Intermediate Inputs	119,504	209,852	329,355

Notes: Separate industry profiles for Minnesota and North Dakota were used in the analysis for each year but have been averaged for presenting information. Sector profile definitions are contained in Appendix A. Value of production is comprised of crop production, insurance indemnities, and federal payments. Proprietor jobs reflect only producers that have a majority of farm production related to dry beans. The overall number of producers raising dry beans are larger than shown in this table.

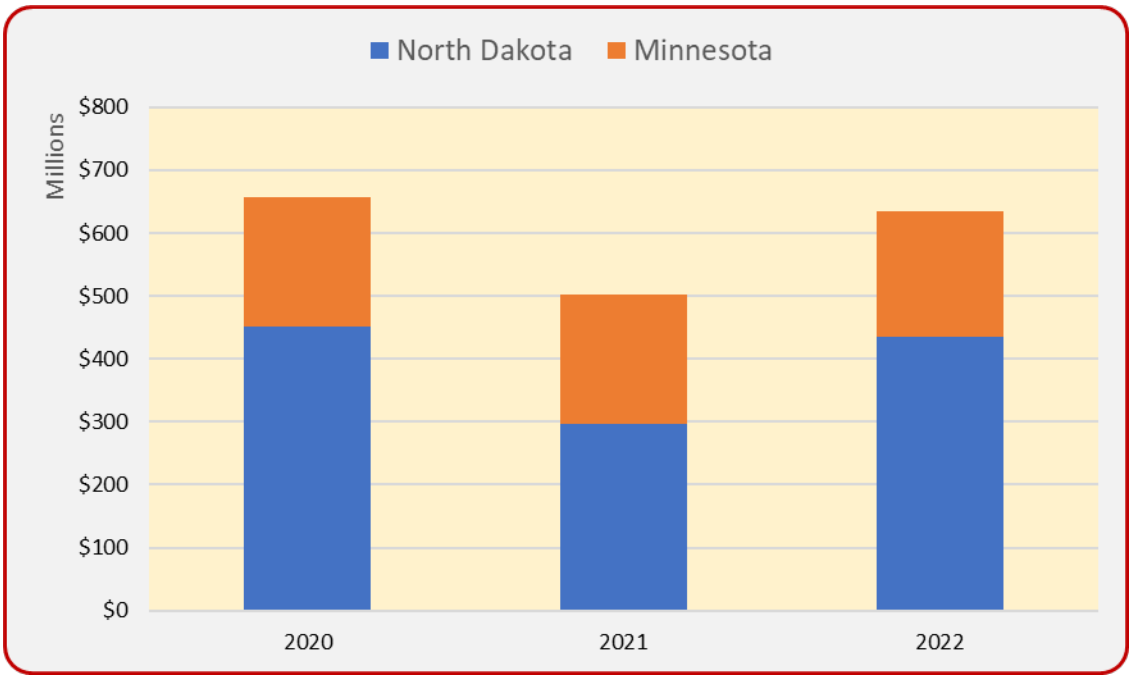


Figure 6. Value of Dry Bean Production, Minnesota and North Dakota, 2020 through 2022

Additional economic effects tied to crop production include $18.9 million for captial expenditures, operating expenses associated with federal crop insurance, and in-state spending of land leases in Minnesota and North Dakota (Table 3).

Table 3. Capital Expenditures, Crop Insurance Administrative and Operating and In-state Spending of Cash Rent, Dry Bean Production, Minnesota and North Dakota, Average 2020 through 2022

	Minnesota	North Dakota	Combined
	---------- 000s nominal $ ----------		
Capital Expenditures	3,492	37,339	40,831
Crop Insurance Operating	1,612	5,447	6,059
Cash Rent	4,935	13,972	18,907

Notes: Separate industry profiles for Minnesota and North Dakota were used in the analysis for each year but have been averaged for presenting information. Cash rent represents the portion of land leasing spent by in-state land owners.

Direct Effects for Dry Bean Processing

Direct output (sales) of dry bean processing was estimated at $760 million in 2023 (Table 4). Total direct employment for dry bean processing was 556 jobs with a combined payroll of $54.3 million.

Table 4. Economic Sector Profiles, Dry Bean Processors, Minnesota and North Dakota, 2023			
Sector Profile Components	North Dakota	Minnesota	Combined
	---------- 000s nominal $ ----------		
Output (sales)	538,094	221,707	759,800
Employment (jobs)	393.6	162.2	555.8
Employment Compensation	39,231	15,092	54,323
Property-type Income	127,159	53,693	180,852
Tax on Production and Inputs	2,235	693	2,928
Intermediate Inputs	369,469	152,229	521,698
Notes: Sector profile definitions are contained in Appendix A.			
Sources: Survey of Processors, IMPLAN (2025).			

Dry bean processors purchased nearly $522 mllion in goods and services in 2023 (Table 5). Of all goods and services purchased by dry bean processors, 95 percent was purchased in Minnesota and North Dakota. Of the $522 million of input purchases, 89 percent was for commodities for processing.

Table 5. Purchases of Goods and Services in Minnesota and North Dakota, Dry Bean Processors, Minnesota and North Dakota, 2023			
Spending by Geography	North Dakota	Minnesota	Combined
	---------- 000s nominal $ ----------		
Gross Purchases of Goods and Services	369,469	152,229	521,698
In-state Purchase of Goods and Services*	352,577	145,270	497,847
Purchase of Goods and Service in Neighboring State**	10,821	4,456	15,272
Purchases Outside of ND and MN	6,076	2,503	8,579
*Goods and services for operations in MN purchased from sources in MN. Goods and services for operations in ND purchased from sources in ND.			
**Goods and services for operations in MN that represent purchases in ND. Goods and services for operations in ND that represent purchases in MN.			
Sources: Survey of Dry Bean Processors.			

An additional direct effects from dry bean processors relate to capital expenditures. Based on survey data, dry bean processors made purchases of $10.5 million in 2023 for buildings, vehicles, equipment, and machinery (Table 6).

Table 6. Capital Expenditures, Dry Bean Processors, Minnesota and North Dakota, 2023

Capital Expenditures	North Dakota	Minnesota	Combined
	---------- 000s nominal $ ----------		
Construction	2,534	1,044	3,055
Equipment, Machinery, and Vehicles	4,879	2,010	6,890
Total	7,414	3,065	10,468

Sources: Survey of Dry Bean Processors.

Industry Contribution

The economic contribution of the dry bean industry in Minnesota and North Dakota was based on 2023 operations for processors and annual average values for dry bean production from 2020 through 2022.

Industry Size

Direct employment in Minnesota and North Dakota for the dry bean industry was estimated at 1,454 jobs (Table 7), which includes labor for dry bean processing and dry bean production. Indirect and induced economic activity supported 4,151 jobs (Table 7). Total employment associated with the industry was estimated at 5,600 jobs.

Table 7. Direct, Indirect, and Induced Economic Effects, Key Economic Metrics, Dry Bean Production and Dry Bean Processing, Minnesota and North Dakota, 2023

Industry Segment and Economic Effect	Employment[1]	Labor Income	Value-added	Output
	--jobs--	---------- 000s nominal $ ----------		
Dry Bean Production				
Direct	871	167,416	276,914	613,763
Indirect	1,919	147,302	237,901	438,938
Induced	1,561	87,422	148,091	260,982
Total	4,351	402,139	662,906	1,313,682
Share of Industry	77.6%	79.7%	67.6%	59.0%
Dry Bean Processing				
Direct	583	56,624	241,406	765,441
Indirect	319	25,413	40,852	83,219
Induced	351	82,162	35,343	62,590
Total	1,253	102,698	317,601	911,251
Share of Industry	22.4%	20.3%	32.4%	41.0%
Combined Segments				
Direct	1,454	224,040	518,320	1,379,205
Indirect	2,238	172,715	278,753	522,156
Induced	1,913	108,083	183,433	323,572
Total	5,604	504,838	980,507	2,224,933

[1]Employment represents wage and salary jobs and self-employed jobs.

Labor income for direct employment, which includes wages, salaries, paid benefits, and sole proprietor's income, was $224 million (Table 7). Labor income from indirect and

induced effects was estimated at $281 million. Labor income from all economic effects was nearly $505 million.

Value-added from direct operations of the industry was $518 million in Minnesota and North Dakota. Indirect and induced economic effects contributed another $452 million in value-added. The dry bean industry contributed $980 million to the gross state production of Minnesota and North Dakota.

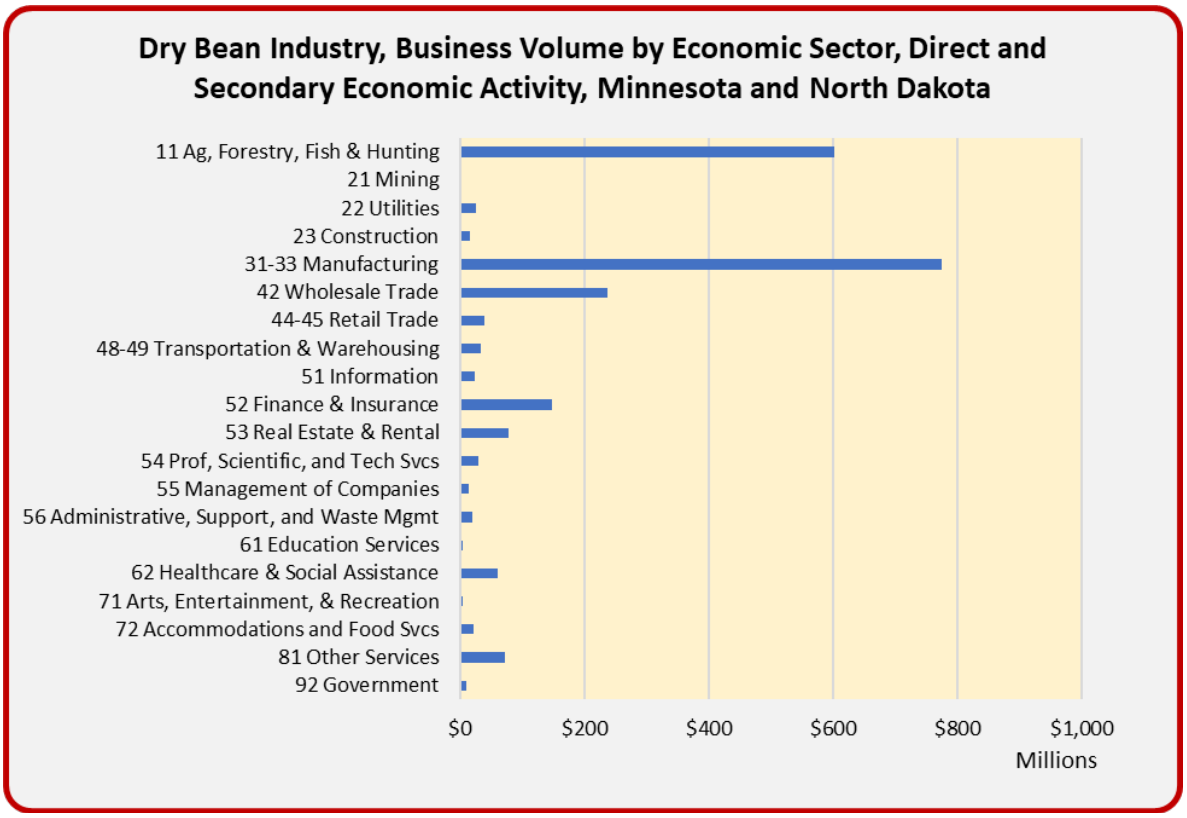
Direct output of the industry was estimated at nearly $1.4 billion. Indirect and induced economic effects added another $845 million in output. Direct and secondary output (gross business income) was estimated at $2.2 billion.

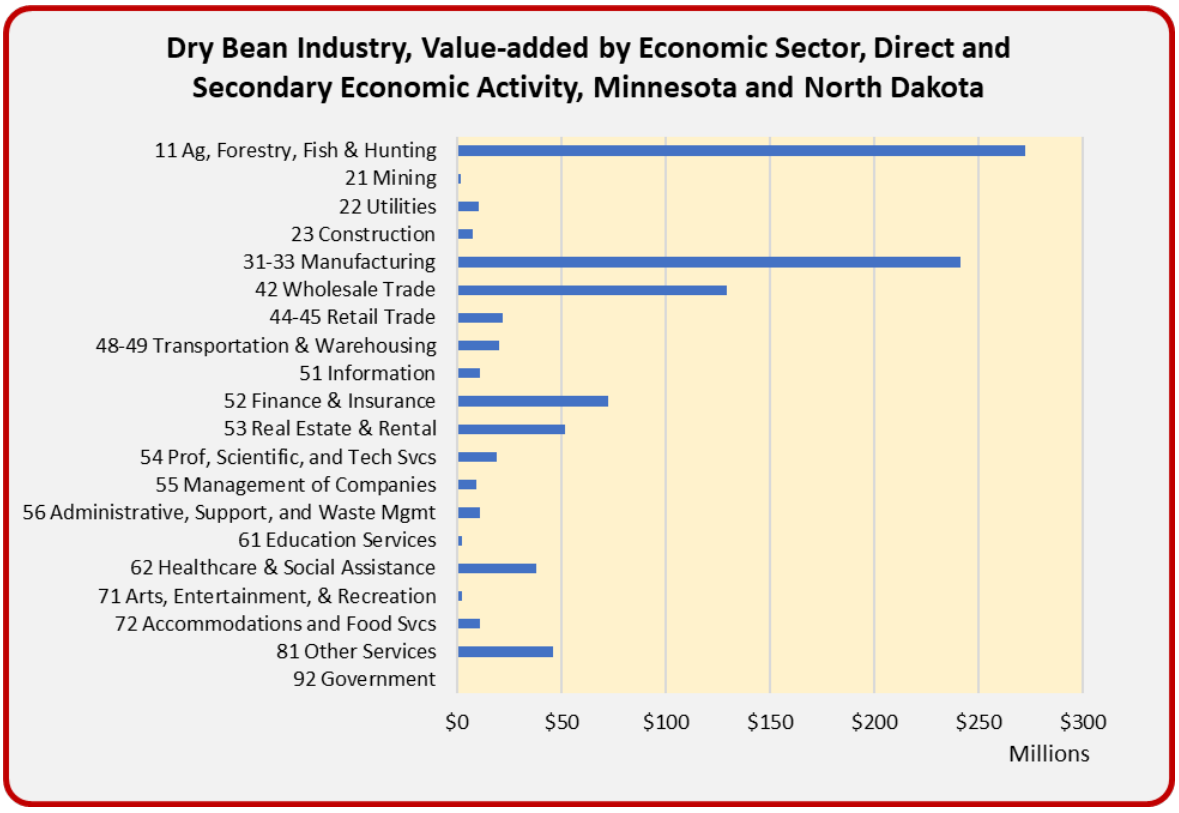
Dry bean production represented about 60 to 80 percent of the industry, depending upon the economic metric. Dry bean processing in the two-states represented 20 to 40 percent on the industry.

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 7 through 10). 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.


Dry Bean Industry, Business Volume by Economic Sector, Direct and Secondary Economic Activity, Minnesota and North Dakota
11 Ag, Forestry, Fish & Hunting
21 Mining
22 Utilities
23 Construction
31-33 Manufacturing
42 Wholesale Trade
44-45 Retail Trade
48-49 Transportation & Warehousing
51 Information
52 Finance & Insurance
53 Real Estate & Rental
54 Prof, Scientific, and Tech Svcs
55 Management of Companies
56 Administrative, Support, and Waste Mgmt
61 Education Services
62 Healthcare & Social Assistance
71 Arts, Entertainment, & Recreation
72 Accommodations and Food Svcs
81 Other Services
92 Government
$0
$200
$400
$600
$800
$1,000
Millions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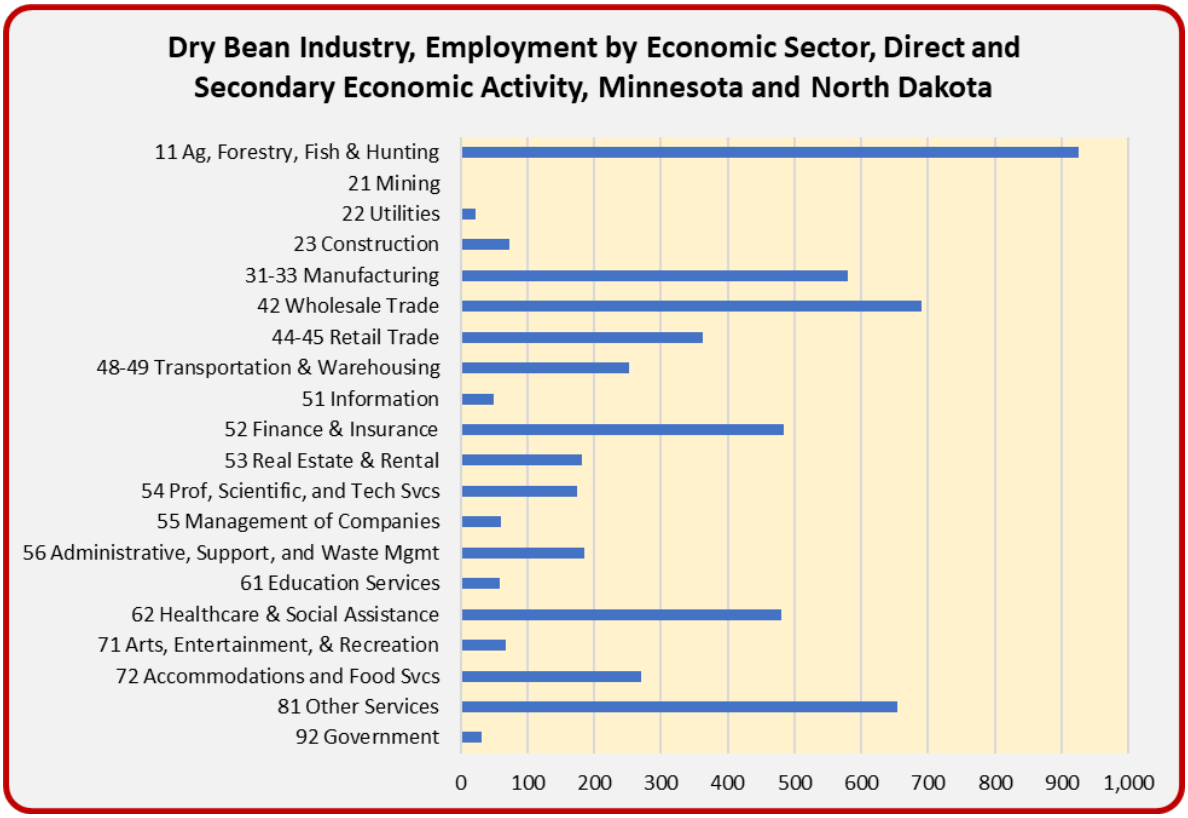
55 Management of Companies
56 Administrative, Support, and Waste Mgmt
61 Education Services
62 Healthcare & Social Assistance
71 Arts, Entertainment, & Recreation
72 Accommodations and Food Svcs
81 Other Services
92 Government
$0
$50
$100
$150
$200
$250
$300
Millions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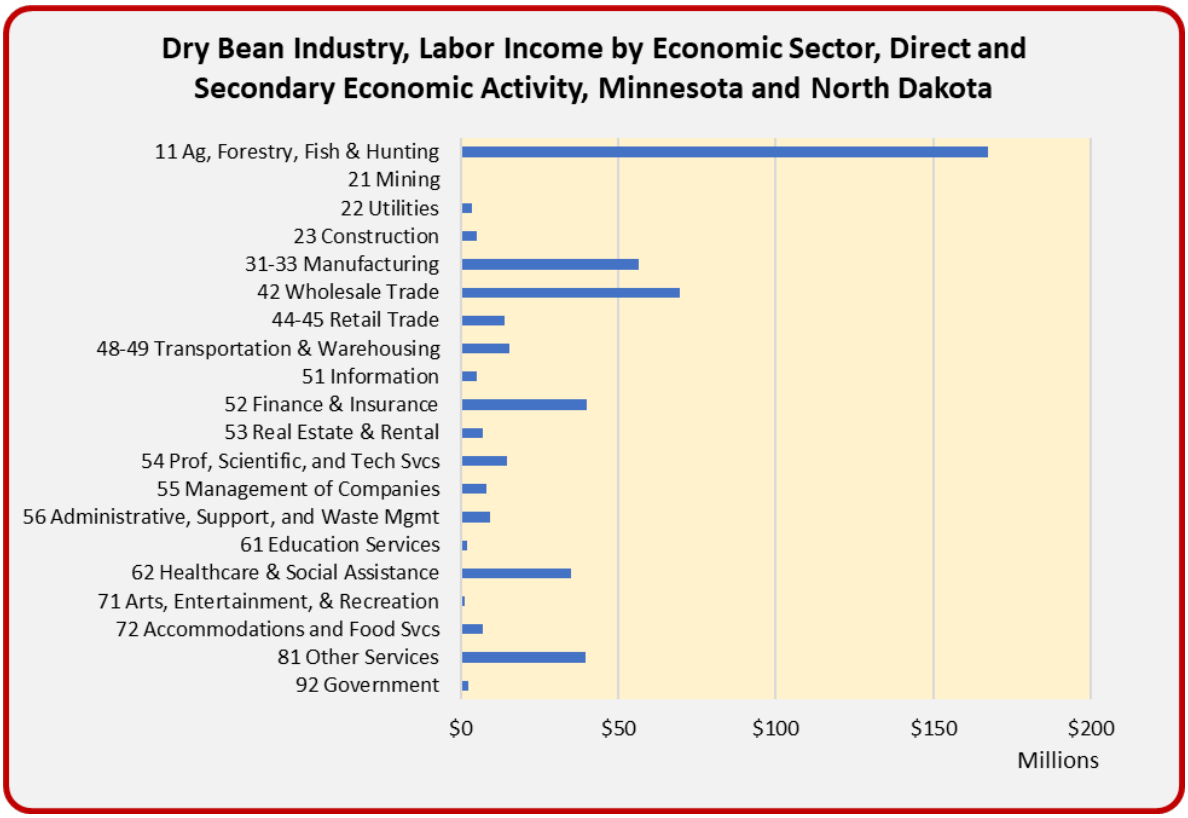
62 Healthcare & Social Assistance
71 Arts, Entertainment, & Recreation
72 Accommodations and Food Svcs
81 Other Services
92 Government
0
100
200
300
400
500
600
700
800
900
1,000


Dry Bean Industry, Labor Income by Economic Sector, Direct and Secondary Economic Activity, Minnesota and North Dakota
11 Ag, Forestry, Fish & Hunting
21 Mining
22 Utilities
23 Construction
31-33 Manufacturing
42 Wholesale Trade
44-45 Retail Trade
48-49 Transportation & Warehousing
51 Information
52 Finance & Insurance
53 Real Estate & Rental
54 Prof, Scientific, and Tech Svcs
55 Management of Companies
56 Administrative, Support, and Waste Mgmt
61 Education Services
62 Healthcare & Social Assistance
71 Arts, Entertainment, & Recreation
72 Accommodations and Food Svcs
81 Other Services
92 Government
$0
$50
$100
$150
$200
Millions

Economic Contribution by State

State-level economic contribution is based on multi-region input-output analysis (Appendix B); therefore, economic effects within Minnesota or North Dakota include the economic effects arising from cross-state purchases of inputs by dry bean processors and trade flows between the two states.

Minnesota

In Minnesota, the dry bean industry had 455 direct jobs in 2023. Total employment (direct and secondary) was estimated at nearly 2,140 jobs (Table 8). Labor income associated with direct employment was $66 million. Indirect and induced economic effects were responsible for another $123 million in labor income. The industry contributed $361 million to the state's gross state product. Gross business volume for the industry was $785 billion (Table 8).

Across all economic metrics, the combined effects of production and processing in Minnesota represented 35 to 38 percent of the two-state dry bean industry. Dry bean production represented about 64 to 80 percent of the industry in Minnesota, depending upon various economic metrics.

Table 8. Direct, Indirect, and Induced Economic Effects, Key Economic Metrics, Dry Bean Industry, Minnesota, 2023				
Industry Segment and Type of Economic Effect	Employment	Labor Income	Value-added	Output
		millions nominal $		
Dry Bean Production				
Direct	285	50,252	85,449	205,790
Indirect	723	61,987	100,425	174,671
Induced	689	41,837	72,044	121,559
Total	1,697	154,076	257,918	502,020
Share of MN	79.4%	81.2%	71.3%	63.9%
Dry Bean Processing				
Direct	170	15,773	70,482	223,358
Indirect	122	10,461	16,755	32,114
Induced	149	9,438	16,677	28,207
Total	441	35,672	103,913	283,678
Share of MN	20.6%	18.8%	28.7%	36.1%
Combined				
Direct	455	66,025	155,930	429,148
Indirect	845	72,448	117,179	206,784
Induced	838	51,275	88,721	149,766
Total	2,138	189,748	361,831	785,698
MN Share of Two-state Industry	38.2%	37.6%	36.9%	35.3%

North Dakota

In North Dakota, the industry had nearly 1,000 direct jobs. Total industry employment (direct and secondary) was estimated at nearly 3,500 jobs (Table 9). Labor income associated with direct employment was estimated at $158 million. Indirect and induced economic effects contributed another $157 million to labor income. The industry contributed $619 million to gross state product. Gross business volume for the industry in North Dakota was $1.4 billion.

Across the key economic metrics, activity in North Dakota represented about 62 to 65 percent of the two-state industry. Dry bean production represented about 64 to 80 percent of the industry in North Dakota, depending upon various economic metrics.

Table 9. Direct, Indirect, and Induced Economic Effects, Key Economic Metrics, Dry Bean Industry, North Dakota, 2023				
Industry Segment and Type of Economic Effect	Employment	Labor Income	Value-added	Output
		millions nominal $		
Dry Bean Production				
Direct	586	117,164	191,405	407,973
Indirect	1,196	85,315	137,476	264,267
Induced	872	45,585	76,046	139,423
Total	2,654	248,063	404,988	811,663
Share of ND	76.6%	78.7%	65.5%	56.4%
Dry Bean Processing				
Direct	413	40,851	170,925	542,084
Indirect	197	14,952	24,097	51,105
Induced	202	11,223	18,666	34,384
Total	812	67,026	213,688	627,573
Share of ND	23.4%	21.3%	34.5%	43.6%
Combined				
Direct	999	158,015	362,390	950,057
Indirect	1,393	100,267	161,574	315,372
Induced	1,074	56,808	94,712	173,806
Total	3,466	315,090	618,676	1,439,235
ND Share of Two-state Industry	61.8%	62.4%	63.1%	64.7%

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. Local governments in both states rely heavily on property taxes.

All Government Revenues

The dry bean industry was estimated to contribute $30.3 million in government revenues directly from the individuals working in the industry and from firms in the industry (Table 10). Tax revenues from secondary business activity were estimated to generate an additional $45.9 million in state and local government revenues. A total of $76.3 million in state and local tax revenues was generated by the dry bean industry in Minnesota and North Dakota, (Table 10)

Table 10. State and Local Government Revenues, Dry Bean Industry, Minnesota and North Dakota, 2023

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	24,109	---	24,109
Non-taxes	349	---	349
IMPLAN Analysis and Other Secondary Sources			
Social Insurance Tax	175	552	727
Personal Income Tax	3,826	5,289	9,115
Sales Tax	grouped above	18,805	18,805
Property Tax	grouped above	16,371	16,371
Corporate Income Tax	grouped above	2,228	2,228
Other Taxes	1,247	1,839	3,087
Non-Taxes	616	856	1,472
Totals	30,321	45,941	76,262

Government Revenues

State and local government revenues were compiled for Minnesota and North Dakota for both production and processing.

Minnesota

The dry bean industry in Minnesota was estimated to directly contribute $8.8 million in government revenues as a result of payroll, income, property, and other taxes (Table 11). Tax revenues from secondary business activity were estimated to generate an additional $29.9 million in state and local government collections. A total of $38.6 million in state and local government revenues was generated by the dry bean industry in Minnesota.

Table 11. State and Local Government Revenues, Dry Bean 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	5,523	---	5,523
Non-taxes	102	---	102
IMPLAN Analysis and Other Secondary Sources			
Social Insurance Tax	6	30	35
Personal Income Tax	2,471	4,143	6,614
Sales Tax	grouped above	11,735	11,735
Property Tax	grouped above	10,588	10,588
Corporate Income Tax	grouped above	1,624	1,624
Other Taxes	473	1,239	1,711
Non-Taxes	202	502	704
Totals	8,775	29,861	38,637

North Dakota

The dry bean industry in North Dakota was estimated to directly contribute $21.5 million in government revenues from payroll, income, property, and other taxes (Table 12). Tax revenues arising from secondary business activity were estimated to generate an additional $16.5 million in state and local government collections. A total of $38 million in state and local government revenues was generated by the dry bean industry in North Dakota (Table 12).

Table 12. State and Local Government Revenues, Dry Bean Industry, North Dakota, 2023			
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	18,586	---	18,586
Non-taxes	247	---	247
IMPLAN Analysis and Other Secondary Sources			
Social Insurance Tax	169	523	692
Personal Income Tax	1,355	1,146	2,501
Sales Tax	grouped above	7,070	7.070
Property Tax	grouped above	5,783	5,783
Corporate Income Tax	grouped above	604	604
Other Taxes	774	601	1,375
Non-Taxes	414	354	768
Totals	21,546	16,079	37,626

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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

- Direct Effects
- Indirect Effects
- Induced Effects

Types of Economic Activity

- Value Added
- Total Economic Output
- Employment and Employment Compensatoin
- Proprietor Income
- Labor Income
- Government Revenue
- Property-type Income
- Taxes on Production and Imports

Selection of Input-output Model

IMPLAN Modeling System

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

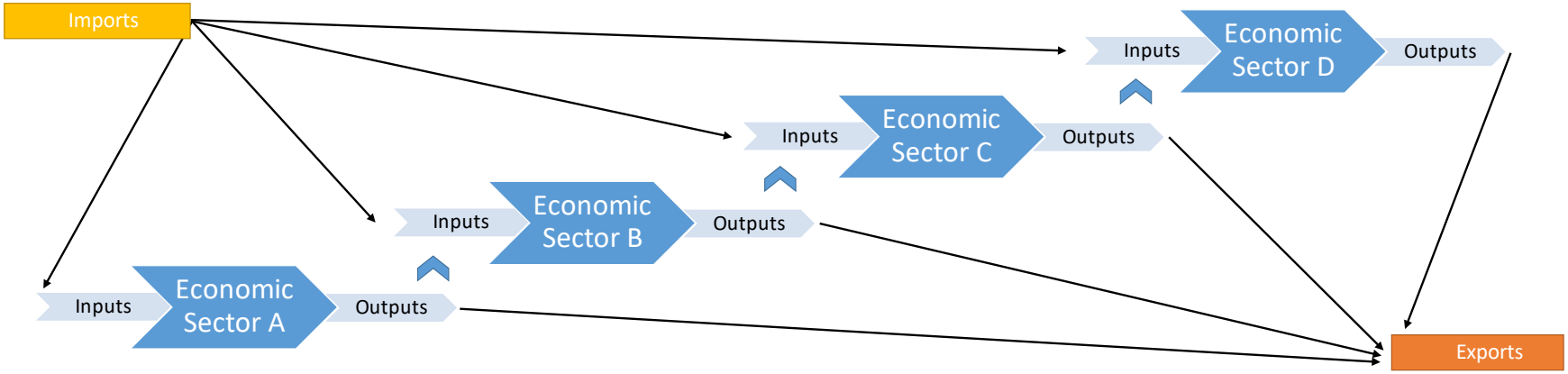
Input-output (I-O) analysis is a mathematical representation of the production and consumption of goods and services within a given economy. The basic premise to I-O modeling can be traced to economic base theory, or the understanding that a given economy is comprised of both 1) economic sectors or industries 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.

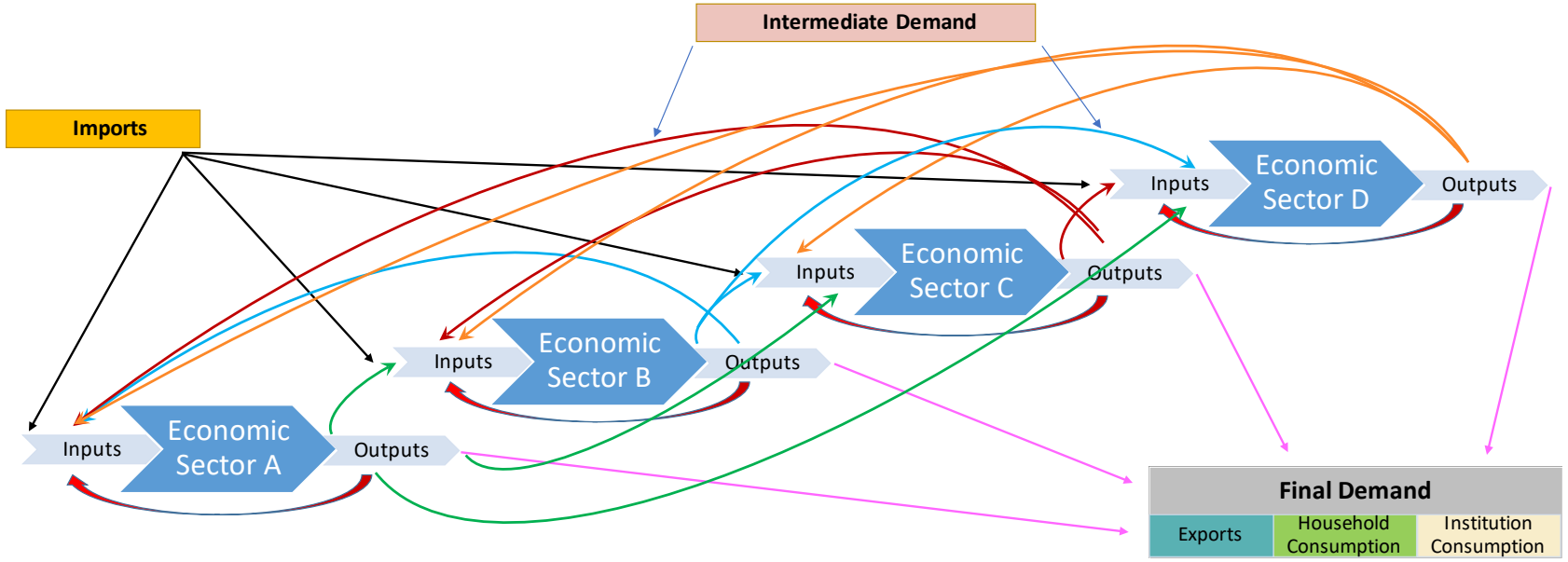
While I-O analysis is a popular methodology used by a host of different stakeholders, the methodology has a number of fundamental assumptions or limitations. Key assumptions in I-O methodologies include 1) the economy is in equilibrium, 2) any expansion or contraction is linear, constant, and fixed, 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).

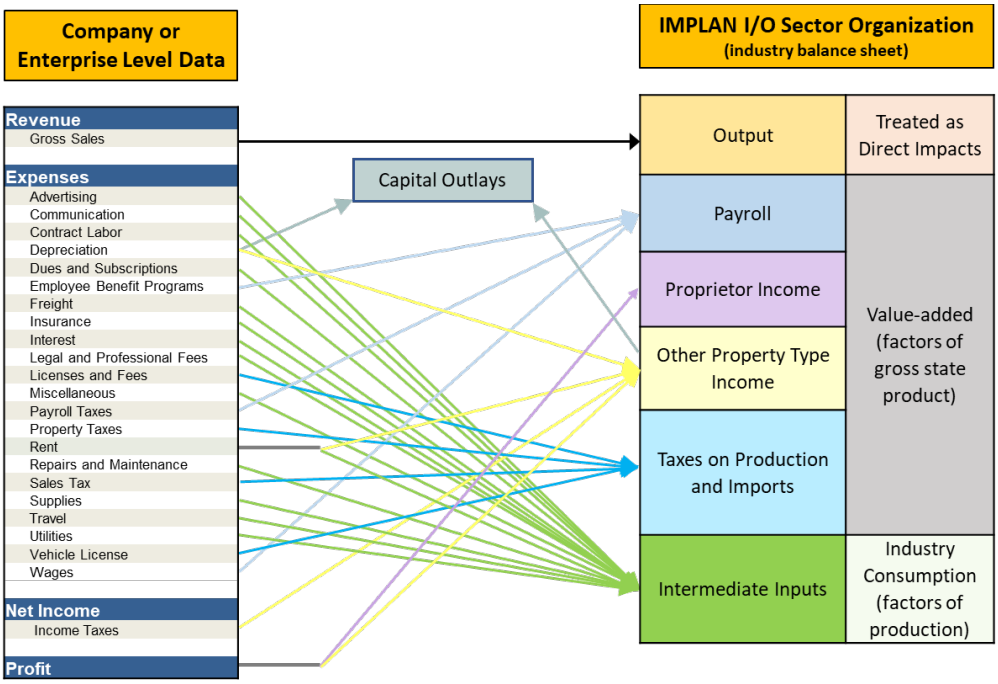
IMPLAN modeling system is a widely used and well-recognized source of economic data—this process is desirable because it allows for consistency and compatibility across regional, state, and sub-state economies. However, not all industries within all economies are accurately represented using federal, 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.

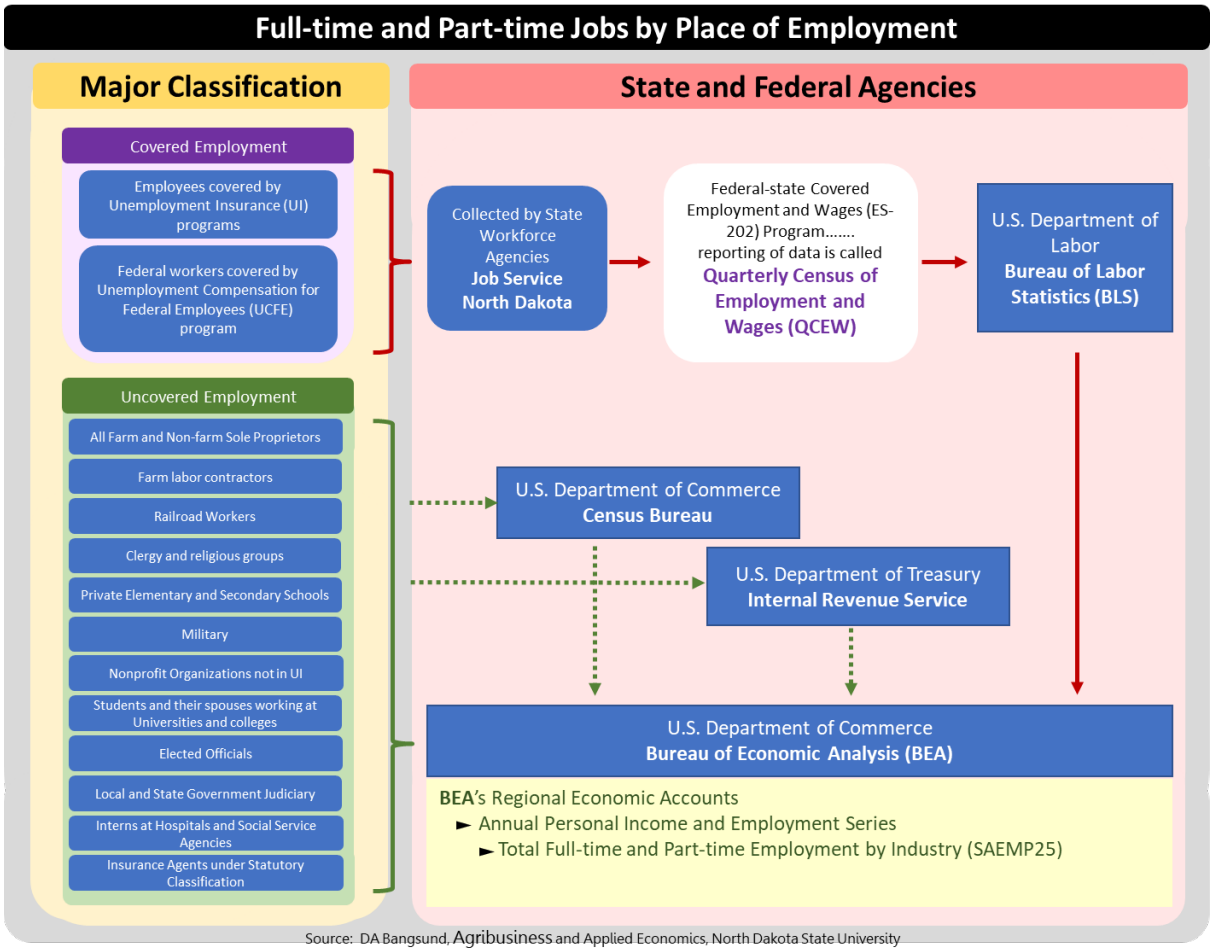
Federal Government Revenues	
Social Insurance Taxes: Employee Contribution	The employee paid portion for Federal social insurance. These contributions include payments by employees, the self-employed, and other individuals who participate in the following government programs: Old-age, survivors, and 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.



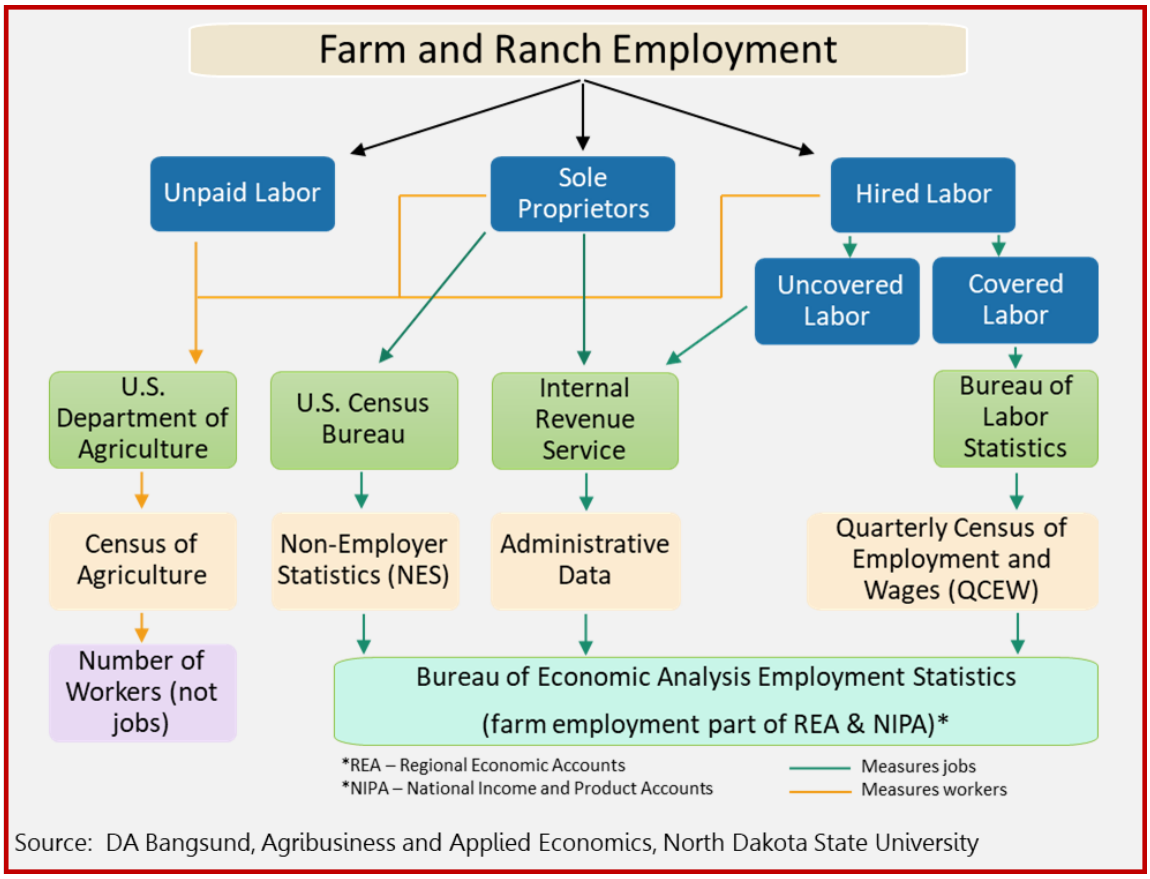
Source: DA Bangsund, Agribusiness and Applied Economics, North Dakota State University

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 dry bean 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.

Dry Bean Processing Sector

1) Compile a Dry Bean Processing Sector Profile

Survey data formed the basis to construct the economic profile in IMPLAN. The economic contribution of dry bean processing was handled using an economic impact event (custom) with other contribution controls applied to various sectors (e.g., grain production). The construction 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.

The listing of "intermediate inputs" within IMPLAN represents all the goods and services consumed in one production cycle. 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 effects for any activity, policy, program, or event. Appendix A contains 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 definitions or NAICS codes, although some firms prefer to provide expenditure data based on the actual expense or purchase. For the dry bean industry, each 2-digit NAICS expenditure grouping for survey firms has total spending, purchases from in-state sources, and purchases made in the neighboring state.

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

In some cases, the default production function within IMPLAN for the target industry contains inputs that are not relevant or appropriate for the industry in a given region. These conditions are corrected 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 value (expense) of goods and services used by the target industry. The value of goods and services sourced (purchased) from entities within the study area is called regional inputs. Information from the survey of dry bean processing (Appendix E) provided the data to make spending adjustments for total and regional inputs.

Survey-based financial data are used to make two adjustments to the industry spending profile. The first adjustment is to change 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 value of goods and services from in-state sources.

The spending values within IMPLAN do not represent actual expenditure amounts but rather are 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 distinct economic sectors, which necessitates grouping IMPLAN data and survey data into comparable categories since survey data is not delineated in the same capacity as IMPLAN's I-O matrix. 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 output value in 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 the target state 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 are treated separately.

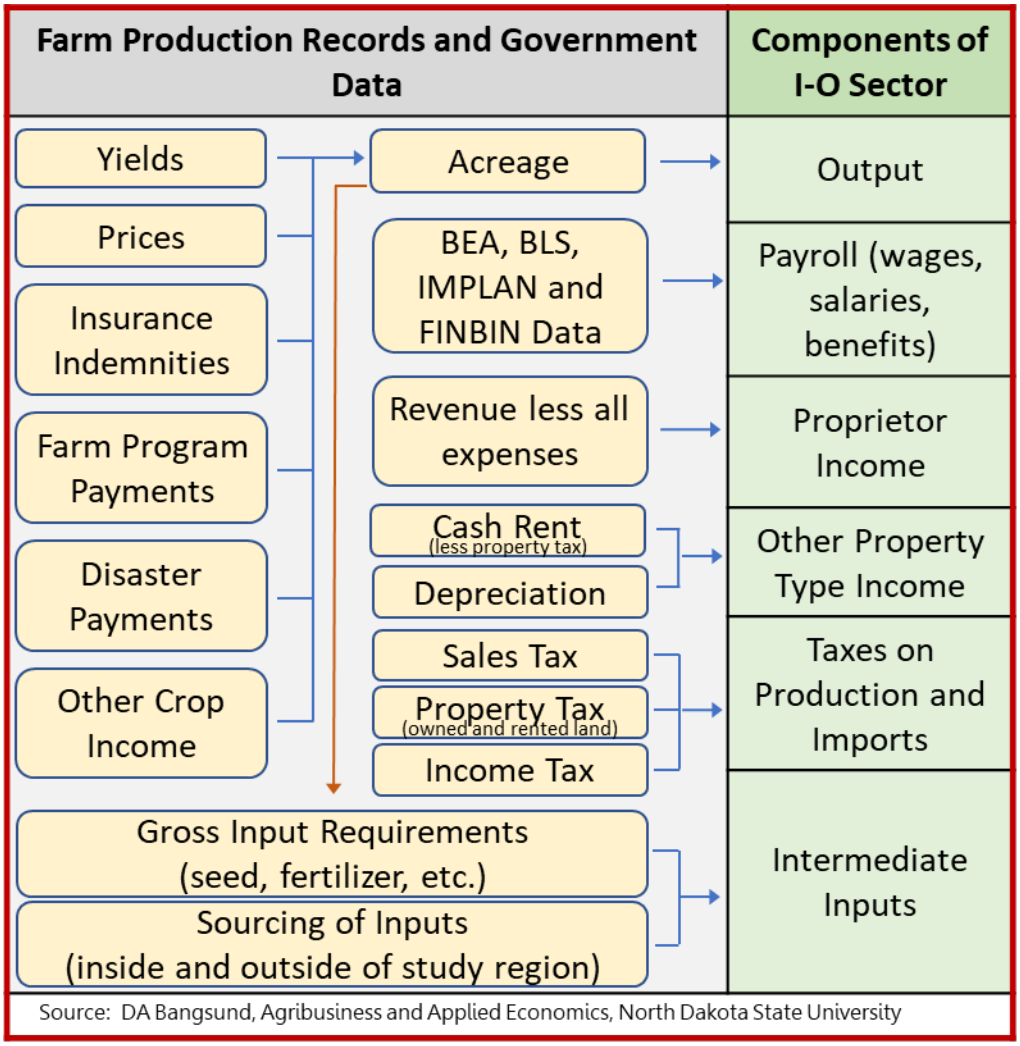
Dry Bean Production Sector

1) Reconstruct the economic profile for Dry Bean Production

Farm production records and government data were used to re-construct the economic profile (see following figure). 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.

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 dry bean processing sectors. However, the spending pattern was customized assuming producers purchase all intermediate inputs within their own state.



Capital Outlays

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

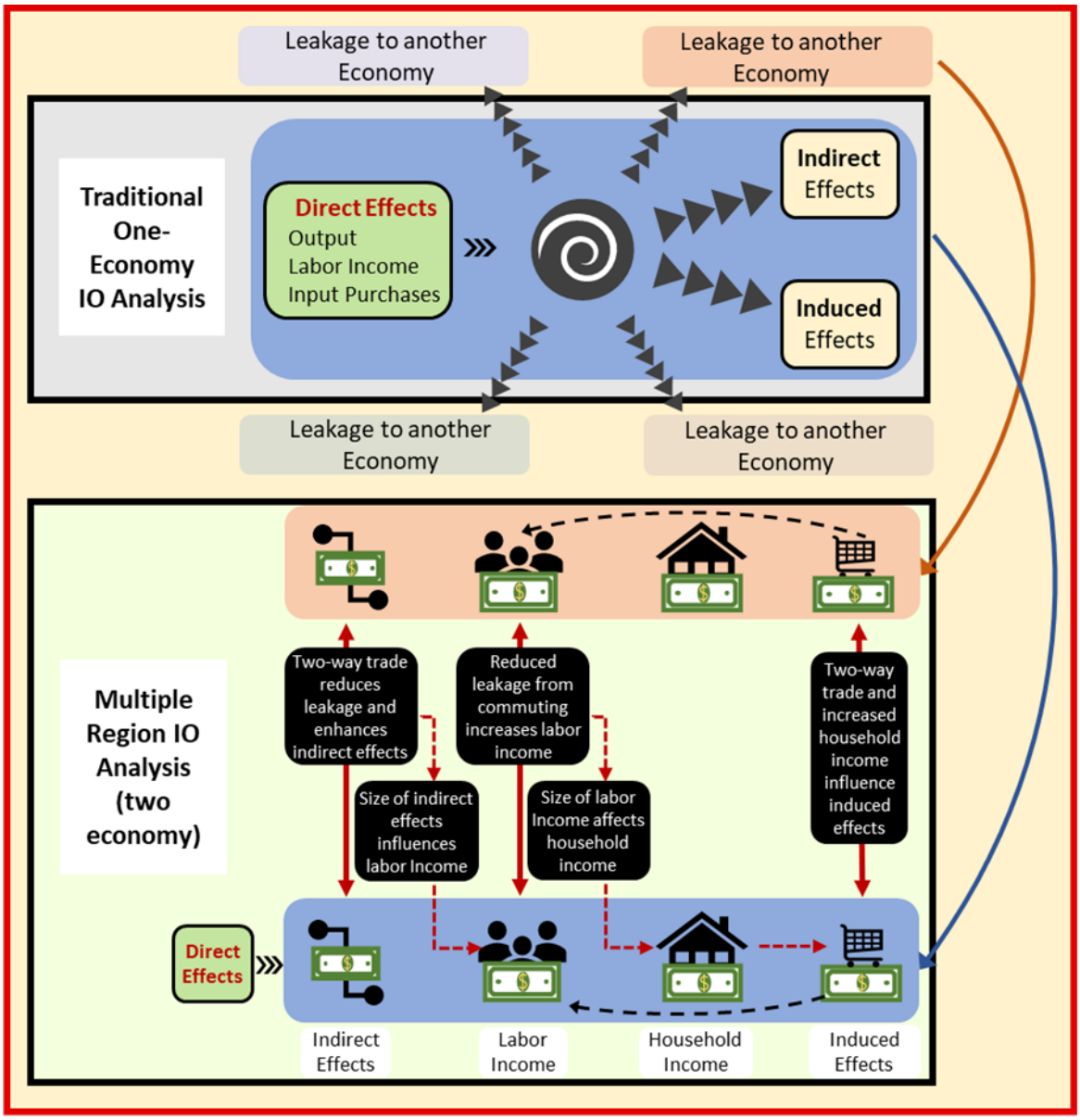
Depreciation associated with dry bean production is one option for developing a proxy for capital outlays. However, the amount of capital expenditures associated with dry bean production was estimated using an approach developed by Bangsund and Hodur (2023, 2025).

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 dry bean production (IMPLAN Sector 2) or dry bean processing, economic contribution controls were used in the capital expenditure analysis.

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

The dry bean industry 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 (see following figure). MRIO is a modeling process within IMPLAN 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.

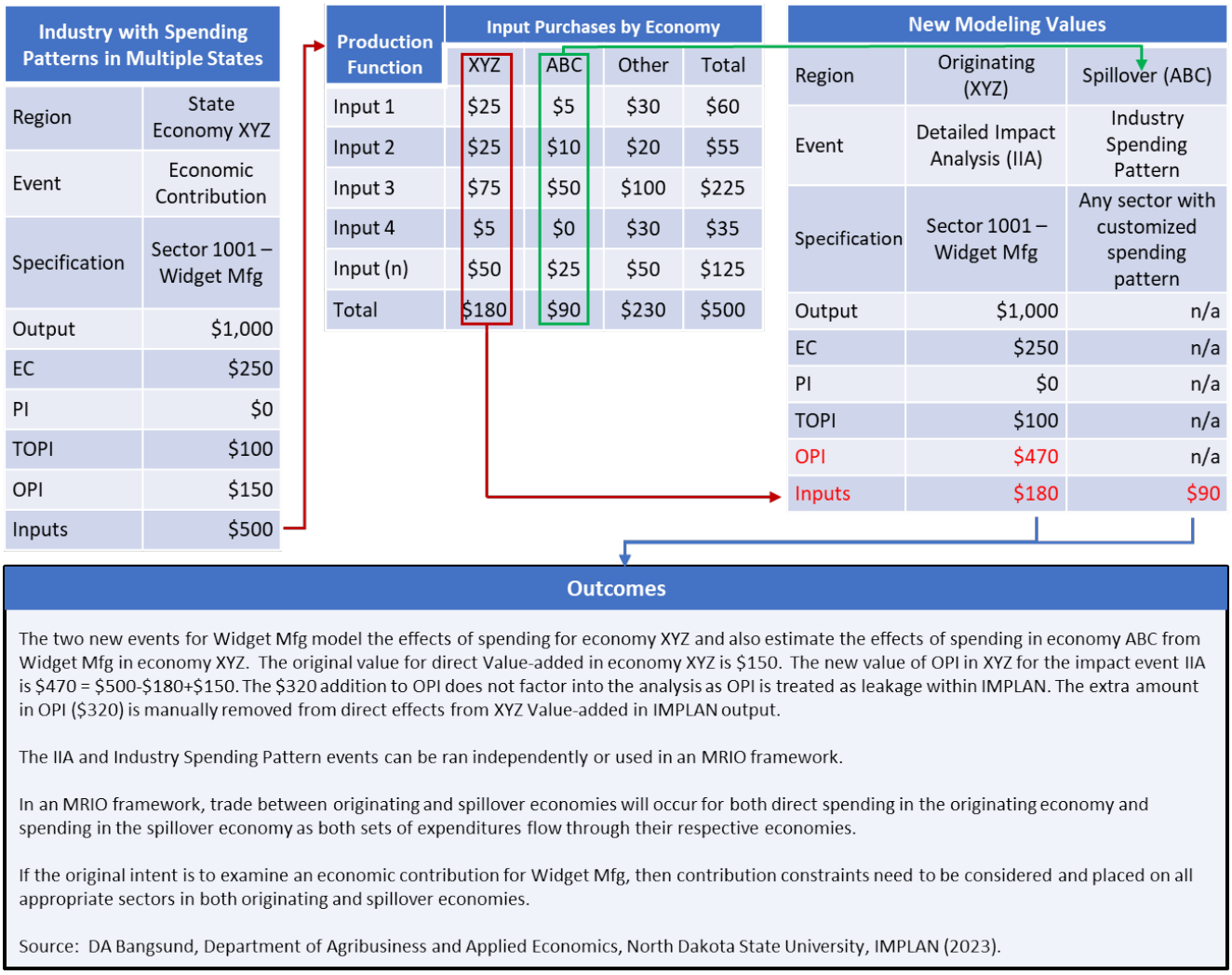


Sources: DA Bangsund, Agribusiness and Applied Economics, North Dakota State University, and IMPLAN LLC (2023).

Survey data provided the type and value of intermediate inputs and capital expenditures in Minnesota and North Dakota (see following figure). Typically, industry contribution assessments focus on spending patterns for one geography and survey data will match that geography. However, the unique circumstances associated with the dry bean industry and availability of spending information (survey) for more than one state required adjustments from traditional, stand-alone single economy modeling.

Intermediate purchases in the MRIO analysis were constructed for separate spending patterns in both originating (MN/ND) and spillover states (ND/MN). For example, dry bean

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



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).

Dry bean production also was modeled using an MRIO analysis but, unlike the I-O setup for processing segments, production expenditures did not contain industry spending patterns in the neighboring state. The MRIO structure allowed for spillover effects of production in Minnesota to be captured with cross-economy trade with North Dakota. Production in North Dakota was modeled in a similar capacity with the Minnesota economy.

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 within this

report 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 MRIO state's share. A similar treatment of MRIO results was applied to dry bean production.

IMPLAN Mapping, Dry Bean Industry, Minnesota and North Dakota, 2020, 2021, 2022 and 2023					
Industry Segment with Corresponding Industry Activity	Event Type	Event Specification	Customized Coefficients	Destination State	MRIO States
Dry Bean Production					
Growing Dry Beans	Industry Impact Analysis (detailed IIA)	Sector 2	Yes	MN	ND
Growing Dry Beans	Industry Impact Analysis (detailed IIA)	Sector 2	Yes	ND	MN
Cash Rent	Labor Income	6001-Proprietors Income	No	MN	ND
Cash Rent	Labor Income	6001-Proprietors Income	No	ND	MN
Capital Expenditures	Industry Change	Sector 55	No	MN	ND
Capital Expenditures	Industry Change	Sector 56	No	MN	ND
Capital Expenditures	Industry Change	Sector 60	No	MN	ND
Capital Expenditures	Industry Change	Sector 392	No	MN	ND
Capital Expenditures	Industry Change	Sector 402	No	MN	ND
Capital Expenditures	Industry Change	Sector 405	No	MN	ND
Capital Expenditures	Commodity Change	Commodity 3290	No	MN	ND
Capital Expenditures	Commodity Change	Commodity 3341	No	MN	ND
Capital Expenditures	Commodity Change	Commodity 3342	No	MN	ND
Capital Expenditures	Commodity Change	Commodity 3344	No	MN	ND
Capital Expenditures	Commodity Change	Commodity 3395	No	MN	ND
Capital Expenditures	Commodity Change	Commodity 3396	No	MN	ND
Capital Expenditures	Industry Change	Sector 55	No	ND	MN
Capital Expenditures	Industry Change	Sector 56	No	ND	MN
Capital Expenditures	Industry Change	Sector 60	No	ND	MN
Capital Expenditures	Industry Change	Sector 392	No	ND	MN
Capital Expenditures	Industry Change	Sector 402	No	ND	MN
Capital Expenditures	Industry Change	Sector 405	No	ND	MN
Capital Expenditures	Commodity Change	Commodity 3290	No	ND	MN
Capital Expenditures	Commodity Change	Commodity 3341	No	ND	MN
Capital Expenditures	Commodity Change	Commodity 3342	No	ND	MN
Capital Expenditures	Commodity Change	Commodity 3344	No	ND	MN
Capital Expenditures	Commodity Change	Commodity 3395	No	ND	MN

Capital Expenditures	Commodity Change	Commodity 3396	No	ND	MN
A&O Spending	Institutional Spending Pattern	Capital Spending	No	MN	ND
A&O Spending	Institutional Spending Pattern	Capital Spending	No	ND	MN
A&O Labor	Labor Income	6001-Proprietors Income	No	MN	ND
A&O Labor	Labor Income	6001-Proprietors Income	No	ND	MN
Prevent Plant Acreage	Industry Impact Analysis (detailed IIA)	Sector 2	Yes	MN	ND
Prevent Plant Acreage	Industry Impact Analysis (detailed IIA)	Sector 2	Yes	ND	MN
Dry Bean Processing					
Manufacturing Sector (input purchases in host state)	Industry Impact Analysis (detailed IIA)	Sector 2	Yes	MN	ND
Manufacturing Sector (input purchases in host state)	Industry Impact Analysis (detailed IIA)	Sector 2	Yes	ND	MN
Manufacturing Sector (input purchases in neighboring states)	Industry Spending Pattern	Sector 2	Yes	MN	ND
Manufacturing Sector (input purchases in neighboring states)	Industry Spending Pattern	Sector 2	Yes	ND	MN
Capital Expenditures	Industry Output	Sector 50	No	MN	ND
Capital Expenditures	Industry Output	Sector 51	No	MN	ND
Capital Expenditures	Industry Output	Sector 385	No	MN	ND
Capital Expenditures	Commodity Output	Commodity 3378	No	MN	ND
Capital Expenditures	Industry Output	Sector 50	No	ND	MN
Capital Expenditures	Industry Output	Sector 51	No	ND	MN
Capital Expenditures	Industry Output	Sector 385	No	ND	MN
Capital Expenditures	Commodity Output	Commodity 3378	No	ND	MN
Contribution Control Events					
Contribution Control	Industry Contribution Analysis	Sectors 1-16	No	MN&ND	---
Contribution Control	Industry Contribution Analysis	Sector 19	No	MN&ND	---
Contribution Control	Industry Contribution Analysis	Sectors 63-103	No	MN&ND	---

Appendix C

Dry Bean Production Budgets

Composition Dry Bean Production Expenditures

Dry bean production budgets were compiled for owned land and rented land in both Minnesota and North Dakota. Production budgets were used to estimate the economic contribution of dry bean production, and were used to develop a custom industry balance sheet and industry spending patterns for intermediate inputs.

Revenues

Crop revenues were compiled from estimates of production, marketing year crop prices, miscellaneous revenues, and insurance indemnities. Production and marketing year prices for North Dakota were obtained from NDSU Extension. Insurance indemnities were obtained from National Crop Insurance Services.

Expenses

Expenses for dry bean production were obtained separately for owned and rented land 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 each state was obtained from the 2022 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 two states was handled as a stand-alone analysis within each state's I-O matrix.

Net Returns

Producer net returns from dry bean production were estimated by subtracting variable and fixed costs from gross revenue. All expenses represented cash costs. A separate analysis was used to estimate capital expenditures for dry bean production based on analyses developed by Bangsund and Hodur (2023,2025). As a result, the budgets excluded non-cash costs associated with owned land, return on invested equity, management charges, and income tax liability. Based on data from the Farm Business Management Database for whole-farm economic reports, an effective income tax rate was estimated (Bangsund and Hodur 2023, 2025) and used to estimate income tax payments. Income tax payments were placed in Other Property Type Income. 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.

Average Annual per-Acre Dry Bean Production Expenses and Average Annual Planted Acreage, Minnesota and North Dakota, 2020 through 2022				
	Minnesota		North Dakota	Total
Acreage Planted	241,667		657,167	898,834
Rented Land Acreage	122,846		373,762	496,608
Owned Land Acreage	118,820		283,405	402,225
Expenses	Owned Land ND	Owned Land MN	Rented Land ND	Rented Land MN
Variable				
Seed	60.36	86.78	61.02	80.96
Fertilizer	38.07	94.72	36.74	89.99
Chemical	52.97	106.03	57.29	95.90
Insurance	23.43	33.46	33.14	33.70
Fuel & Oil	15.85	24.18	13.54	23.30
Repairs	36.09	43.32	32.80	43.33
Custom Hire	2.24	7.15	8.32	22.80
Hired Labor	0.00	6.33	0.00	10.12
Land Rent	0.00	0.00	73.50	150.74
Marketing	0.00	4.20	0.00	5.07
Machinery Leases	0.21	1.87	1.27	8.48
Interest	6.38	7.21	7.44	10.68
Misc	2.48	9.76	5.39	11.09
Fixed				
Hired Labor	16.81	19.84	21.24	13.37
Machinery Lease	6.60	4.41	7.84	2.21
Building Lease	0.00	0.38	0.33	1.05
Property Tax	14.85	20.45	0.00	0.00
Farm Insurance	9.20	8.58	5.11	8.90
Utilities	5.39	4.22	3.76	5.30
Dues/Fees	1.65	3.41	1.78	3.19
Interest	46.96	64.77	3.00	5.54
Depreciation	50.91	50.00	43.20	41.42
Misc	4.41	6.44	4.02	4.37
Sources: Farm Financial Management Data Base (2024), NDSU Extension Service (2024).				

Appendix D

Industry Questionnaire

NDSU AGRIBUSINESS AND APPLIED ECONOMICS

Economic Contribution of Dry Bean Industry in Minnesota and North Dakota

Survey of Value-added Processing

Confidentiality and Use of Data

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

Survey data from firms are pooled and extrapolated to create state totals. Pooling and extrapolation prevent revealing the operations of any single firm or facility.

Guidelines and Instructions

Please use the following guidelines.

1. Please provide information for 2023 or your most recent year end.

2. If information is not readily available, please estimate.

3. Please complete the survey by xxxxx xx, 2024.

Study Contacts

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Contribution of Dry Bean Industry

Value-added Processing

Contact Person: _____

Email: _____

A: Please estimate the percentage of your firm/plant's processing activities in 2023 for the following commodities.

Dry Beans	_____%
Other crops	
Field Peas	_____%
Lentils	_____%
Chickpeas	_____%
Misc.	_____%
	100%

B. Please check all the processing activities that your firm performs.

- □ seed conditioning
- □ color/size sorting
- □ drying and/or dehydrating
- □ grinding/milling
- □ freeze dried / individually quick frozen
- □ bulk packaging (e.g., totes)
- □ retail packaging (consumer ready dry goods)

C. Please estimate your processing capacity and processing output in 2023.

Annual processing capacity _____ cwt of crops

Quantity of commodities processed

	Minnesota	North Dakota
Dry beans	_____ cwt	_____ cwt
Other crops	_____ cwt	_____ cwt

I. Value of Processed Products for 2023 (values can be rounded to thousands)

Having some gauge of overall revenues is important metric for measuring the economic effects of processing on each state's economy.

Source of Revenues	Operations by State	
	Minnesota	North Dakota
Sales of processed crops and value of processed crops placed into inventory	$	$
Other revenues (e.g., custom processing for a third party)	$	$

II. Employment and Payroll for 2023 at your facilities in both states.

Employment and Payroll	Operations by State	
	Minnesota	North Dakota
Jobs		
Full-time positions		
Part-time positions		
Seasonal positions		
Compensation		
Wages and salaries	$	$
Employee 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 2023 (expenses can represent your best estimate and can be rounded to thousands)

If a major expense does not fit the listings, please write in the type of expense.

Categories	Expenses	Percentage from Sources in Each State	
		Minnesota	North Dakota
Example Firm A: water and sewer	$2,000	100%	0%
Example Firm B: general office expenses	$7,000	85%	5%
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)	$	%	%
Utilities (e.g., natural gas, electricity, water, sewer, garbage)	$	%	%
Leases and rent expense	$	%	%
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, legal and attorney fees)	$	%	%
Business travel (e.g., lodging, meals, entertainment, mileage, conferences, airfare)	$	%	%
General and Annual Facility Maintenance and Upkeep	$	%	%
New and Replacement Equipment and Machinery	$	%	%
Miscellaneous	$	%	%
	$	%	%
	$	%	%
	$	%	%

		$	%	%

Categories	Expenses	Percentage from Sources in Each State	
		Minnesota	North Dakota
Example: repairs	$21,000	10%	70%
Purchase of Commodities			
Dry Beans	$	%	%
Other crops	$	%	%
In-bound freight on commodities	$	%	%
	$	%	%
Inputs Consumed During Processing			
Dust control, desiccants, disinfectants, chemicals, catalysts, emulsifiers, preservatives, yeast, enzymes, artificial coloring, salt, oil, seasonings, sweeteners etc.	$	%	%
Totes, pallets, bagging, packaging, labeling supplies	$	%	%
Other (please specify)	$	%	%
	$	%	%

Categories	Expenses	Percentage from Sources in Each State	
		Minnesota	North Dakota
Outbound Freight and Transportation			
Truck (owned fleet)	$	%	%
Truck (contracted hauling)	$	%	%
Rail tariffs	$	%	%
Other (please specify)	$	%	%
	$	%	%
Local and State Governments (please exclude payroll taxes and exclude federal taxes)			
Property Tax	$	%	%

	Sales and Use Tax	$	%	%
	Corporate Income Tax	$	%	%
	Licenses, fees, permits, fines, inspections, audits	$	%	%
	Other (please list)	$	%	%
		$	%	%

Appendix E

Survey Data from Dry Bean Processors

Appendix Table E1. Expenditures per Hundredweight of Dry Beans Processed, Dry Bean Processors, Minnesota and North Dakota, 2023			
Expenditure Category	**Total Expense**	**In-state Expenditures**	**Neighboring State**
	---------- $/cwt process ----------		
General office supplies	0.0361729	0.0294804	0.0049735
Communications	0.0152246	0.0129124	0.0010838
Office lease or rent	0.0355488	0.0355488	0.0000000
Insurance	0.1971847	0.1521678	0.0432625
Interest/banking/brokerage fees/charges	0.4758117	0.2975301	0.1782817
Business services	0.2072101	0.1595227	0.0433522
Travel	0.0378950	0.0274287	0.0014466
Other (grain sampling)	0.0046242	0.0046242	0.0000000
Electricity	0.1744203	0.1657498	0.0086704
Natural Gas	0.0054479	0.0054479	0.0000000
Water and Sewer	0.0043367	0.0043367	0.0000000
Garbage	0.0038046	0.0038046	0.0000000
Propane	0.0573694	0.0573694	0.0000000
Dry Beans (in thousands of $)	26.2753236	25.8113888	0.4639348
In-bound freight on commodities	0.0963864	0.0955352	0.0008511
Inputs Consumed During Processing	0.0050578	0.0021676	0.0000000
Totes, pallets, bagging, packaging, labeling	0.5056895	0.3140006	0.0444360
Facility Maintenance	0.0072254	0.0046965	0.0025289
Engineering and technical services	0.0000000	0.0000000	0.0000000
Contracted repairs	0.1098255	0.0729762	0.0368494
Repairs	0.0238437	0.0190750	0.0023844
Expansion/Upgrades/New Construction	0.2030327	0.2030327	0.0000000
New/Replacement Equipment/Machinery	0.3908922	0.2851309	0.0211523
Contracted Hauling	0.4706602	0.2385815	0.0093713
Owned Fleet	0.0000000	0.0000000	0.0000000
Rail Tariffs	0.2109806	0.2109806	0.0000000
Memberships, Dues, Subscriptions	0.0214596	0.0132212	0.0038887
Training, Safety, Employee Education	0.0109826	0.0075577	0.0000000
Charitable/Scholarships, Donations	0.0124947	0.0114311	0.0000087
Property Tax	0.0489880	0.0421961	0.0000000
Sales and Use Tax	0.0074999	0.0002746	0.0000000
Corporate Income Tax	0.0949413	0.0020737	0.0000000
Lic, Fees, Permits, Fines, Inspec, Audits	0.0197904	0.0197904	0.0000000