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DEPARTMENT OF AGRICULTURAL AND APPLIED ECONOMICS
UNIVERSITY OF MINNESOTA
COLLEGE OF AGRICULTURE
ST. PAUL, MINNESOTA 55108
"THE ECONOMIC IMPORTANCE OF MINNESOTA'S FOOD AND AGRICULTURE INDUSTRY"

Dave Senf, Wilbur Maki, and James P. Houck*

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*Dave Senf, Ph.D. Candidate, Wilbur Maki, Professor and James P. Houck, Professor and Department Head, Department of Agricultural and Applied Economics, University of Minnesota, St. Paul

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Food and agricultural production continues to be one of Minnesota's leading economic activities. The economic importance of the State's food and agricultural industry, defined to include farm production and food processing, is often underestimated. Usually overlooked is the key export-producing role played by this sector. Exports, either to other states or countries, are the most important source of the state's economic well-being. Minnesota's top exporter is its food and agriculture industry.

Minnesota's economy can be divided into two main sectors. One sector, the export sector, produces goods and services for markets outside of Minnesota and is considered to be the state's economic base. The other sector, the local sector or service sector, as it is sometimes called, is oriented towards markets within the state. Thus, the local sector can be said to be dependent on the export sector. It supports the export sector and the state's resident population, both households and businesses.
New dollars are injected into the state by exports and are cycled through the local sector creating income and jobs. If Minnesota's economic base industries are healthy then the State's overall economic performance will be strong. But the local sector is important too. It provides for the quality of life and quality of economic environment sought by local households and businesses.

Shipments of packaged meats to grocery stores across the nation by meat packing plants in Austin, Albert Lea, and Worthington typify export activity in Minnesota's food and agricultural industry. Sales revenues received by these meat packing plants are injected into the state's economy primarily through labor earnings which circulate through the entire local sector creating additional income and employment as workers spent their earnings.

Purchases of inputs from Minnesota suppliers by meat packing plants also generate income and employment in the local sector. The suppliers pay their workers and buy Minnesota-produced inputs creating another round of spending leading to more income and employment. This spending cycle is repeated a number of times but eventually ceases as income leaks out of Minnesota for the importation of goods and services produced in other states and nations. The magnitude of economic activity generated by meat product exports is a function of how high labor earnings are and the degree to which the plants rely on Minnesota rather than out-of-state suppliers for inputs.
Figure 1 delineates the sales of the state's industries into export and local sales. Most industries are involved in both export and local activities. Of the $165 billion of output produced in Minnesota in 1990, approximately one-third, or $55 billion, was exported. These exports represent Minnesota's economic base. The food and agricultural industry is the state's largest exporter, exporting over $12 billion of products, followed by high tech manufacturing, forestry products, durable goods production, non-durable goods manufacturing, and the trade industry. Together, these export-producing industries generate more than three-fourths of Minnesota's crucial economic base. (A technical note detailing the model used to identify Minnesota's economic base follows this report.)

The other two-thirds of Minnesota's economy, the $110 billion local sector, is also identified in Figure 1. The local sector provides goods and services for Minnesota households and serves the state's business community. Examples of local sector activities are: utilities provided to business, medical services for Minnesota households, state and local government services, and local truck transportation. Even though the local sector is usually thought to be dependent on the export sector, the export sector is to some extent dependent on the local sector. For Minnesota's exporters to be competitive in national and international markets, a supportive and productive local sector must exist.
Food and agricultural producers account for 22 percent of the state's economic base when measured by export sales, Figure 2. Other measures of an industry's contribution to the economic base are the amount of value added and the income and employment created by exports. An industry with high labor earnings contributes more to the state's economy than an industry with low labor earnings if the two industries have similar levels of exports and local input purchases. If one measures the state's economic base in terms of direct value added, income or employment generated by exports, food and agriculture's share is about 13 to 14 percent, second only to the entire high-tech manufacturing sector, Figure 2.

The degree to which an industry is linked to the rest of the state's economy is also important when judging the economic importance of a industry. An exporting industry with high wages but few linkages to other local businesses may have less of an impact on the local sector than a low paying industry with strong linkages to Minnesota suppliers. As indicated in Figure 3, the food and agricultural industry imports, from other states or nations, more intermediate inputs than any other industry and uses more Minnesota-produced inputs than any other industry in the state. Local input use by food and agricultural production is almost twice as large as imported input use. In fact, the food and agricultural industry's use of inputs produced here in Minnesota is almost twice as large as that of the next largest
user, high-tech manufacturing. This means that food and agriculture has stronger ties to the rest of the State's economy than any other major industry. For the same reason, it loses less of each new dollar from import purchases. Its ripple effects over several years are larger than those of any other sector.

This high degree of local linkage results from the well-developed food and agricultural supply system that exists here in Minnesota. Much of the linkage is internal to the industry. The industry purchases more than $6 billion of intermediate inputs from itself, that is from other farms and food businesses in the State. The intermediate inputs are used to produce other products that are eventually shipped out of state or consumed by Minnesota households, Figure 4.

An example of linkages at the farm level is the use of Minnesota-grown hay and corn for feed by the state's dairy and livestock producers. There also exist a strong linkage between the State's farm and food processors. Food processors here in Minnesota purchase more than 40 percent of the state's farm output. Dairy and livestock raw materials account for the majority of Minnesota's farm production purchased by food processors. Minnesota's economy benefits more when farm commodities are processed before being exported since value added increases and employment opportunities are created. Strong local linkages mean large ripple effects throughout the state's economy.
Food and agricultural producers also purchase $3.8 billion worth of products from other Minnesota industries, creating valuable, internal economic linkages leading to increased income and employment for Minnesotans. Farmers purchase fertilizer, machinery, fuel, and financial services in farm communities across the State. Food processors purchase foods and services such as utilities, trucking, packing material, and plant equipment from Minnesota suppliers.

In addition to the $6 billion of sales to itself, the food and agricultural industry also makes modest sales to other Minnesota industries. For example, the so-called Eating and Drinking sector, purchases over $500 million worth of products from food and agricultural processors and producers. Agriculture's major in-state market is sales to Minnesota households, $2.1 billion worth through food expenditures at grocery stores. The $2.1 billion figure includes the value of food products when shipped from food processors but not transportation, wholesale or retail markups. Over half of Minnesota's food and agricultural products, 12.1 billion worth, are shipped to customers in other states and nations. Figure 5 shows the distribution of the state's agricultural sales.

Let us now consider the local sector effects associated with Minnesota's food and agricultural industry. Of the 162 thousand food and agricultural workers, 73 thousand are directly involved in the production of export products. These jobs are the industry's export or basic jobs. A canner in Sleepy Eye, a Red
River wheat farmer, a Rock County hog farmer, and a Northfield cereal manufacturing employee are representative of export food and agricultural workers in Minnesota.

The revenue earned by food and agricultural exports circulates through the State's local sector, via labor earnings and purchases of Minnesota-produced inputs, creating an estimated 257 thousand jobs. Figure 6 shows the industry composition of local sector jobs generated by food and agricultural exports. They include jobs in food and agriculture, in trade, and in state and local services. The industry receiving the most job spin-off is the food and agricultural industry itself. Most of these jobs are related to farm product purchases by Minnesota's food processors. Food and agriculture generated local sector jobs which account for 17 percent of the state's 1.8 million local sector jobs.

For most of Greater Minnesota, the 80 counties outside of the metro area, export activity created by food and agriculture is even more important than for the state as a whole. The industry accounts for more than 40 percent of all Greater Minnesota export sales. Food and agriculture is 26 to 29 percent of Greater Minnesota's economic base measured in value added, income, or employment, Figure 7. Greater Minnesota's heavy dependence on natural resource-based activities is illustrated by the 50 percent share of basic income attributable to the food and agricultural, forestry, and mining industries.
Figure 8 shows the percent of total regional jobs generated by the food and agricultural industry. They include local sector jobs created by exports and, in turn, by successive rounds of household spending and intermediate input purchasing stimulated by the industry's exports. Western Minnesota depends on food and agriculture for almost half of its employment. In Southeastern and Central Minnesota, the industry accounts for three of every ten jobs. Only in the Northeast and Metro regions of the state does job dependency on food and agriculture fall below 20 percent. One out every three jobs in Greater Minnesota is connected in some way to food and agricultural production.

Export job distribution in the four Greater Minnesota regions are displayed in Figure 9. Central Minnesota, which includes St. Cloud, depends heavily on food and agriculture, forestry, and non-durable goods manufacturing. The Southeastern region of Minnesota, anchored by Rochester, has a rather diverse base economy featuring health services, high-tech, and durable goods manufacturing, in addition to food and agriculture. In the Northeast, food and agriculture, forestry, and mining comprise over half of the region's base economy. The Western part of the State relies on food and agriculture for one of every two export jobs.
Another aspect of the food and agricultural industry's importance to the Minnesota's economy is the state's strong trade surplus in food and agricultural products, Figure 10. Minnesota exports, to other states and nations, more food and agricultural products than it imports from other states and nations. The $4.4 billion positive trade balance in food and agricultural products helps offset trade deficits in other products such as durable and non-durable manufactured goods purchased at retail level. This positive trade allows Minnesotans to have ready access to goods and services produced elsewhere in the United States and around the world.

Suppose, for example, that food and agricultural exports to other states and nations increase by 1.2 billion dollars on an annual basis. This is about a 10% increase. The impacts of this increase in jobs and value added on the Minnesota economy are shown in Figures 11 and 12. These are long-term effects that would occur over a five-year period. Also shown are employment and value added impacts associated with a 10 percent export expansion in other selected industries.

Direct job and value added created by this hypothetical food and agricultural export expansion is about 11 thousand jobs and $358 million worth of value added. These effects are the basic or export effects. As time goes on, an additional 39 thousand jobs and $1,165 million worth of value added is generated in the local sector as a result of increased household spending and input purchases by food and agricultural producers.
Overall, this one billion dollar agricultural export expansion generates about $2.5 billion in economic activity throughout Minnesota, creating 50 thousand jobs and $1.5 billion of value added. These multiplier effects for food and agriculture exports compare favorably with the effects of the other industries, including high-tech and bio-tech manufacturing.

No matter how its value or importance is measured, food and agriculture and its related sectors are crucial to the continued prosperity, stability, and vitality of the entire economy of Minnesota.
Minnesota's economic base was estimated with the IMPLAN system. IMPLAN, which is an acronym for "Impact Analysis for Planning", is a micro-computer system of regional input-output economic models. Input-output models show inter-industry purchases and sales including sales to final demand sectors and payments to value added sectors. IMPLAN was developed over the last fifteen years by the United States Forest Service and is now maintained at the University of Minnesota by the Minnesota IMPLAN Group in the Department of Agricultural and Applied Economics. Approximately 300 regional analysts are currently using IMPLAN to address regional economic issues in over 40 states. Ten federal agencies and many state agencies are also using the IMPLAN system.

Both national data and regional data are employed to capture Minnesota's unique economic structure and trade patterns. IMPLAN's data base is extensive, combining statistical series from a number of government sources. The major data sources are:

Department of Commerce, Bureau of Economic Analysis, Regional Information System's employment and income series.

Department of Commerce, Bureau of Economic Analysis, National Income and Product Accounts.

Department of Commerce, Bureau of Economic Analysis, Gross State Product series.

Department of Commerce, Bureau of Census, County Business Patterns.

The calculations here are based on 1985 statistical series, the most recent available IMPLAN data base. Updating of the data base to 1990 is underway but will not be released until late-1992. The results reported here have been inflated to 1990 dollars using price data from the Bureau of Labor Statistics.

IMPLAN's most important contribution is identification of regional economic structure, industrial inter-dependence and domestic exports. This information is essential for a thorough analysis of a regional economy. The drawback of using 1985 data is more than offset by the detailed information IMPLAN provides.

The estimated long-term industry effects of increased exports was computed using IPASS, a dynamic simulation model based on IMPLAN. IPASS (an acronym for: Interactive Policy Analysis Simulation System) takes the computed results of one year and feeds them into the computer modeling system for the next year's calculation. In this way, the model simulates the actual workings of the Minnesota economy. It is also used to estimate the effects of predicted changes in export market conditions and government policies on economic activity within the State.
Figure 1
Export and Local Activity in Minnesota

- Food & Agriculture
- High Tech Mfg
- Forestry Industry
- Durable Mfg
- Nondurable Mfg
- Trade
- FIRE
- Mining
- Transportation
- Construction
- Health Services
- All Other Industries

1990 Billion Dollars

FIRE - Finance, Insurance & Real Estate
Figure 2
Minnesota Economic Base

Export Sales Basis

Food & Agriculture 22%
High Tech Mfg 19%
Durable Mfg 11%
Nondurable Mfg 7%
All Other Industries 6%
Housing 4%
Trade 7%
Transportation 4%
Mining 4%

Value Added Basis

Food & Agriculture 25%
High Tech Mfg 16%
Durable Mfg 12%
All Other Industries 11%
Health Services 5%
Mining 4%
Transportation 6%
Trade 10%
FIRE 7%
Nondurable Mfg 7%

Income Basis

Food & Agriculture 18%
Durable Mfg 18%
High Tech Mfg 17%
All Other Industries 11%
Health Services 4%
Mining 4%
Transportation 6%
Trade 9%
FIRE 6%

Employment Basis

Food & Agriculture 14%
Durable Mfg 11%
High Tech Mfg 10%
All Other Industries 18%
Health Services 5%
Mining 4%
Transportation 6%
Trade 12%
FIRE 6%
Nondurable Mfg 7%
Misc. Services 6%
Forestry Industry 7%
Nondurable Mfg 7%
Figure 3
Industrial Intermediate Input Use

- Food & Agriculture
- High Tech Mfg
- FIRE
- Trade
- Construction
- Durable Mfg
- Nondurable Mfg
- Health Services
- Forestry Industry
- Transportation
- Eating and Drinking
- All Other Industries

FIRE = Finance, Insurance & Real Estate

1990 Billion Dollars
Figure 4

Purchases by Food & Agriculture Industry

Purchases from Following Industries:

- Food & Agriculture
- Trade
- FIRE
- Transportation
- Utilities
- Forestry Industry
- Nondurable Mfg
- Durable Mfg
- High Tech Mfg
- All Other Industries
- Value Added Payment
- Imports

1990 Billion Dollars

FIRE = Finance, Insurance & Real Estate
Figure 5
Sales by Food & Agriculture Industry

Sales to Following Industries:
- Food & Agriculture
- Eating and Drinking
- All Other Industries
- Minnesota Households
- State & Local Govnmt
- Changes in Bus Inv
- Domestic Exports
- Foreign Exports

1990 Billion Dollars
Figure 6
Food & Agriculture Generated Local Jobs

In the Following Industries:

- Food & Agriculture
- Trade
- State & Local Gov
- FIRE
- Health Services
- Eating & Drinking
- Business Services
- Misc. Services
- Personal Services
- Transportation
- Professional Services
- All Other Industries

Thousands of Jobs
Figure 7
Greater Minnesota Economic Base

Export Sales Basis

Food & Agriculture 40%
Forestry Industry 14%
Durable Mfg 9%
Mining 6%
All Other Industries 8%
High Tech Mfg 6%

Value Added Basis

Food & Agriculture 30%
Forestry Industry 14%
Durable Mfg 11%
All Other Industries 11%
Mining 10%
Health Services 8%

Income Basis

Food & Agriculture 26%
Forestry Industry 14%
Durable Mfg 11%
All Other Industries 13%
Mining 6%
Health Services 8%

Employment Basis

Food & Agriculture 26%
Forestry Industry 6%
Durable Mfg 9%
All Other Industries 9%
Construction 3%
Mining 4%
Trade 4%
Figure 9
Regional Basic Employment

Central Minnesota Economic Base

Forestry Industry 12%
Non-durable Mfg 11%
Trade 8%
Miss. Service 8%
High Tech Mfg 7%
Durable Mfg 4%
Transportation 2%
Eating & Drinking 3%
Health Services 4%
Construction 4%
Food & Agriculture 39%

Northeast Minnesota Economic Base

Forestry Industry 28%
Non-durable Mfg 7%
Hotel & Lodging 4%
Miss. Service 9%
High Tech Mfg 4%
Personal Services 2%
Construction 8%
Health Services 6%
Mining 14%
Food & Agriculture 19%

Southeast Minnesota Economic Base

Durable Mfg 12%
Non-durable Mfg 6%
Trade 4%
Miss. Service 9%
High Tech Mfg 12%
Health Services 14%
Eating & Drinking 2%
Construction 2%
Food & Agriculture 26%

Western Minnesota Economic Base

FIRE 3%
Non-durable Mfg 4%
Eating & Drinking 2%
Miss. Service 8%
Durable Mfg 3%
Forestry Industry 6%
Personal Services 9%
Transportation 4%
All Other Industries 6%
Health Services 4%
Construction 3%
Food & Agriculture 46%
Figure 10
Commodity Trade Balance

1986 Billion Dollars

Exports
Imports

Commodities
Food & Agriculture
High Tech Mfg
Durable Mfg
Forestry Industry
Trade
Nondurable Mfg
FIRE
Mining
Transportation
Construction
Health Services
All Other Industries

FIRE = Finance, Insurance & Real Estate
Employment Impacts From 10 Percent Export Expansion

Figure 11
Figure 12

Value Added Impacts From 10 Percent Export Expansion

Millions of 1990 Dollars