



Economic Contribution of the Sugarbeet Industry in Minnesota and North Dakota

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Abstract

Agricultural industries in small geographical areas with limited acreage tend to be overlooked by those not associated with the growing region or industry. Sugarbeets continue to be produced in a relatively small geographic area and on relatively limited acreage in Minnesota and North Dakota. These factors, along with continued debate over policies affecting domestic sugar industries and recent industry expansions, help justify a continued assessment of the economic importance of the sugarbeet industry to the regional economy.

Revenues from sugarbeet production and expenditures by processors to Minnesota and North Dakota entities in fiscal 2011 represented the direct economic impacts from the industry. Expenditure information was provided by sugarbeet processing and marketing cooperatives. Secondary economic impacts were estimated using input-output analysis.

The sugarbeet industry, which included the growing regions and processing plants located in the Red River Valley of Minnesota and North Dakota and west central Minnesota planted 652,741 acres and processed 15.5 million tons of sugarbeets in fiscal 2011. Production and processing activities generated \$1.7 billion in direct economic impacts. Gross business volume (direct and secondary effects) from the sugarbeet industry was estimated at \$4.9 billion. Direct and secondary employment in the industry was 2,473 and 18,830 full-time equivalent jobs, respectively. The industry paid \$15.4 million in property taxes and was estimated to generate another \$105 million in sales and use, personal income, and corporate income taxes in Minnesota and North Dakota.

In real terms, gross business volume of the sugarbeet industry in Minnesota and eastern North Dakota has increased 185 percent since 1987. Increases in business activity from the industry have resulted from increased production, processing, and marketing activities, as well as relatively high sugar prices during fiscal 2011.

Key words: sugarbeet industry, North Dakota, Minnesota, economic impact

Highlights

Minnesota and North Dakota had nearly 57 percent of the nation's planted sugarbeet acreage and produced 55 percent of the nation's sugarbeet tonnage in 2010. Despite being the single largest sugarbeet producing region in the United States, sugarbeets are produced on relatively few acres and remain geographically limited within the Upper Midwest. The sugarbeet industry, as described in this report, included production and processing facilities in the Red River Valley of North Dakota and Minnesota and in west central Minnesota. The purpose of this report was to estimate the economic contribution of the sugarbeet industry in Minnesota and North Dakota.

Three sugarbeet cooperatives located in eastern North Dakota (Minn-Dak Farmers Cooperative) and Minnesota (American Crystal Sugar Company and Southern Minnesota Beet Sugar Cooperative) were surveyed to obtain estimates of expenditures made within Minnesota and North Dakota in fiscal 2011. In addition, United Sugars Corporation, which handles the marketing of sugar for American Crystal and Minn-Dak Farmers Cooperative, and Midwest Agri-Commodities, which handles the marketing of sugarbeet pulp and molasses, also were surveyed to obtain estimates of expenditures made within the two-state region.

Crop production budgets were developed to estimate the direct economic impacts from sugarbeet production. Total direct impacts from sugarbeet production in the two states were estimated to average \$1,653 per acre or \$1.08 billion. Direct impacts from processing and marketing activities were estimated at \$601 million in fiscal 2011. About 65 percent of total direct impacts were generated in Minnesota.

Total direct economic impacts from the sugarbeet industry (i.e, sugarbeet production, processing, and marketing activities) were estimated at \$1.7 billion in fiscal 2011. The North Dakota Input-Output Model was used to estimate the secondary economic impacts. The \$1.7 billion in direct impacts generated another \$3.2 billion in secondary economic impacts. Total economic activity (direct and secondary impacts, also termed gross business volume) was estimated at \$4.9 billion in the two-state region. Total state and local tax revenues generated by the industry were estimated at \$120.8 million, which included \$15.4 million in property taxes and \$105 million in combined sales and use, personal income, and corporate income taxes in Minnesota and North Dakota. The cooperatives also employed an equivalent of 2,473 full-time workers and indirectly supported an additional 18,830 full-time equivalent jobs in the two-state region.

The sugarbeet industry in Minnesota and eastern North Dakota has experienced substantial physical and economic growth over the past 20 years. Since 1987, planted acreage and tons processed have increased 42 percent and 121 percent, respectively. However, acreage planted in recent years has remained lower than levels found in the early 2000s, yet tons processed have continued to increase despite fewer planted acres. Correspondingly in real terms (effects of inflation removed), gross business volume generated by the sugarbeet industry in North Dakota and Minnesota has increased by 49 percent since 2003, 61 percent since 1997, 108 percent since 1992, and 185 percent since 1987. While real growth has occurred in the industry, some of the large percentage changes observed with fiscal 2011 figures can be attributable to unusually high sugar prices over the study period.

The characteristics of the sugarbeet-growing area suggest most of the industry's economic activity affects local economies because expenditures for crop inputs (*Retail Trade* sector) and returns to growers (*Households* sector), which represent a majority of the economic activity, are evenly distributed throughout the growing area. Although the sugarbeet industry in Minnesota and North Dakota is not large in terms of acres or geographic area, the magnitude of key economic measures (i.e., retail trade activity, personal income, and overall business activity) clearly indicates that the industry contributes substantially to Minnesota and North Dakota economies.

Economic Contribution of the Sugarbeet Industry to the Economy of Minnesota and North Dakota

Dean A. Bangsund, Nancy M. Hodur and F. Larry Leistritz*

INTRODUCTION

Agriculture has historically been a major component of the regional economy of North Dakota and Minnesota (Coon and Leistritz 2011, Senf et al. 1993). Despite the historical importance of agriculture, agriculture is no longer the single largest sector in either Minnesota or North Dakota (Lazarus 2002, Coon and Leistritz 2011). Generally, the agriculture sector has not decreased in magnitude in recent decades, rather other sectors of the economy have grown, and now surpass agriculture in terms of economic size. As a result, the relative share of agriculture to the states' economies has decreased over the past decade. While the role of agriculture in the regional economy may be, in relative terms, smaller than in the past decades, specific industries within the agriculture sector often find it advantageous to describe their activities in economic terms.

In the past decade, a number of studies have attempted to document the relative economic contribution of various commodities to the North Dakota and Minnesota economies. For example, economic contribution studies have been conducted for the wheat industry in North Dakota and Minnesota (Bangsund and Leistritz 2005, Bangsund et al. 1994), the barley industry in Minnesota, North Dakota, and South Dakota (Bangsund and Leistritz 1998a), and the soybean industry in North Dakota (Bangsund et al. 2011). In some cases, the studies take on a national focus, for example, an assessment of the economic size of the U.S. Sunflower Industry (Bangsund and Leistritz 1995) and the Sugar and Corn Sweetener Industry (LMC International Ltd. 2001).

The economic contribution of the sugarbeet industry in Minnesota and North Dakota has been periodically assessed since 1987. Coon and Leistritz (1988), Bangsund and Leistritz (1993), Bangsund and Leistritz (1998b), and Bangsund and Leistritz (2004) estimated the economic contribution of the sugarbeet industry in North Dakota and Minnesota in previous years. However, continued debate over the future of national sugar policies have prompted a re-evaluation of the industry's economic importance. A reassessment of the industry's economic importance to the region would be helpful to demonstrate the economic implications of future policy changes affecting domestic sugar industries and document the economic effect of recent industry expansions.

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OBJECTIVES

The purpose of the study was to estimate the economic contribution (direct and secondary effects) of the sugarbeet industry to the economies of Minnesota and North Dakota.

Specific objectives include:

- 1) quantify sugarbeet acreage and production in Minnesota and eastern North Dakota,
- 2) estimate the direct economic impacts of the sugarbeet industry to the state economies of Minnesota and North Dakota,
- 3) estimate the secondary economic impacts of the sugarbeet industry to the state economies of Minnesota and North Dakota.

PROCEDURES

An economic contribution analysis, as defined in this study, represents an estimate of all relevant expenditures and returns associated with an industry (i.e., economic activity from sugarbeet production, processing, transportation, and marketing). The economic contribution approach to estimating economic activity has been used for several similar studies (Bangsund et al. 2011, Bangsund and Leistritz 2010, and Bangsund and Leistritz 2005). The methods and analyses used in this report paralleled those used by Bangsund and Leistritz (2004).

Analysis of the sugarbeet industry required several steps. Discussion of the procedures used in the study was divided into the following sections: (1) sugarbeet production in Minnesota and North Dakota (2) sugarbeet production expenditures, (3) sugarbeet processor and marketing alliance expenditures, and (4) application of input-output analysis to generate secondary impacts.

Sugarbeet Production

Sugarbeet production and associated processing facilities are concentrated in the Red River Valley of North Dakota and Minnesota and west central Minnesota (Figure 1). Sugarbeet production is centered around processing plants operated by three producer-owned cooperatives: American Crystal Sugar Company with headquarters in Moorhead, Minnesota; Minn-Dak Farmers Cooperative located in Wahpeton, North Dakota; and Southern Minnesota Beet Sugar Cooperative located in Renville, Minnesota.

Generally, the growing conditions in the Red River Valley and west central Minnesota are conducive to sugarbeet production. Sugarbeets, unlike most traditional crops (e.g., small grains, corn, beans), are difficult and expensive to transport long distances. They also have unique storage problems not found with most crops (i.e., they are bulky, require specialized

handling equipment, have limited storage life, and must be stored in cold conditions). As a result, processing facilities and sugarbeet production are located in close proximity to each other. The geographic concentration of sugarbeet production and processing accentuates the industry's economic impact on local economies.

Seven counties in eastern North Dakota collectively produced about 5.3 million tons of sugarbeets for American Crystal Sugar Company and Minn-Dak Farmers Cooperative in 2010 (Table 1). Minnesota had over 23 counties that collectively produced 11.7 million tons of sugarbeets in 2010 (Table 1). The combined growing regions in eastern North Dakota and Minnesota planted nearly 654,000 acres of sugarbeets in 2010 (National Agricultural Statistics Service 2011). About 31 percent of the region's planted acreage was in North Dakota and 69 percent in Minnesota. The three sugar cooperatives reported processing about 15.5 million tons of sugarbeets and 652,741 planted acres of sugarbeets in 2010.

Sugarbeet acreage in Minnesota and North Dakota has increased from 1970 through 2000s (Figure 2). Since 2000, national sugarbeet acreage has been trending lower. The trend in acreage in North Dakota and Minnesota also has declined slightly over the same period, but to a much lesser extent than the changes observed nationally. As a result, the share of national acreage grown in North Dakota and Minnesota has risen over the period and in recent years has approached 60 percent of national acreage.

Changes in sugarbeet tonnage mirrored changes in acreage from the 1970s through 2000 (Figure 3). U.S. sugarbeet tonnage declined gradually from 1970 through the early 1980s, increased through the 1980s, and has stabilized over the last decade. As a result of U.S. production remaining relatively stable since 1970 and production in Minnesota and North Dakota consistently increasing over the same period, the share of U.S. production in Minnesota and North Dakota has continued to increase (Figure 3). In 2010, Minnesota and North Dakota accounted for about 57 percent of U.S. planted acreage and 55 percent of total U.S. sugarbeet production.

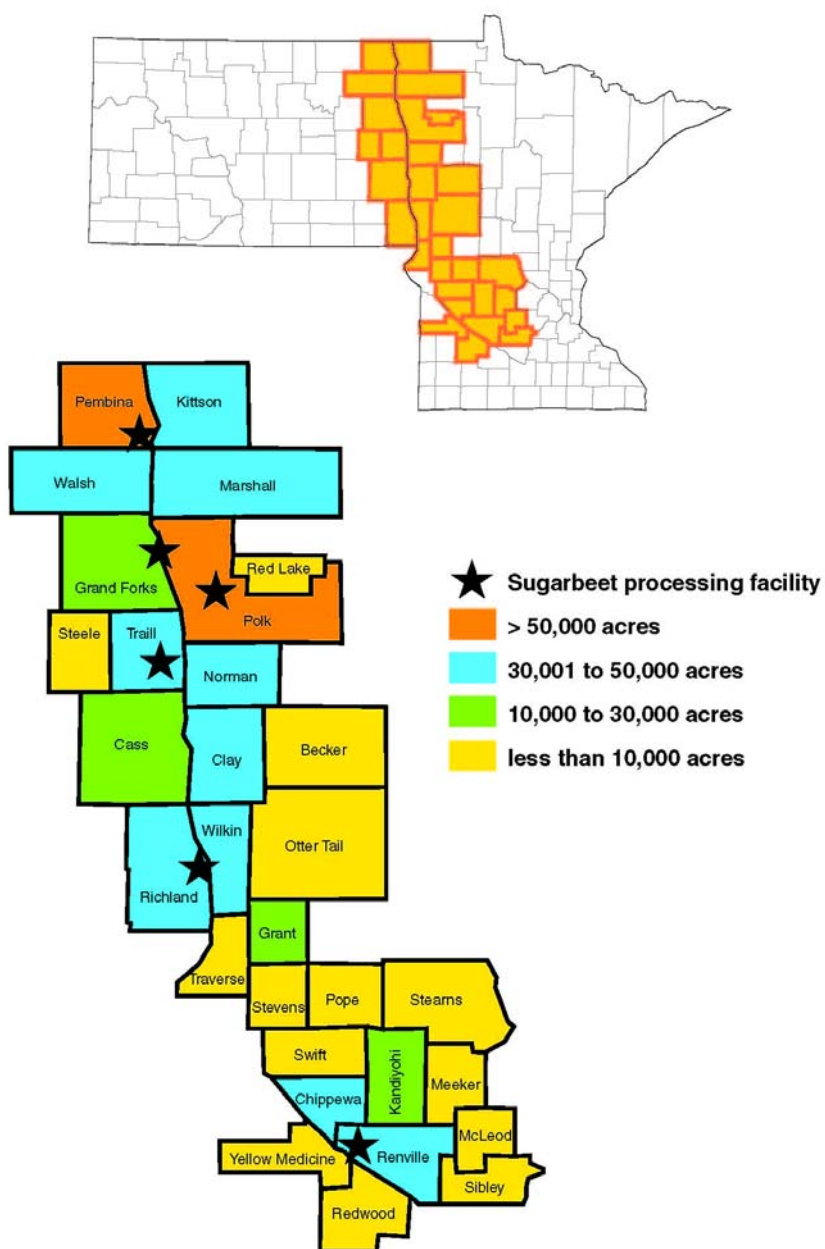


Figure 1. Distribution of Sugarbeet Production and Processing Facilities in Minnesota and Eastern North Dakota, 2010

Source: National Agricultural Statistics Service (2011).

Table 1. Sugarbeet Production, by County, Minnesota and Eastern North Dakota, 2010

State/County	Acreage		Yield ^a	Production
	Planted	Harvested		
	----- acres -----		- tons/acre -	----- tons -----
North Dakota				
Cass	14,900	14,700	26.85	400,000
Pembina	60,200	58,700	25.35	1,526,000
Richland	31,000	30,500	25.19	781,000
Steele	500	500	30.00	15,000
Traill	31,200	31,000	27.53	859,000
Walsh	39,100	38,700	25.22	986,000
Other Counties ^b	<u>27,700</u>	<u>27,500</u>	<u>27.83</u>	<u>773,000</u>
State	204,600	201,600	26.09	5,338,000
Minnesota				
Becker	7,500	7,400	26.00	195,000
Chippewa	30,100	30,000	25.32	762,000
Clay	43,600	42,900	27.55	1,201,000
Grant	12,200	12,100	27.30	333,000
Kandiyohi	14,400	14,400	26.67	384,000
Kittson	31,100	28,400	19.94	620,000
McLeod	2,300	2,300	25.48	58,600
Mahnomen	2,500	2,400	26.16	65,400
Marshall	42,100	40,800	22.78	959,000
Meeker	2,500	2,500	26.04	65,100
Norman	38,200	37,900	28.69	1,096,000
Otter Tail	3,300	3,100	25.33	83,600
Polk	91,200	90,600	26.59	2,424,000
Pope	2,600	2,600	29.50	76,700
Redwood	4,700	4,700	27.23	128,000
Renville	37,800	37,500	27.01	1,021,000
Sibley	2,600	2,500	25.65	66,700
Stearns	2,600	2,600	29.85	77,600
Stevens	4,500	4,500	32.44	146,000
Swift	7,600	7,500	28.95	220,000
Traverse	9,400	9,300	27.77	261,000
Wilkin	48,700	48,000	26.92	1,311,000
Yellow Medicine	3,700	3,600	23.68	87,600
Other Counties ^b	<u>3,800</u>	<u>3,400</u>	<u>23.08</u>	<u>87,700</u>
State		441,000	26.13	11,731,000

^a Yield per planted acre.^b Included Grand Forks, Cavalier, and other counties.

Source: National Agricultural Statistics Service (2011).

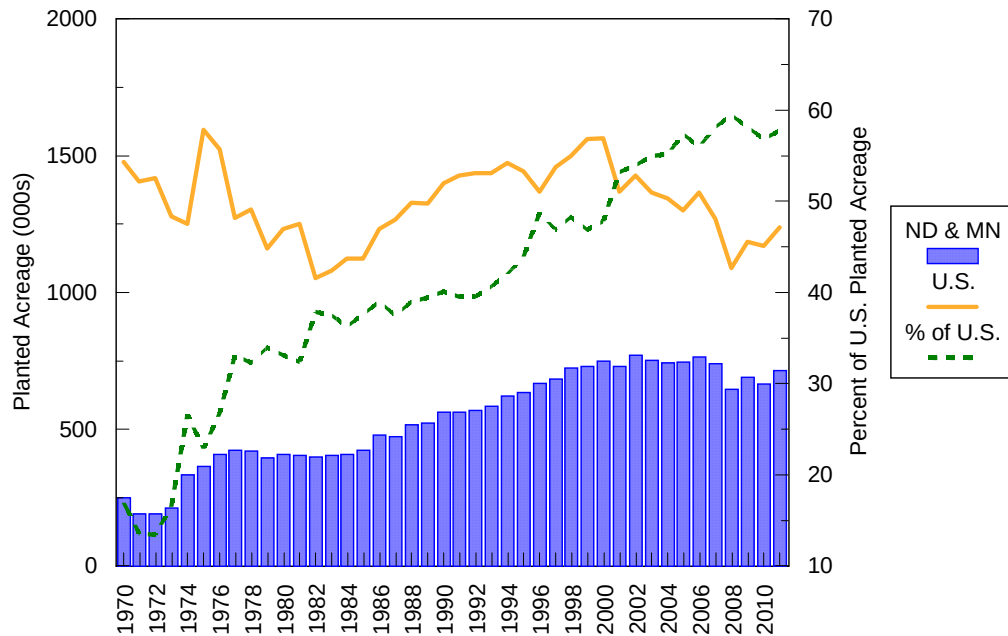


Figure 2. Planted Sugarbeet Acreage, United States, Minnesota and North Dakota, 1970 through 2011

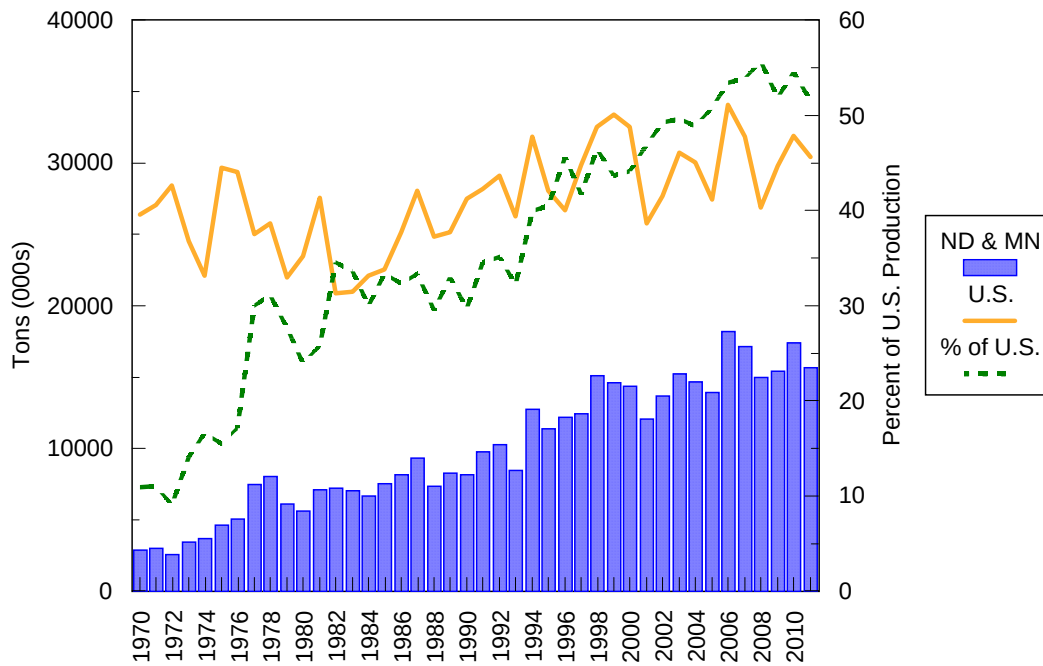


Figure 3. Sugarbeet Production, United States, Minnesota and North Dakota, 1970 through 2011

Sugarbeet Production Expenditures

Crop expenses were obtained from the Farm Business Management Programs in North Dakota and Minnesota (Minnesota Farm Business Management Education 2011, North Dakota Farm and Ranch Business Management Education 2011). Budgets obtained were for sugarbeet production on owned land and rented land in the Red River Valley in North Dakota and Minnesota, and for owned and rented land in west-central Minnesota. Expenses were averaged between budgets for sugarbeets produced on owned land and rented land by the ratio of owned and rented farm land in the sugarbeet producing counties (U.S. Department of Agriculture 2011a). Revenues from sugarbeet production were derived from the survey of processors, which listed payments made to producers.

Cash outlays by sugarbeet farmers represent money spent for fuel, seed, fertilizer, chemicals, machinery, and other items which impact local economies. The budget contained some noncash expenditures, which are considered appropriate production costs, but do not represent a cash expenditure. Non-cash expenditures were treated proxies for purchases of various production related inputs (e.g., machinery depreciation, building depreciation, management charges).

Sugarbeet Cooperative Expenditures

The three sugarbeet cooperatives located in eastern North Dakota (Minn-Dak Farmers Cooperative) and Minnesota (American Crystal Sugar Company and Southern Minnesota Beet Sugar Cooperative) were asked to provide the amount of processing, research, distribution, and administrative cash expenditures made within Minnesota and North Dakota in fiscal 2011 (Appendix B). Expenditures made in Minnesota and North Dakota by United Sugars Corporation and Midwest Agri-Commodities also were obtained. Non-cash outlays or expenditures made to entities outside of the two-state area were not included. Itemization of expenditures for each cooperative were not included due to confidentiality.

Input-output Analysis

Economic activity from a project, program, or policy can be 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 (sometimes further categorized into indirect and induced effects) result from subsequent rounds of spending and respending within an economy. This process of spending and respending is sometimes termed the multiplier process, and the resultant secondary effects are sometimes referred to as multiplier effects (Leistritz and Murdock 1981).

Input-output (I-O) analysis is a mathematical tool that traces linkages among sectors of an economy and calculates the total business activity resulting from a direct impact in a basic sector (Coon et al. 1985). The North Dakota I-O Model has 17 economic sectors, is closed with respect to households (households are included in the model), and was developed from primary (survey) data from firms and households in North Dakota. Empirical testing has shown the North Dakota I-O Model is sufficiently accurate in estimating economic impacts in neighboring states (Coon and Leistritz 2011; Coon et al. 1984; Leistritz et al. 1990).

ECONOMIC IMPACTS

The economic contribution from the sugarbeet industry was estimated from production and processing expenditures. Both production and processing expenditures represent the direct economic impacts from the sugarbeet industry. Subsequently, the direct impacts were used with an input-output model to estimate the secondary impacts. Secondary impacts result from the turnover or respending of direct impacts within the area economy. The following section is divided into five major parts: (1) direct impacts, (2) secondary impacts, (3) tax revenue, (4) total economic impacts, and (5) previous industry impacts.

Direct Impacts

From an economic perspective, direct impacts are those changes in output, employment, or income that represent the initial or direct effects of a project, program, or event. The direct impacts from the sugarbeet industry on the local economies in Minnesota and North Dakota include (1) expenditures and returns from the production of sugarbeets, (2) expenditures from processing sugarbeets into refined sugar, and (3) expenditures incurred through marketing activities associated with the sugarbeet industry. The following sections describe these direct economic impacts.

Sugarbeet Production

Farmers and producers generate direct economic impacts to the area economy through (1) expenditures for production outlays and (2) net returns from production. Direct economic impacts from sugarbeet production (i.e., production outlays and producer returns) were estimated using cost-of-production budgets and payments to sugarbeet growers, as reported by the cooperatives. Separate budgets were developed for sugarbeet production in the Red River Valley and west central Minnesota. Each budget contained estimates of gross revenue, variable and fixed costs, and returns to unpaid labor, management, and equity (Appendix A). Gross revenue per acre was calculated by dividing sugarbeet payments (i.e., payments made by the cooperatives to the growers) by estimated planted sugarbeet acreage from each cooperative and adding farm program payments obtained on sugarbeet acreage (estimates obtained from the Farm Business Management Programs in North Dakota and Minnesota). Variable and fixed costs represented an average of actual production costs incurred on owned and rented land in calendar year 2010 (North Dakota Farm and Ranch Business Management Education 2011 and Minnesota Farm Business Management Education 2011).

Cash and non-cash expenses (e.g., depreciation) from sugarbeet production represented direct impacts. Returns to invested resources (i.e., unpaid labor, management, and equity) also were considered direct impacts, even though net returns do not represent a cash expenditure. Net returns were considered retained by the producer, eventually resulting in personal or business purchases in the regional economy.

Total direct impacts per acre from sugarbeet production should be equal to the gross revenue per acre, providing all economic activity (production expenses and returns to unpaid labor, management, and equity) remains in the two-state economy. All expenses and returns associated with sugarbeet production in calendar year 2010 were assumed to initially be made

to entities within the two-state economy. For example, sugarbeet growers are residents of the regional economy and production inputs are assumed to be made from entities located near the producer's residence or farming enterprise. Total direct impacts from sugarbeet production were estimated at \$1,653 per acre or \$1.079 billion (Table 2).

Total direct impacts of \$1,653 per planted acre were further broken into variable costs, fixed costs, and returns to unpaid labor, management, and equity. Variable costs (i.e., outlays for seed, herbicide, fertilizer, chemical, custom hire, etc. that change with the level of production) were estimated at \$722.57 per acre. Fixed costs (i.e., expenses that do not change with the level of production, such as interest on land debt payments, farm utilities, and machinery overhead) were estimated to be \$221.60 per acre. Total expenses were estimated at \$944.17 per acre. Net returns were estimated at \$708.54 per acre (Table 2).

Table 2. Direct Economic Impacts from Sugarbeet Production in Minnesota and Eastern North Dakota, Fiscal 2011^a

Expenses and Returns ^b	Direct Impacts	
	Per Acre	Total
Payments to Growers	--	\$1,063,453,624
Misc Farm Program Payments	--	\$9,685,382
Misc Revenue & Insurance Indemnities	--	\$5,651,287
Planted Acreage	--	652,741
Revenue per Acre	--	\$1,652.71
Variable Costs	\$722.57	471,648,000
Fixed Costs	\$221.60	144,650,000
Total Costs	\$944.17	616,298,000
Net Returns	\$708.54	462,492,000
Direct Impacts	\$1,652.71	1,078,790,000

^a While some production expenses occur in the spring of calendar year 2010, all expenditures were treated as part of the industry's economic contribution in fiscal 2011.

^b See Appendix A for complete budgets.

Sugarbeet Processing and Marketing

Sugarbeet cooperatives and their processing facilities impact local economies through expenditures for production and processing inputs, labor, and investment in facilities and capital. American Crystal Sugar Company, Minn-Dak Farmers Cooperative, Southern Minnesota Beet Sugar Cooperative, United Sugars Corporation, and Midwest Agri-Commodities were surveyed to estimate their fiscal 2011 cash expenditures (Appendix B). Only cash expenditures and outlays made within the two-state economy were included.

Total cash expenditures made to entities in the two-state region by the processing cooperatives and sugar marketing alliances in Minnesota and North Dakota were \$1.66 billion in fiscal 2011. However, over \$1 billion represented payments to growers and was reflected in the direct impacts attributable to sugarbeet production. Direct economic impacts from the cooperatives were estimated at \$601 million (Table 3). Approximately 58 percent of the direct impacts from the processing component of the industry were generated in Minnesota. North Dakota received about 42 percent of processor expenditures. The processing cooperatives and marketing companies also were directly responsible for 2,473 full-time equivalent jobs in fiscal 2011.

Direct Impacts by State

Total direct impacts from the sugarbeet industry (production, processing, and marketing) in Minnesota and North Dakota were estimated at \$1.680 billion in fiscal 2011¹ (Table 4). Sugarbeet production accounted for 64 percent (\$1.079 billion) of all direct impacts, while sugarbeet processing and marketing accounted for 36 percent (\$601 million) of all direct impacts. Based on planted sugarbeet acreage in the study region, about 68 percent and 32 percent of the direct impacts from sugarbeet production were generated in Minnesota and North Dakota, respectively. Similarly, about 58 percent and 42 percent of the direct impacts from processing were captured in Minnesota and North Dakota, respectively, based on expenditures made in each state by the processing cooperatives and marketing companies (Table 4).

Total direct impacts in Minnesota were estimated at \$1.087 billion (\$348.8 million from processors and \$739.0 million from growers). Total direct impacts in North Dakota were estimated at \$592.3 million (\$252.5 million from processors and \$339.8 million from growers).

¹While some production expenses occur in the spring of calendar year 2010, all expenditures relating to sugarbeet production were treated as part of the industry's economic contribution in fiscal 2011.

Table 3. Direct Economic Impacts from Sugarbeet Processing and Marketing Activities in Minnesota and North Eastern North Dakota, Fiscal Year 2011

Expenditure Category	Expenditures in Minnesota and North Dakota
	-- 000s \$ --
Total payments to sugarbeet growers	1,034,635
Contract construction	53,669
Plant maintenance and overhaul	48,868
Transportation	73,523
Communication	1,121
Public Utilities	46,312
Miscellaneous Manufacturing	2,191
Wholesale trade	81,914
Retail trade	5,069
Finance, insurance, and real estate	14,649
Business and personal services	8,876
Professional and social services	19,475
Coal	6,740
State and local taxes ^b	9,646
Labor ^c	215,228
Other expenses	14,004
Total cash expenditures	1,664,739
Direct impacts from processors ^d	601,286

^a Only expenditures made within the two-state region were included.

^b Included sales and use, property, and miscellaneous taxes.

^c Included wages and salaries and employee benefits.

^d Direct impacts were calculated by subtracting payments to sugarbeet growers from total expenditures. Payments made to sugarbeet growers were considered direct impacts attributable to sugarbeet production.

Table 4. Total Direct Impacts of the Sugarbeet Industry, by State and Component of the Industry, Fiscal 2011

Industry Component	Minnesota	North Dakota	Total ^a	
	----- 000s \$ -----			
Processing/Marketing	348,774	252,510	601,284	35.8%
State Share	58.0%	42.0%		
Production ^b	739,035	339,757	1,078,792	64.2%
State Share	68.5%	31.5%		
Total (all activities) ^a	1,087,809	592,267	1,680,076	
State Share	64.7%	35.3%		

^a Columns and rows may not sum due to rounding.

^b Calendar year 2010 expenses treated as part of fiscal 2011 industry impacts.

Direct Impacts by Economic Sector

Sugarbeet production expenditures, returns to sugarbeet growers, and production outlays by sugarbeet cooperatives were allocated to various economic sectors of the North Dakota I-O Model. Seed, herbicide, fungicide, insecticide, fertilizer, fuel, lubrication, repairs, and machinery depreciation were allocated to the *Retail Trade* sector. Custom hire expenses were allocated to the *Business and Personal Services* sector. Crop insurance, interest expense, and machinery and building leases were allocated to the *Finance, Insurance, and Real Estate* sector. Property taxes were allocated to the *Government* sector. Utility expenses were allocated to the *Communication and Public Utilities* sector. Hired labor, land rent, beet stock charges, and net returns were allocated to the *Households* sector. Dues and fees were allocated to the *Professional and Social Services* sector.

The survey of processors was designed to collect information on expenditures made by processing and marketing activities in the tri-state region. Both individual expenditures and expenses that can be grouped together into broad categories, based on Standard Industrial Classification (SIC) codes, were included in the survey. Major expense types based on SIC codes were organized to match several existing sectors in the North Dakota I-O Model. Those expenditure categories were directly allocated to the same sectors in the North Dakota I-O Model (see Appendix B for more detail). The remaining expenses collected from the survey of processing and marketing activities were allocated to appropriate sectors of the North Dakota I-O Model in the same manner as production outlays.

Miscellaneous manufacturing, wholesale trade, and 40 percent of plant maintenance and overhaul expenses were allocated to the *Agricultural Processing and Miscellaneous Manufacturing* sector. Twenty percent of plant maintenance and overhaul expenses were

allocated to *Business and Personal Services* sector. Forty percent of plant maintenance and overhaul expenses were allocated to the *Retail Trade* sector. Expenses for petroleum, natural gas, coal, and communications were allocated to the *Communications and Public Utilities* sector. Employee benefits, insurance, and interest expenses were allocated to the *Finance, Insurance, and Real Estate* sector. Sugarbeet research was allocated to the *Professional and Social Services* sector. All taxes, unemployment, and workman's compensation were allocated to the *Government* sector. Salary and wage expenses were allocated to the *Households* sector.

The *Households* and *Retail Trade* sectors collectively accounted for about 68 percent of all direct impacts (Table 5). The *Finance, Insurance, and Real Estate* sector accounted for 9 percent, while direct impacts in the *Construction* and *Transportation* sectors collectively accounted for 8 percent of all expenditures. Noticeable direct impacts also were generated in the *Communications and Public Utilities*, *Agricultural Processing and Miscellaneous Manufacturing*, and *Professional and Social Services* sectors (Table 5).

Table 5. Direct Economic Impacts of Sugarbeet Industry in Minnesota and North Dakota, by Economic Sector, Fiscal 2011

Economic Sector	Industry Activity		Total
	Production	Processing and Marketing	
	----- 000s \$ -----		
Construction	0	53,669	53,669
Transportation	4,593	73,523	78,116
Communication and Public Utilities	4,492	54,173	58,665
Ag Processing and Misc Mnfg	0	103,651	103,651
Retail Trade	362,451	24,616	387,067
Finance, Insurance, and Real Estate	60,769	93,616	154,685
Business and Personal Services	13,653	30,623	44,276
Professional and Social Services	2,896	21,068	23,964
Households (personal income)	619,200	135,960	755,160
Government	10,738	10,085	20,823
Total	1,078,792	601,284	1,680,076

Secondary Impacts

The secondary impacts of the sugarbeet industry were estimated using the North Dakota Input-Output Model. The North Dakota Input-Output Model traces linkages among sectors of an economy and calculates total business activity resulting from a direct impact in a basic sector (Coon et al. 1985). The model embodies interdependence coefficients or multipliers that measure the level of total gross business volume (gross receipts) generated in each sector of the regional economy from an additional dollar of sales to final demand in a given sector. The model was developed from primary data from North Dakota firms and households and is closed with respect to households (meaning that measurements of economy-wide personal income are included within the model). The input-output model applies the expenditures from the sugarbeet industry to these interdependence coefficients. Resulting levels of business activity were used to estimate secondary (indirect and induced) employment, based on historic relationships.

This process of spending and respending can be explained by using an example. A single dollar from an area sugarbeet producer (*Households* sector) may be spent for a bag of sugar at the local store (*Retail Trade* sector); the store uses part of that dollar to pay for the next shipment of sugar (*Transportation* and *Agricultural Processing* sectors), part to pay the store employee (*Households* sector) who shelved or sold the sugar, and part to pay operating expenses for the store (*Communications and Public Utilities*, *Business and Personal Services*, *Finance*, *Insurance*, and *Real Estate*); the sugar processor uses part of that dollar to pay for the sugarbeets used to make the sugar (*Agriculture-Crops* sector); the sugarbeet grower in turn uses a portion of the sugarbeet payment to purchase production inputs (*Retail Trade* and *Business and Personal Services* sectors)... and so on.

Total direct impacts of \$1.680 billion from the sugarbeet industry in Minnesota and North Dakota generated about \$3.239 billion in secondary impacts (Table 6). Secondary economic impacts were greatest in the *Households* (\$1.04 billion), *Retail Trade* (\$962 million), *Finance*, *Insurance*, and *Real Estate* (\$214 million), *Communications and Public Utilities* (\$152 million), and *Construction* (\$114 million) sectors. The economic activity in the *Households* sector represents economy-wide personal income resulting from industry expenditures and their subsequent secondary effects. Each dollar of direct impacts generated \$1.93 in secondary impacts.

Table 6. Direct, Secondary, and Total Economic Impacts of the Sugarbeet Industry in Minnesota and North Dakota, Fiscal 2011

Economic Sector	Industry Impacts		
	Direct	Secondary	Total
	----- 000s \$ -----		
Construction	53,669	114,113	167,782
Transportation	78,116	16,966	95,082
Communication and Public Utilities	58,665	151,976	210,641
Ag Processing and Misc Mnfg	103,651	143,181	246,832
Retail Trade	387,067	962,145	1,349,212
Finance, Insurance, and Real Estate	154,685	213,710	368,395
Business and Personal Services	44,276	80,906	125,182
Professional and Social Services	23,964	116,933	140,897
Households (personal income)	755,160	1,038,543	1,793,703
Government	20,823	156,007	176,830
Other sectors ^a	0	244,404	244,404
Total	1,680,076	3,238,884	4,918,960
Direct Employment (full-time jobs)	2,473	--	--
Secondary Employment (full-time jobs)	--	18,830	--

^a Includes Agriculture and Mining sectors.

Tax Revenue

Tax collections are another important measure of the economic impact of an industry on an economy. Tax implications have become an increasingly important measure of local and state-level impacts. Some of the interest in estimating tax revenue generated by an industry has stemmed from public awareness of the importance of tax revenue to local and state governments. In an era of reduced federal funding, revenue shortfalls, and growing public demand on governments to balance their budgets while providing constant or increased levels of services and benefits, tax collections have become an important factor in assessing economic impacts.

Business activity alone does not directly support government functions; however, taxes on personal income, retail trade, real estate property, and corporate income are important revenue sources for local and state governments. Total economic impacts in the *Retail Trade* sector were used to estimate revenue from sales and use taxes. Economic activity in the *Households* sector was used to estimate personal income tax collections. Similarly, corporate

income tax revenue was estimated from the economic activity in all business sectors (excluding the *Households, Government, and Agriculture* sectors). The sugarbeet cooperatives and growers paid an estimated \$15.4 million in property taxes in Minnesota and North Dakota in 2011. Property taxes were included in the direct impacts.

Tax collections were estimated separately for Minnesota and North Dakota. Direct economic impacts, those from sugarbeet production and processing, were estimated for each state. I-O analysis was used to estimate total business activity in each state. Total business activity, which is comprised of personal income, retail trade, and other business activity, was used to estimate tax revenue. Tax revenue generated by the sugarbeet industry in North Dakota included \$21.5 million in sales and use taxes, \$8 million in personal income taxes, and \$3 million in corporate income taxes in fiscal 2011 (Table 7). The sugarbeet industry in Minnesota generated \$26.9 million in sales and use taxes, \$40.4 million in personal income taxes, and \$5.4 million in corporate income taxes in fiscal 2011 (Table 7). Total tax collections generated by the sugarbeet industry in fiscal 2011 from sales and use, personal income, and corporate income taxes in the two-state region were about \$105.4 million (Table 7). Total tax revenue attributable to the industry was estimated at \$120.8 million, which included property, sales and use, personal income, and corporate income taxes.

Table 7. Estimated Tax Collections and Direct Taxes Paid by the Sugarbeet Industry in Minnesota and North Dakota, Fiscal 2011

Tax	Minnesota	North Dakota	Total
Estimated Tax Collections	----- 000s \$ -----		
Sales and Use	26,943	21,531	48,474
Personal Income	40,413	8,009	48,422
Corporate Income	5,413	3,054	8,467
Sub-total	72,769	32,594	105,363
Direct Tax Payments			
Property	11,528	3,892	15,420
Total	84,297	36,846	120,783

Total Economic Impacts

Total business activity from sugarbeet industry expenditures and returns in Minnesota and North Dakota was estimated at nearly \$4.9 billion in fiscal 2011 (see Table 6). The sectors of the two-state economy with the greatest total economic impact included the *Households* (economy-wide personal income) (\$1.8 billion), *Retail Trade* (\$1.3 billion), *Finance, Insurance, and Real Estate* (\$368 million), *Agricultural Processing and Manufacturing* (\$247 million), *Communications and Public Utilities* (\$211 million), *Construction* (\$168 million), and *Government* (\$177 million) sectors.

The North Dakota I-O Model also estimates secondary employment. Employment estimates represent the number of full-time jobs generated as a result of the secondary economic activity. The sugarbeet cooperatives and marketing alliances were directly responsible for 2,473 full-time equivalent jobs and indirectly supported an additional 18,830 full-time equivalent jobs. The sugarbeet industry generated about \$36.8 million in tax revenue in North Dakota and another \$84.3 million in tax revenue in Minnesota.

The number of jobs created directly from sugarbeet production is difficult to estimate because most sugarbeet farmers also raise other crops. This complicates the employment estimate since if they did not raise sugarbeets, they likely would remain employed raising other crops. Also, sugarbeet labor requirements are seasonal, requiring substantial additional labor during planting and harvesting. Thus, estimating full-time employment equivalents is difficult. Although full-time employment equivalents for additional part-time hired labor are unknown, most of the seasonal employment (i.e., migrant workers, harvest labor, and truck drivers) is captured in the input-output analysis. Secondary employment was calculated based on secondary business activity and expressed in full-time equivalents. Seasonal employment, measured in terms of individuals employed, would be higher than the number of full-time equivalents, since those workers are employed for short time periods.

Previous Industry Impacts

Previous estimates of the economic contribution of the sugarbeet industry were compared to analyze the changing economic importance of the industry (Table 8). Four prior studies examining the economic contribution of the sugarbeet industry in eastern North Dakota and Minnesota have employed similar methodologies at various points in time. Thus, comparisons of previous estimates can be made by adjusting previous industry estimates to reflect real dollars (effects of inflation removed). Previous estimates from Coon and Leistritz (1988), Bangsund and Leistritz (1993), Bangsund and Leistritz (1998b), Bangsund and Leistritz (2004) were adjusted using the Gross Domestic Product–Implicit Price Deflator (U.S. Department of Commerce 2011) to reflect 2011 equivalent dollars.

Using a survey of sugarbeet processors to obtain processing, research, and distribution expenditures and using crop budgets to estimate farmers' production expenditures, Coon and Leistritz (1988) estimated the overall business activity generated from the sugarbeet industry in eastern North Dakota and Minnesota in 1987. Using similar methodologies, Bangsund and Leistritz (1993) also surveyed sugarbeet processors to obtain their operating expenditures and producer payments in eastern North Dakota and Minnesota. Bangsund and Leistritz (1993) and Bangsund and Leistritz (2004) included producer (grower) net returns associated with sugarbeet

production in their study, an item not included in the study by Coon and Leistritz (1988). Methodologies used by Bangsund and Leistritz (1998b, 2004) were similar to those of Bangsund and Leistritz (1993), except expenditures made by United Sugars Corporation and Midwest Agri-Commodities to entities in Minnesota and North Dakota were included. The methods used in this study are similar to those used by Bangsund and Leistritz (1993, 1998b, 2004).

Adjusting previous estimates of industry size for inflation revealed that the sugarbeet industry exhibited real growth (size has increased after adjusting for inflation) over the last 20 years. Since 1987, planted acreage and tons processed have increased 42 percent and 121 percent, respectively. Planted acreage in 1987 was about 460,000 acres, while planted acreage in 2010 increased to 652,741 acres. Correspondingly, in real terms, gross business volume generated by the sugarbeet industry in eastern North Dakota and Minnesota has increased by 49 percent since 2003, nearly 61 percent since 1997, 108 percent since 1992, and about 185 percent since 1987.

Changes in direct employment were mostly constant over the 1987 to 2010 period. Direct employment within the industry grew by nearly 11 percent from 1987 to 1992. Direct employment by the industry remained relatively constant from 1992 through 2010: 2,410 full-time equivalents (FTE) in 1992, 2,486 FTE in 1997, 2,377 FTE in 2003, and 2,473 FTE in 2010 (Table 8).

Changes in secondary employment over the same period were similar. The number of jobs supported by secondary business activity generated by the sugarbeet industry increased by nearly 45 percent from 1987 to 1992 and increased by 19 percent from 1992 to 1997. However, secondary employment decreased by 12 percent from 1997 to 2003. From 2003 to 2010, secondary employment increased by 18 percent.

The decrease in secondary employment from 1997 to 2003 was not due to less overall economic activity (e.g., secondary economic impacts increased by 10 percent in real terms over the same period), but rather the decrease was reflective of changes in productivity ratios² used to estimate secondary employment. The relative change in productivity ratios from 1997 to 2003 was greater than the relative change in the industry's secondary economic activity. For example, the average amount of economy-wide business activity required to support one secondary job rose from \$104,398 (average of all sectors influenced by the sugarbeet industry) in 1997 to \$124,476 in 2003, a 19 percent increase. Thus, even though the industry generated a 10 percent increase in inflation-adjusted secondary business volume, the number of secondary jobs supported by the industry decreased because, in percentage terms, the average amount of business activity required to support a secondary job increased by 19 percent.

² A measure of the amount of economic activity needed in an economic sector to support one full-time job within that sector.

Table 8. Economic Size of the Sugarbeet Industry in Minnesota and North Dakota, Selected Years

Economic Indicators	Sugarbeet Industry Activity in Various Years ^a				
	1987	1992	1997	2003	2010
Gross Business Volume (000s nominal \$)	985,709	1,635,800	2,321,500	2,812,219	4,918,960
Gross Business Volume (000s 2010 \$) ^b	1,726,800	2,367,000	3,062,700	3,304,900	4,918,960
Direct Employment (full-time jobs)	2,175	2,410	2,486	2,377	2,473
Secondary Employment (full-time jobs)	10,604	15,375	18,248	16,009	18,830
Tax Revenue Generated (000s 2010 \$)	39,180	48,620	67,280	70,190	105,363
Planted Acreage	460,000	554,400	654,400	776,300	652,741
Economic Impact per Acre (2010 \$)	3,835	4,452	4,681	4,494	7,536
Tons of Sugarbeets Processed ^c	7,000,000	9,273,819	11,690,823	14,525,889	15,487,498
Economic Impact per Ton (2010 \$)	247	255.23	261.97	244.07	317.61
Gross Business Volume by State (000s 2010)					
Minnesota	na	1,641,700	1,973,800	2,252,520	3,161,634
North Dakota	na	827,000	1,088,800	1,052,300	1,757,326

na--not available.

^a Sources for previous studies: 1987, Coon and Leistritz (1988); 1992, Bangsund and Leistritz (1993); 1997, Bangsund and Leistritz (1998b); 2003, Bangsund and Leistritz (2004). Producer net returns and expenditures made by marketing activities were excluded from Coon and Leistritz (1988). Expenditures made by marketing activities were excluded from Bangsund and Leistritz (1993). Expenditures by marketing companies were included in Bangsund and Leistritz (2004) and included in the current study. Bangsund and Leistritz (2004) included the economic impacts from the Sidney, MT sugarbeet plant; however, the effects of that processing plant were removed for sake of comparison to past economic assessments.

^b Adjusted for inflation using the Gross Domestic Product–Implicit Price Deflator (U.S. Department of Commerce 2011).

^c Exact tonnage of sugarbeets processed was not available from Coon and Leistritz (1988).

Recent changes in the economic impact of the industry have not been proportional in North Dakota and Minnesota. The economic size of the sugarbeet industry in North Dakota increased 32 percent in real terms from 1992 to 1997, while the size of the industry in Minnesota increased 20 percent over the same period. However, the economic contribution of the sugarbeet industry in North Dakota decreased in real terms by 3 percent from 1997 to 2003. The economic size of the sugarbeet industry in Minnesota; however, increased over the same period by nearly 14 percent. By comparison, the economic size of the industry increased in real terms by nearly 67 percent in North Dakota and 40 percent in Minnesota from 2003 to 2010.

While changes in planted acreage from 1997 to 2003 between the two states were similar in percentage terms (16.7 percent increase in ND and 14.5 percent increase in Minnesota), in physical terms, increased acreage in Minnesota was nearly double that of North Dakota over the period (an increase of 35,700 acres in ND compared to 64,000 acres in MN). From 2003 to 2010, the industry decreased planted acreage. The decrease was greater in North Dakota (-18 percent) than in Minnesota (-11 percent). While some of the change in gross business volume between the two states can be attributed to planted acreage, the distribution of expenditures by processing and marketing activities also account for the differences in economic activity between the two states. About 65 percent of the industry-wide gross business volume was generated in Minnesota and 35 percent was generated in North Dakota in fiscal 2011. By comparison in 2003, about 32 percent of the industry's economic activity was generated in North Dakota and 68 percent in Minnesota.

The economic size and importance of the sugarbeet industry in eastern North Dakota and Minnesota has increased substantially in the last 20 years. However, the rate of change over time has not necessarily been equally distributed between North Dakota and Minnesota. Bangsund and Leistritz (1998b) showed subtle shifts in economic growth favoring North Dakota over Minnesota in the mid 1990s, while Bangsund and Leistritz (2004) showed shifts in economic growth favoring Minnesota over North Dakota. Currently, shifts in growth, albeit relatively subtle, have again favored North Dakota over Minnesota.

Subtle changes in physical measures (i.e., impact per ton, impact per acre) of the industry's impact occurred from 1987 to 2011. Gross business volume per planted acre increased in real terms from 1987 to 1992 and from 1992 to 1998. However, gross business volume per planted acre, after adjusting for inflation, decreased from 1997 to 2003 only to increase again from 2003 to 2010. The amount of business activity per planted acre was estimated at about \$7,500 in 2010, a 68 percent increase from inflation-adjusted figures for 2003. Similarly, in real terms, the gross business volume per ton of sugarbeets processed went from \$262 per ton in 1997 to \$318 per ton in 2010. In previous studies, the gross business volume per ton (in real terms) of sugarbeets processed fluctuated between the studies. Both measures, gross business volume per ton processed and per acre planted, after correcting for inflation, showed increases from 2003 to 2010. Potential reasons for the change might be attributable to such things as annual differences in yield, shrink, and spoilage, varying levels of sugar content, spending patterns by the industry within the study region, and changes in sugar prices.

Physically, the sugarbeet industry in eastern North Dakota and Minnesota has decreased in size based on planted acreage, yet increased in size based on tons of sugarbeets harvested and processed, and volume of sugar marketed. Expansions and contractions have been varied over the last 20 years as sugarbeet acreage increased by 81,000 acres or by 12 percent in eastern

North Dakota and Minnesota from 1997 to 2003 while planted acreage decreased by nearly the same amount from 2003 through 2010 (82,600 acres or by 11 percent). Despite changes in acreage, tonnage of sugarbeets processed has shown steady increases over the 1987 to 2010 period. However, changes in tonnage of sugarbeets processed has not matched percentage changes in gross business volume. Physical growth, in percentage terms, has only contributed to a portion of the industry expansion.

Several reasons contribute to the situation where physical growth does not match economic growth. First, not all physical measures of the industry (acreage, tonnage) translate into linear changes in economic size, as processors do not incur proportional increases in all expenditures with proportional increases in processing activity. Second, the degree to which processors purchase inputs and services from entities outside of the study region can affect the impact of the industry since the primary mechanism used to measure the economic contribution of the sugarbeet industry is an assessment of expenditures made within the study region. If the volume of those purchases changes, or if additional inputs, once available locally, now require purchasing from entities outside of the study region, the net effect can lead to slippage in the amount of expenditures made in the regional economy. Third, changes in sugar prices can lead to changes in revenues for processors and growers.

The economic size of the industry over time has been adjusted to reflect changes in the purchasing power of the dollar (inflation). If the same correction for inflation is performed on wholesale prices of refined beet sugar in the Midwest, average annual sugar prices show a 16 percent decrease from 1997 to 2003 (U.S. Department of Agriculture 2011b). However, prices have increased 74 percent from 2003 through 2010. The dramatic rise in wholesale refined beet sugar prices in the Midwest is perhaps the largest single driver of the substantial increase in the sugarbeet industries gross business volume when comparing 2003 to 2010 figures.

Finally, yields can influence the economic and physical measures of the industry. The industry is processing greater volumes on sugarbeets from fewer acres over the last several years. Therefore, increased yields have contributed to the increase in the gross business volume, despite a reduction in planted acreage. Thus, future changes in the economic importance of the sugarbeet industry not only hinge on physical size, such as acreage and tonnage produced, but also will rely on prices received for industry outputs and spending patterns by industry processors within the regional economy.

SUMMARY and CONCLUSIONS

The sugarbeet industry analyzed in this study is geographically limited to the Red River Valley of North Dakota and Minnesota and west central Minnesota. Within these areas, sugarbeets are produced and processed into refined sugar. The industry is concentrated geographically and structurally, which boosts the economic effect of the industry on local economies. However because sugarbeets are produced in a relatively small area compared to other traditional crops and livestock within the two states and with relatively few acres, the economic impact generated by the industry can be overlooked or underestimated.

The purpose of this study was to estimate the economic contribution of the sugarbeet industry to the economies in Minnesota and North Dakota in 2010. An economic contribution analysis, as used in this study, represents an estimate of all relevant expenditures by a specific industry and the subsequent secondary effects of those expenditures.

Sugarbeet production budgets were developed to estimate costs of production and returns from growing sugarbeets in the each state. The sugarbeet processing cooperatives and joint marketing entities in Minnesota and North Dakota were surveyed to obtain estimates of their in-state expenditures. Expenditures from processing and marketing activities and combined expenditures and net returns from sugarbeet production in the two-state region were estimated at \$1.7 billion in fiscal 2011. The \$1.7 billion in direct impacts, based on input-output analysis, generated another \$3.2 billion in secondary impacts. The sugarbeet industry employed 2,473 full-time equivalent workers and, based on secondary business activity, supported an additional 18,830 full-time equivalent jobs in the two-state region. Total economic activity (direct and secondary impacts) was estimated at \$4.9 billion in 2010, including \$1.8 billion in economy-wide personal income and \$1.3 billion in annual retail sales. Also, the sugarbeet industry generated about \$105.4 million in sales and use, personal income, and corporate income taxes and paid \$15.4 in property taxes. Total tax collections were \$84.3 million in Minnesota and \$36.5 million in North Dakota. Minnesota had the largest share of the industry's gross business volume (\$3.2 billion or 64 percent) with North Dakota having \$1.7 billion in gross business volume.

For every dollar the sugarbeet industry spent in Minnesota and North Dakota an additional \$1.93 in business activity was generated within the regional economy. Each acre of sugarbeets planted generated about \$7,500 in total business activity (production, processing, marketing, and secondary impacts) or, expressed alternatively, each ton of sugarbeets processed generated about \$318 in total business activity.

Examinations of previous studies of the economic contribution of the sugarbeet industry revealed that the industry has experienced substantial real growth (i.e., effects of inflation were removed) in the last 20 years. Planted acreage in eastern North Dakota and Minnesota increased by 60 percent from 1987 to 2003, but has decreased by 11 percent since 2003. Tons of sugarbeets processed increased by 121 percent from 1987 to 2010 and, more recently, by 14 percent from 2003 to 2010. In real terms, gross business volume generated by the industry in Minnesota and North Dakota has increased 49 percent since 2003 and 185 percent since 1987. Some of the increase can be attributable to substantial increases in wholesale refined beet sugar

prices in fiscal 2010 and fiscal 2011, which have in the Midwest region of the U.S. increased about 74 percent from average prices received from 2005 through 2009.

The sugarbeet industry in Minnesota and North Dakota contributes substantially to the two-state economy. Not only was the dollar volume of business activity considerable, but most processing plants are located in rural areas of the two states. Even though the sugarbeet industry has processing plants located throughout the sugarbeet-growing area, the size of the sugarbeet-growing area suggests much of its economic activity affects local economies. Expenditures for crop inputs and returns to growers, which represent a majority of the economic activity, are evenly distributed throughout the growing area. Substantial impacts in two major sectors of the economy, *Households* and *Retail Trade*, help to support this conclusion. In contrast, economic activity in other sectors of the economy may represent a concentration of economic activity in one or two major cities or with a few large firms (e.g., *Communications and Public Utilities*).

Although the sugarbeet industry in Minnesota and North Dakota is not large in terms of acres or geographic area, if measured in terms of personal income, retail sales, total business activity, tax revenue collections, and employment (direct and secondary), its economic contribution is highly apparent. The industry is an important and substantial contributor to both local economies and the two-state regional economy.

REFERENCES

- Bangsund, Dean A., Frayne Olsen, and F. Larry Leistritz. 2011. *Economic Contribution of the Soybean Industry in North Dakota*. Agribusiness and Applied Economics Report No. 678, Department of Agribusiness and Applied Economics, North Dakota State University, Fargo.
- Bangsund, Dean A. and F. Larry Leistritz. 2010. *Economic Contribution of the Petroleum Sector to the North Dakota Economy*. Agribusiness and Applied Economics Report No. 676, Department of Agribusiness and Applied Economics, North Dakota State University, Fargo.
- Bangsund, Dean A. and F. Larry Leistritz. 2005. *Economic Contribution of the Wheat Industry to the North Dakota Economy*. Agribusiness and Applied Economics Report No. 554, Department of Agribusiness and Applied Economics, North Dakota State University, Fargo.
- Bangsund, Dean A. and F. Larry Leistritz. 2004. *Economic Contribution of the Sugarbeet Industry in Minnesota, North Dakota, and Eastern Montana*. Agribusiness and Applied Economics Report No. 532. Department of Agricultural Economics, North Dakota State University, Fargo.
- Bangsund, Dean A. and F. Larry Leistritz. 1998a. *Economic Contribution of the Barley Industry in North Dakota, South Dakota, and Minnesota*. Agricultural Economics Report No. 391, Department of Agricultural Economics, North Dakota State University, Fargo.
- Bangsund, Dean A. and F. Larry Leistritz. 1998b. *Economic Contribution of the Sugarbeet Industry to North Dakota and Minnesota*. Agricultural Economics Report No. 395. Department of Agricultural Economics, North Dakota State University, Fargo.
- Bangsund, Dean A. and F. Larry Leistritz. 1995. *Economic Contribution of the United States Sunflower Industry*. Agricultural Economics Report No. 327, Department of Agricultural Economics, North Dakota State University, Fargo.
- Bangsund, Dean A., Randall S. Sell, and F. Larry Leistritz. 1994. *Economic Contribution of the Wheat Industry to the Minnesota Economy*. Agricultural Economics Report No. 312, Department of Agricultural Economics, North Dakota State University, Fargo.
- Bangsund, Dean A. and F. Larry Leistritz. 1993. *Economic Contribution of the Sugarbeet Industry to the Economy of North Dakota and Minnesota*. Agricultural Economics Report No. 305, Department of Agricultural Economics, North Dakota State University, Fargo.
- Coon, Randal C. and F. Larry Leistritz. 2011. *North Dakota Input-Output Model Data Base*. Unpublished departmental report, Department of Agribusiness and Applied Economics, North Dakota State University, Fargo.

- Coon, Randal C. and F. Larry Leistritz. 1994. *An Update of North Dakota's Economic Base Data*. Agricultural Economics Statistical Series No. 54, Department of Agricultural Economics, North Dakota State University, Fargo.
- Coon, Randal C. and F. Larry Leistritz. 1988. *The Economic Contribution of the Sugarbeet Industry of Eastern North Dakota and Minnesota*. Agricultural Economics Miscellaneous Report No. 115, Agricultural Experiment Station, North Dakota State University, Fargo.
- Coon, Randal C., Carlena F. Vocke, and F. Larry Leistritz. 1984. *Expansion and Adaptation of the North Dakota Economic-Demographic Assessment Model (NEDAM) for Minnesota: Technical Description*. Agricultural Economics Miscellaneous Report No. 76, Agricultural Experiment Station, North Dakota State University, Fargo.
- Coon, Randal C., F. Larry Leistritz, Thor A. Hertsgaard, and Arlen G. Leholm. 1985. *The North Dakota Input-Output Model: A Tool for Analyzing Economic Linkages*. Agricultural Economics Report No. 187, Agricultural Experiment Station, North Dakota State University, Fargo.
- Lazarus, William F. 2002. *How Big is Minnesota's Food and Agricultural Industry?* Staff Paper P02-14. Department of Applied Economics, University of Minnesota, St. Paul.
- Leistritz, F. Larry and Steve H. Murdock. 1981. *Socioeconomic Impact of Resource Development: Methods for Assessment*. Westview Press, Boulder, CO.
- Leistritz, F. Larry, Steve H. Murdock, and Randal C. Coon. 1990. "Developing Economic-Demographic Assessment Models for Substate Areas." *Impact Assessment Bulletin* 8(4):49-65.
- LMC International Ltd. 2001. *The Importance of the Sugar and Corn Sweetener Industry to the U.S. Economy*. Report prepared for American Sugar Alliance. LMC International Ltd., New York, NY.
- Minnesota Agricultural Statistics Service. Various years. *Minnesota Agricultural Statistics*. Minnesota Department of Agriculture, U.S. Department of Agriculture, and Minnesota Agricultural Statistics Service, St. Paul.
- Minnesota Farm Business Management Education. 2011. *FINBIN Farm Financial Database*. Minnesota State Colleges and University Farm Business Management Education, Center for Farm Financial Management, University of Minnesota, St. Paul, MN and North Dakota Vocational and Technical Education Adult Farm Business Management, Bismarck, ND.
- National Agricultural Statistics Service. 2011. <http://www.nass.usda.gov/> (Accessed October, 2011). National Agricultural Statistics Service, Washington, D.C.

- North Dakota Agricultural Statistics Service. *Various years. North Dakota Agricultural Statistics*. North Dakota Agricultural Statistics Service, North Dakota Department of Agriculture, U.S. Department of Agriculture, and North Dakota State University, Fargo.
- North Dakota Farm and Ranch Business Management Education. 2011. *FINBIN Farm Financial Database*. Minnesota State Colleges and University Farm Business Management Education, Center for Farm Financial Management, University of Minnesota, St. Paul, MN and North Dakota Vocational and Technical Education Adult Farm Business Management, Bismarck, ND.
- Senf, Dave, Wilbur Maki, and James Houck. 1993. "Measuring the Size of Minnesota's Agricultural Economy." *Minnesota Agricultural Economist*. No. 672, Minnesota Extension Service, University of Minnesota, St. Paul.
- U.S. Department of Agriculture. 2011a. *2007 Census of Agriculture*. <http://www.agcensus.usda.gov/> (Accessed October 2011). U.S. Department of Agriculture and National Agricultural Statistics, Washington, D.C.
- U.S. Department of Agriculture. 2011b. *Sugar and Sweeteners Outlook*. <http://www.ers.usda.gov/briefing/sugar/data.htm> (Accessed October 2011). Economic Research Service, U.S. Department of Agriculture, Washington, D.C.
- U.S. Department of Commerce. 2011. *Gross Domestic Product–Implicit Price Deflator*. <http://www.bea.gov/index.htm> (Accessed October 2011). Bureau of Economic Analysis, U.S. Department of Commerce, Washington, D.C.

APPENDIX A

Sugarbeet Production Budgets

Budget Sources and General Composition

Sugarbeet production budgets were compiled for the two main growing regions: Red River Valley in North Dakota and Minnesota and west central Minnesota. Production budgets were used to estimate the economic contribution of sugarbeet production, and were used to allocate production expenses to various sectors of the North Dakota I-O Model.

Revenues

Payments to farmers and planted acreage in each major growing area were obtained from the survey of sugarbeet processors (Appendix B). Estimates of per-acre federal farm program payments, miscellaneous revenues, and crop insurance indemnities were obtained from the North Dakota Farm and Ranch Business Management Education (2011) and Minnesota Farm Business Management Education (2011). Payments from sugarbeet processors, farm program payments, and insurance indemnities were combined to estimate gross revenues from sugarbeet production.

Expenses

Expenses for sugarbeet production on owned and rented land in the North Dakota and Minnesota Red River Valley were obtained from Minnesota Farm Business Management Education (2011) and North Dakota Farm and Ranch Business Management Education (2011). Similarly, expenses for sugarbeet production in west central Minnesota were obtained from Minnesota Farm Business Management Education (2011). Expenses available from the Farm Business Management Education programs represented an average of actual production costs incurred by the farmers/producers who are enrolled in the program. Expenses for sugarbeet production in the Red River Valley and west central Minnesota represented an average of operating costs for both rented and owned land. The ratio of rented to owned land in the Red River Valley and west central Minnesota sugarbeet growing regions was obtained from the *2007 Census of Agriculture* (U.S. Department of Agriculture 2011a) and used to average production costs between owned and rented land.

Net Returns

Producer net returns from sugarbeet production were estimated by subtracting variable and fixed costs from gross revenue. All expenses represented cash costs, except depreciation charges, which were used a proxy for machinery purchases. As a result, the budgets excluded non-cash costs associated with owned land, return on invested equity, management charges, and income tax liability. The producer net returns estimated in the budgets should not be confused with economic profit. Instead, the returns to unpaid labor, management, and equity simply represent gross revenues less cash expenses. Economic costs of production were not estimated.

Sugarbeet Production Budget, North Dakota and Minnesota Red River Valley, 2010

Sugarbeet payments to growers			\$874,266,309
Planted acreage in Red River Valley			537,332
	Owned Land	Rented Land	Average
Amount of land that is rented			54.7%
Farm program payments	\$16.88	\$16.19	\$16.50
Miscellaneous income	6.29	6.71	\$6.52
Insurance indemnities	2.06	0.94	\$1.45
Payments from sugarbeet processors			\$1,627.05
Gross Revenue (\$/planted acre)			\$1,651.52
Variable Expenses (\$/planted acre)			
Seed	158.07	158.16	158.12
Fertilizer	81.88	79.73	80.71
Chemical	67.38	67.96	67.70
Insurance	23.94	24.31	24.14
Fuel and Lubrication	61.41	62.90	62.23
Repairs	89.51	90.16	89.86
Custom Hire	12.24	11.90	12.05
Hired Labor	28.59	25.77	27.05
Stock lease	120.26	163.78	144.05
Machinery and Building Lease	0.14	0.79	0.49
Hauling and trucking	7.71	5.47	6.49
Interest	16.86	17.84	17.39
Land Rent*	0	83.35	45.56
Miscellaneous	2.19	1.99	2.08
Total Variable Costs	670.20	794.10	737.92
Fixed Costs (\$/planted acre)			
Custom Hire	3.23	2.67	2.93
Hired Labor	46.11	49.86	48.16
Machinery and Building Lease	5.98	11.78	9.15
Property Tax*	13.60	13.60	13.60
Farm Insurance	9.36	9.21	9.28
Utilities	6.20	6.54	6.38
Dues and Professional Fees	4.62	4.77	4.70
Interest	40.62	11.60	24.76
Machinery & Building Depreciation	92.62	81.69	86.65
Miscellaneous	6.51	8.21	7.44
Total Fixed Costs	228.85	199.94	213.05
Total Costs	899.04	994.04	950.97
Returns to Unpaid Labor, Management, and Equity	---	---	700.55

*Property tax expense on owned land was subtracted from cash rent on rented land. Property tax expense was not originally listed in the budget for rented land. By adding property tax expense on rented land, variable expenses were reduced by the amount of property tax and subsequently, fixed costs on rented land were increased by the same amount. This was done to account for property tax expense for all land used to produce sugarbeets.

Sugarbeet Production Budget, West Central Minnesota, 2010

Sugarbeet payments to growers	\$189,187,315
Planted acreage in west central Minnesota	115,409

	Owned Land	Rented Land	Average
Amount of land that is rented			54.6%
Farm program payments	\$6.03	\$7.99	\$7.10
Miscellaneous Income	15.59	2.83	\$8.62
Insurance Indemnities	1.15	4.98	\$3.24
Payments from Sugarbeet Processors			\$1,639.28
Gross Revenue (\$/planted acre)			\$1,658.42
Variable Expenses (\$/planted acre)			
Seed	146.56	143.45	144.86
Fertilizer	46.38	55.97	51.62
Chemical	90.46	87.99	89.11
Insurance	21.32	29.29	25.68
Packaging and supplies	4.85	0.52	2.48
Fuel and Lubrication	67.41	62.60	64.78
Repairs	69.97	70.23	70.11
Custom Hire	56.32	42.10	48.55
Hired Labor	2.52	16.30	10.05
Machinery and Building Lease	4.77	17.53	11.74
Hauling and trucking	10.38	8.91	9.58
Interest	35.93	24.07	29.45
Land Rent*	0	142.58	77.92
Miscellaneous	7.39	21.59	15.15
Total Variable Costs	564.26	723.13	651.08
Fixed Costs (\$/planted acre)			
Hired Labor	49.46	26.49	36.91
Machinery and Building Lease	13.20	3.10	7.68
Property Tax*	29.72	29.72	29.72
Farm Insurance	19.57	13.98	16.52
Utilities	10.82	7.87	9.21
Dues and Professional Fees	4.32	2.29	3.21
Interest	70.17	12.67	38.75
Machinery & Building Depreciation	120.52	87.99	102.74
Miscellaneous	21.41	12.77	16.69
Total Fixed Costs	339.19	196.88	261.43
Total Costs	903.45	920.01	912.50
Returns to Unpaid Labor, Management, and Equity	---	---	745.73

*Property tax expense on owned land was subtracted from cash rent on rented land. Property tax expense was not originally listed in the budget for rented land. By adding property tax expense on rented land, variable expenses were reduced by the amount of property tax and subsequently, fixed costs on rented land were increased by the same amount. This was done to account for property tax expense for all land used to produce sugarbeets.

APPENDIX B

Sugarbeet Processor Expenditures Survey

Instructions for Sugarbeet Processor Expenditures Survey

Data provided from this survey will be used to estimate the contribution the sugarbeet industry makes to the economies of North Dakota and Minnesota. All the information you provide will be kept strictly confidential. The following general instructions are suggested for completing the questionnaire.

1. Use information for Fiscal Year 2011.
2. Information should be recorded in dollar terms.
3. Include information for all of the organization's processing facilities on this questionnaire.
4. Include relevant information from all business ventures and other cooperative arrangements (United Sugars, Midwest Agri-Commodities, Pro-Gold)
5. If you cannot identify whether expenditures were made to North Dakota or Minnesota entities, please include the expenditure but note the lack of breakdown between states.
6. Do not include expenditures for pre-paid inputs/services purchased this year for next year's campaign.
7. When exact information is not available, please estimate.
8. Definitions for selected expenditure items and their corresponding Standard Industrial Classification (SIC) code listing are included to help in determining allocation of expenditures.
9. Please complete the survey by **July 22** and mail the questionnaire to the address below.
10. If you have questions, please contact:

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

Dr. Nancy Hodur (701-231-7357)
nancy.hodur@ndsu.edu

Mailing Address

Dept # 7610
PO Box 6050
North Dakota State University
Fargo, ND 58108-6050

DEFINITIONS FOR EXPENDITURE CATEGORIES

The following definitions are derived from Standard Industrial Classification Manual (SIC codes) and have been provided to assist in allocating expenses into common categories. If needed, please refer to the following web site for additional examples of the expenses included in each category: http://www.osha.gov/pls/imis/sic_manual.html Each category has several Major Group numbers, which contain additional detail on the type of activities in each category.

Construction: Includes expenses for construction projects, such as construction (including new work, additions, alterations, remodeling, and repairs) of residential, industrial, public, office, warehouse, and other buildings and structures. (Major Groups 15, 16, and 17)

Transportation: Includes expenses for railroad, motor freight, water transportation, air transportation, and other transportation to include packing and crating services, and rental of transportation equipment. (Major Groups 40, 41, 42, 43, 44, 45, 46, and 47)

Communications: Includes expenditures for telephone, telegraph, radio, television, satellite services, Internet transactions, and other communication services. (Major Group 48)

Public Utilities: Includes expenses for natural gas, electricity, water supply, and sanitary (sewer & garbage) services. (Major Group 49)

Wholesale Trade: Expenses paid to establishments primarily engaged in selling merchandise to retailers; to industrial, commercial, institutional, or professional users; or to other wholesalers, or acting as agents in buying merchandise for or selling merchandise to such persons or companies. (Major Groups 50 and 51)

Retail Trade: Includes expenses for building materials, hardware, food, general merchandise, office supplies, automobile fuel, computers, eating and drinking establishments, work uniforms, and most other business and office-related supplies. (Major Groups 52, 53, 54, 55, 56, 57, 58, and 59)

Finance, Insurance, and Real Estate: Includes expenses for loan service, interest on loans, investment counseling, insurance, real estate transactions, brokerage fees, and any other financial service expenditures. (Major Groups 60, 61, 62, 63, 64, 65, 66, and 67)

Business and Personal Services: Examples of business and personal services include expenses for advertising, collection services, photocopying/duplication/printing services, equipment rental, computer services, computer software, security services, tax preparation, automotive/equipment/miscellaneous repairs, entertainment, janitorial services, and overnight lodging. (Major Groups 70, 72, 73, 75, 76, 78, 79, and 87)

Professional and Social Services: Includes expenses for health/pharmaceutical, medical, legal, educational, research and development, child care, vocational training, and other professional services. (Major Groups 80, 81, 82, 83, 84, 86, 88, and 89)

SUGARBEET PROCESSOR EXPENDITURES QUESTIONNAIRE

Cooperative: _____

Location: _____

Contact Person: _____

I. Listing of expenditures made in FY 2011

Expenditure Categories	<u>Estimated Annual Expenditure In</u>	
	North Dakota	Minnesota
	dollars	
Payments to sugarbeet growers (sugarbeet production)		
Other payments to sugarbeet growers (capital returns, etc.)		
Construction		
Plant maintenance and overhaul		
Transportation		
Communications		
Public utilities		
Miscellaneous manufacturing		
Wholesale trade		
Retail trade		
Finance, insurance, and real estate		
Business and personal services		
Professional and social services		
Coal		
Wages and salaries		
Benefits		
Sugarbeet research funded		

Items For Which Expenditures were Made	<u>Estimated Annual Expenditure In</u>	
	North Dakota	Minnesota
	dollars	
Government (taxes paid in ND and MN only)		
Property taxes		
Sales and use taxes		
Unemployment		
Other taxes (please specify)		
Other Expenses (please specify nature of expense)		

II. Total annual revenue (from all ventures): \$_____

III. Number of employees in full-time equivalents: _____

IV. Sugarbeets processed: _____ tons

V. Sugarbeet acreage: _____ acres planted
 _____ acres harvested

VI. Comments/further explanations (attach supporting material if needed):
