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ECONOMIC IMPACT OF AGRICULTURE ON SOUTH DAKOTA

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Agricultural production in South Dakota has traditionally played a major role in the prosperity of the state. In 2010, the sum of crop and livestock production in the state exceeded \$8.33 billion (IMPLAN Pro3 database). This is a significant increase from the \$7.4 billion produced in 2009. In addition to the impacts in the agricultural industry this production has effects that ripple through the South Dakota economy. There are three basic effects that can be identified: the direct, indirect, and induced. The direct effect is the actual value of the products produced and sold from the agricultural sector of the economy. The indirect effect is the business to business activity that is created through the production process and the induced effect is the additional consumer spending resulting from the increased economic activity in the state. Combined, these three effects provide an accurate estimate of the total economic impact of agriculture on the state of South Dakota.

There are two parts to this analysis. Initially only the impact of production agriculture will be considered. Then, the effects of the agricultural processing and manufacturing sector (value added agriculture) will be included to more accurately represent the full impact of agriculture on the state.

Methodology

The software package IMPLAN Pro3 was used to analyze the impact of agriculture on the state. This software is input-output modeling software that was initially developed for use by the National Forest Service and has been modified for commercial use. The relationships among the industries in South Dakota are the internal production functions imbedded within the program. After constructing a baseline model of the state, the impact of agriculture is determined and next the impacts of the other industries that can be directly linked to agriculture are added.

In this analysis the 2010 data for South Dakota was employed. The industry outputs employed are those contained in the IMPLAN Pro3 database. These outputs are gross sales, not Gross Domestic Product (GDP) figures. Therefore, the costs of inputs are included, not excluded as they would be in a measure of GDP. The value of all industry output for IMPLAN Pro3 in 2010 was \$67.276 billion. This figure provides an estimate of the dollars flowing through the South Dakota economy and is slightly lower than the \$67.892 billion produced in 2009.

Industry Breakdown

Using the IMPLAN Pro3 division of industries by the North American Industry Classification System (NAICS) code, 440 different industry classifications in the model are aggregated into 20 different categories. Agriculture, forestry, fishing, and hunting are combined into one category. The twenty categories with their impacts and multipliers are shown in Table 1.

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Table 1 Output for South Dakota Industries, 2010.

Industry	Output (in million \$)	Multiplier	2009 Multipliers ⁺
Agriculture, Forestry, Fishing, and Hunting	8,335	1.61	1.55
Mining	346	1.35	1.30
Utilities	997	1.17	1.22
Construction	3,700	1.41	1.40
Manufacturing	12,830	1.34	1.33
Wholesale Trade	2,631	1.39	1.40
Transportation and Warehousing	1,610	1.49	1.44
Retail Trade	3,540	1.49	1.35
Information	1,776	1.37	1.38
Finance and Insurance	6,995	1.66	1.59
Real Estate and Rentals	4,734	1.17	1.26
Professional-Scientific and Technical Services	1,638	1.52	1.47
Management of Companies	669	1.52	1.46
Administrative and Waste Services	916	1.51	1.45
Educational Services	571	1.59	1.54
Health and Social Services	5,741	1.55	1.51
Arts-Entertainment and Recreation	681	1.46	1.44
Accommodation and Food Services	1,954	1.45	1.44
Other Services	1,762	1.59	1.52
Government and non-NAICS**	5,847	1.48	1.41
TOTAL	67,276*		

Source: IMPLAN Pro3 2009 database

*Difference results from rounding errors

+Source: IMPLAN Pro3 2009 database

**The government and non-NAICS category is composed of industries that do not fit into any of the 440 North American Industry Classification System categories.

As we can observe from the Table 1, the finance and insurance sector has a multiplier of 1.66, placing it 1st out of the twenty categories, followed closely by the agricultural sector at 1.61 and educational services and other services at 1.59. Utilities and real estate and rentals have the lowest multiplier at 1.17. This would imply that investments in the industries with higher multipliers would have larger indirect and induced economic impacts than investments in industries with lower multipliers.

Production Agriculture Analysis

The direct effect of \$8.335 billion represents the value of the products produced in the agricultural production sector of the South Dakota economy (Table 2). The indirect effect is the economic activity that results from industries supplying inputs into the production agriculture sector (business to business activity). The induced effect is the increase in household spending resulting from the increased economic activity in the state. The \$8.335 billion of direct economic impact of production agriculture comprises 12.39% of the total economic activity generated in the state. The total economic impact of production agriculture in South Dakota is \$13.399 billion once we include the \$3.417 billion in indirect and \$1.647 billion in induced effects.

Table 2. Production Agriculture Impact

	Million \$ *
Direct	8,335
Indirect	3,417
Induced	1,647
TOTAL	13,399

*In million nominal dollars

The employment effects are similar to the output effects (Table 3). In employment terms the direct effect represents the number of people employed in agricultural industries. The total employment in production agriculture is 40,663. This number is calculated internally by the IMPLAN program as 4.478541 jobs being created for every \$1 million of agricultural output. The indirect and induced effects are calculated the same way with the factors of 2.290843 for the indirect effect and 1.981447 for the induced effect.

Table 3. Other Production Agriculture Effects

	Employment	Indirect Business Taxes*
Direct	40,663	\$133.219
Indirect	19,094	\$140.036
Induced	16,515	\$107.213
TOTAL	76,272	\$380.468

*In million nominal dollars

Indirect business taxes are all of the taxes collected (sales, property, excise, etc.). The direct effect is the tax revenue generated by the production agriculture industries (Table 3). The indirect effect results from the increased business to business activity and the induced effect from the increased consumer activity associated with agricultural production in the state. It should be noted that property taxes are the majority of the indirect business tax revenue generated in production agriculture.

Value Added Agriculture

To obtain a more accurate estimate of the full impact of agriculture on the state of South Dakota, it is necessary to include industries from the manufacturing/processing sector that can be clearly identified as being related to agriculture. For this analysis these industries include soybean processing, fluid milk and butter, dry milk, cheese, animal slaughter, meat processing, poultry processing, dry pasta, wineries, bread, cookies, crackers and pasta manufacturing, sawmills, frozen food manufacturing, fertilizer manufacturing, animal feed manufacturing, and ethanol.

Table 4. Output of the Value Added Agriculture Sector.

Industry	Output in million \$
Frozen Food	85.288
Manufacturing	
Soybean Processing	141.663
Fluid Milk and Butter	118.617
Cheese	532.103
Dry Milk	40.384
Animal Slaughter	2,285.943
Animal Feed	505.556
Manufacturing	
Poultry Processing	7.857
Bread, cookies, crackers, pasta manufacturing	259.624
Wineries	15.108
Fertilizer Manufacturing	51.232
Sawmills	104.226
Ethanol	834.807
TOTAL	4,982.408

Source: IMPLAN Pro3 database

The \$4.982 billion of direct economic activity in these thirteen industries generates an additional \$3.027 billion in indirect and induced effects in the economy, which leads to \$8.009 billion in total economic activity generated by the value added agricultural sector. Approximately 62.6% of this direct impact, \$3.121 billion, is from the animal slaughter and ethanol industries. Another 21% is added by the cheese and animal feed manufacturing industries. This means that approximately 84% of the value added impact is from only four industries.

Table 5. Other Value Added Agriculture Effects

	Employment	Indirect Business Taxes*
Direct	24,305	\$79.628
Indirect	11,413	\$83.633
Induced	9,872	\$64.084
TOTAL	45,590	\$227.345

*In million nominal dollars

In addition, another 45,590 people are employed because these industries are operating in South Dakota and \$227,344,035 in indirect business tax is generated by the value added agriculture sector.

Total Impact of Production and Value Added Agriculture

The addition of the value added agriculture sector impacts would raise the total economic impact of the agricultural sector of the economy to \$21.408 billion in 2010. The direct effect of the agricultural sector would be \$13.317 billion, making it larger than the manufacturing sector after subtracting agricultural processing from its' total. The agricultural sector would then account for 19.8% of the total direct economic output in South Dakota. The total employment number would increase to 121,862, and the indirect business tax total would increase to \$607,813,139.

Concluding Remarks

Agriculture remains a significant contributor to the total economic activity generated in the state of

South Dakota. The total direct impact of the agricultural sector of the economy in South Dakota is \$13.317 billion and the total impact is \$21.408 billion. This would still make the agricultural sector the largest single sector of the South Dakota economy, at approximately 19.8% of total output. In addition, approximately \$607,813,139 in indirect business taxes and 122,837 jobs in the state are generated by agriculture. Each dollar of direct output in agriculture also generates an additional \$0.61 of economic activity in the state.

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