

Section 3 – Support Industries, Demand Perspectives and Distribution Considerations

As noted in the introduction to this abstract, industry clusters involve companies that are interconnected through supply chains and service provisions. The connections between agricultural producers and food and beverage manufacturers are clear. Specifically, agricultural producers rely on processors and manufacturers to purchase their products, while food and beverage manufacturers need agricultural producers to provide them with inputs. However, these core AFB sectors also depend on a variety of other industries such as packaging, equipment, distribution, research and development, and other technical services.

The competitiveness of the AFB cluster also is rooted in consumer demand trends and conditions. Certainly the total amount of local or regional demand for AFB products is important. However, the quality of local demand matters far more than its size in a global economy. As noted by Porter (2000), the emergence of sophisticated and demanding regional customers compels firms to improve and provides insights into existing and future needs of the cluster. Local demand may also uncover market segments where regional firms can differentiate themselves from competitors. Section 3 considers several of these conditions within the Madison Region and Driftless Region.

Purchasing Patterns among Agricultural Producers and Food and Beverage Manufacturers

Every firm in the AFB cluster relies on relationships with individual suppliers and service providers. However, agricultural producers and food and beverage manufacturers also depend broadly on specific industry categories. Some of these dependencies involve commodities or products that are consumed or used directly in the production process. For instance, livestock or crop operations may rely on animal food manufacturers or fertilizer producers. Other dependencies include specialized support services or products that are indirectly needed by AFB establishments, but do not become a part of the food or beverage product produced. Specifically, AFB establishments may require secondary support from transportation and distribution services; veterinary services; paper, plastic, metal and glass packaging materials; professional and technical services; and machinery manufacturing and repair.

Detailed purchasing information can only be obtained by talking directly with producers and manufacturing firms. Certainly, MadREP's SourceMap project may help in understanding some of these supply chains within the region. However, input-output (I-O) models can also provide some perspective on industry interactions within the AFB cluster. Using a number of assumptions, an I-O model can estimate the magnitude of purchases among industries and approximate what share of these purchases are made within the region.²¹ When using purchasing estimates derived from input-output models, it is important recognize that these figures are rooted in national purchasing patterns among industry sectors. *Consequently, the purchasing estimates presented below should be used only to guide and inform more targeted research efforts. That is, business and investment decisions should not be based on this information.*

²¹ For a detailed discussion of input-output models, including their limitations, see Shaffer, Deller and Marcouiller (2004).

In addition to mapping industry dependencies within the AFB cluster, input-output modeling can also be used to explore potential *gaps* and *disconnects* in the region. As noted by Deller (2012), gaps and disconnects occur in the regional economy where there are products and services with high levels of imports. Specifically, a gap occurs when certain goods and services are not sufficiently available within a region and must be purchased elsewhere. There are many reasons for gaps and certain gaps may actually be desirable in those industry categories that could have a negative impact on the local economy and quality of life. In contrast, a disconnect arises when a good or service is available locally, but a cluster establishment chooses to purchase that service outside of the region. Reasons for a disconnect include a lack of information within the business community; long standing partnerships between firms; unfavorable pricing policies; mistrust; or specialization or expertise of firms in a specific industry (Deller 2012).

When goods and services are purchased outside of the region, these imports can be viewed as a *leakage* of economic activity. Consequently, evaluating gaps and disconnects may suggest opportunities for reducing this leakage through the local provision of these goods and services. That is, there may be opportunities to replace some level of imports with goods and services produced by regional companies. These import replacement opportunities could ultimately suggest prospects for strengthening current businesses in the area or spurring new business development.

To better identify industry interactions in the AFB cluster, an input-output model is created using IMPLAN for the 14 county study area. The estimated 40 largest categories of goods and services purchased by agricultural producers are depicted in Table 3.1. Similarly, the 40 largest categories purchased by food and beverage manufacturers are listed in Table 3.2. Each product category in Table 3.1 and Table 3.2 includes three figures:

1. The total amount of the product or service purchased by agricultural producers or food and beverage manufacturers in the study area;
2. The estimated amount (output) and percentage of the product purchased locally within the 14 county study area;
3. The total dollar value (output) of the product produced by companies currently located within the 14 county study area.

Comparing the dollar amount of products purchased to the amount of a product produced in the study area provides some perspective on potential gaps or disconnects. If agricultural producers or food and beverage manufacturers purchase a large amount of a given product, and there is insufficient production of the product in the region, then the product category is a potential gap. In contrast, a disconnect may exist if a product is produced in the region, but AFB businesses still purchase a large percentage of the product outside the study area.²²

²² Note that only so-called *intermediate purchases* are included in these estimates. Intermediate purchases are goods or services purchased by private industries, rather than those bought by households or institutions (e.g. schools). While goods and services purchased by public institutions or private households are important, purchases among industries are of the greatest concern for understanding the region's supply chains.

Table 3.1 – Goods and Services Used by Agricultural Producers in the 14 County Study Area (Estimates)

Good or Service Purchased	Estimated Amount Purchased	Amount Purchased in the Study Area	Study Area Purchase Percentage	Total Existing Regional Output
Crop and livestock production	\$670,300,000	\$362,200,000	54.0%	\$3,861,900,000
Petroleum refineries	\$319,300,000	\$700,000	0.2%	\$7,800,000
Support activities for agriculture and forestry	\$252,300,000	\$123,800,000	49.1%	\$157,100,000
Other animal food manufacturing	\$237,200,000	\$237,200,000	100.0%	\$493,000,000
Real estate establishments	\$231,200,000	\$168,700,000	73.0%	\$3,255,200,000
Monetary authorities and depository credit intermediation	\$161,900,000	\$139,700,000	86.3%	\$2,451,200,000
Fertilizer manufacturing	\$125,500,000	\$64,400,000	51.3%	\$227,700,000
Pesticide and other agricultural chemical manufacturing	\$121,800,000	\$81,500,000	66.9%	\$423,300,000
Wholesale trade distribution services	\$70,900,000	\$56,000,000	79.1%	\$4,522,500,000
Electric power generation, transmission, and distribution	\$56,300,000	\$53,000,000	94.2%	\$2,014,000,000
Truck transportation services	\$52,000,000	\$40,500,000	77.8%	\$1,316,400,000
Maintenance and repair of non-residential structures	\$23,800,000	\$21,800,000	91.7%	\$763,400,000
Farm machinery and equipment manufacturing	\$21,100,000	\$4,500,000	21.5%	\$1,332,700,000
Soybean and other oilseed processing	\$16,600,000	\$1,200,000	7.5%	\$127,500,000
Rail transportation services	\$16,500,000	\$6,200,000	37.5%	\$136,500,000
Water, sewage and other treatment and delivery systems	\$13,600,000	\$13,300,000	97.8%	\$352,900,000
Natural gas distribution	\$12,500,000	\$4,500,000	36.2%	\$215,100,000
Warehousing and storage	\$10,200,000	\$8,200,000	80.1%	\$345,900,000
Accounting, tax preparation, bookkeeping & payroll svcs.	\$10,200,000	\$5,200,000	51.0%	\$331,000,000
Tire manufacturing	\$8,900,000	\$200,000	2.8%	\$6,500,000
Securities, commodity contracts, investments and related	\$8,200,000	\$3,600,000	43.7%	\$919,700,000
Other basic organic chemical manufacturing	\$7,900,000	\$1,000,000	12.6%	\$1,286,300,000
Legal services	\$7,800,000	\$4,300,000	55.4%	\$641,700,000
Commercial and industrial machinery/equipment rental	\$6,900,000	\$4,000,000	58.7%	\$139,000,000
Automotive equipment rental and leasing	\$6,800,000	\$2,600,000	37.7%	\$124,800,000
Motor vehicle parts manufacturing	\$6,500,000	\$200,000	2.4%	\$515,200,000
All other basic inorganic chemical manufacturing	\$6,400,000	\$400,000	6.4%	\$32,700,000
Flour milling and malt manufacturing	\$6,400,000	\$100,000	1.8%	\$11,800,000
Transport by water	\$6,000,000	\$200,000	2.9%	\$5,900,000
Mining and quarrying stone	\$6,000,000	\$5,700,000	96.0%	\$111,400,000
Biological product (except diagnostic) manufacturing	\$5,600,000	\$800,000	14.5%	\$605,400,000
Hand tool manufacturing	\$5,600,000	\$0	0.0%	\$9,600,000
Pharmaceutical preparation manufacturing	\$5,100,000	\$200,000	4.5%	\$779,500,000
Wood container and pallet manufacturing	\$4,900,000	\$2,600,000	53.4%	\$47,500,000
Other computer related services, including facilities mgmt.	\$4,500,000	\$3,600,000	80.4%	\$536,000,000
Private junior colleges, colleges, universities & prof. schools	\$4,300,000	\$2,800,000	66.5%	\$718,000,000
Civic, social, professional, and similar organizations	\$4,000,000	\$4,000,000	98.6%	\$481,300,000
Storage battery manufacturing	\$3,900,000	\$0	0.0%	\$3,700,000
Veterinary services	\$3,800,000	\$3,800,000	98.3%	\$142,600,000
Telecommunications	\$3,300,000	\$2,600,000	79.0%	\$1,719,000,000

Sources: IMPLAN and Author's Calculations

Table 3.2 – Goods and Services Used by Food and Beverage Manufacturers in the 14 County Study Area (Estimates)

Good or Service Purchased	Estimated Amount Purchased	Amount Purchased in the Study Area	Study Area Purchase Percentage	Total Existing Regional Output
Dairy cattle and milk products	\$1,380,500,000	\$1,230,600,000	89.1%	\$1,549,100,000
Cheese	\$698,600,000	\$400,500,000	57.3%	\$2,654,300,000
Cattle from ranches and farms	\$505,000,000	\$259,000,000	51.3%	\$473,600,000
Wholesale trade distribution services	\$358,200,000	\$282,400,000	78.8%	\$4,522,500,000
Truck transportation services	\$288,400,000	\$225,000,000	78.0%	\$1,316,400,000
Management of companies and enterprises	\$275,300,000	\$172,100,000	62.5%	\$1,351,400,000
Grains	\$214,000,000	\$66,300,000	31.0%	\$979,300,000
Fluid milk and butter	\$193,000,000	\$167,000,000	86.6%	\$650,700,000
Animal products, except cattle, poultry and eggs	\$185,600,000	\$78,800,000	42.5%	\$185,000,000
Paperboard containers	\$180,400,000	\$26,000,000	14.4%	\$97,700,000
Metal cans, boxes, and other metal containers (light gauge)	\$162,400,000	\$66,100,000	40.7%	\$677,800,000
Flavoring syrups and concentrates	\$144,600,000	\$11,900,000	8.2%	\$14,500,000
Fruit	\$144,200,000	\$15,500,000	10.7%	\$48,700,000
Processed animal meat and rendered byproducts	\$134,600,000	\$59,500,000	44.2%	\$1,160,200,000
Oilseeds	\$122,400,000	\$16,100,000	13.1%	\$304,300,000
Dry, condensed, and evaporated dairy products	\$120,600,000	\$91,100,000	75.5%	\$471,800,000
Corn sweeteners, corn oils, and corn starches	\$106,000,000	\$8,800,000	8.3%	\$13,500,000
Electricity, and distribution services	\$100,100,000	\$94,200,000	94.1%	\$2,014,000,000
Shortening and margarine and other fats and oils products	\$99,000,000	\$1,200,000	1.2%	\$20,600,000
Soybean oil and cakes and other oilseed products	\$91,600,000	\$7,200,000	7.8%	\$127,500,000
Canned, pickled and dried fruits and vegetables	\$85,000,000	\$27,500,000	32.3%	\$946,300,000
Plastics packaging materials & unlaminated films/sheets	\$81,500,000	\$7,400,000	9.1%	\$192,100,000
Plastics bottles	\$81,200,000	\$4,000,000	4.9%	\$39,700,000
Flour and malt	\$70,400,000	\$1,200,000	1.7%	\$11,800,000
Other animal food	\$70,000,000	\$54,600,000	78.1%	\$493,000,000
Natural gas, and distribution services	\$68,300,000	\$24,800,000	36.3%	\$215,100,000
Vegetables and melons	\$63,000,000	\$16,300,000	25.8%	\$55,300,000
All other crop farming products	\$61,200,000	\$15,900,000	26.0%	\$95,300,000
Advertising and related services	\$55,600,000	\$37,800,000	68.0%	\$958,800,000
Rail transportation services	\$48,300,000	\$18,100,000	37.4%	\$136,500,000
Other plastics products	\$47,000,000	\$8,600,000	18.3%	\$1,392,200,000
Real estate buying and selling, leasing, managing & related	\$46,600,000	\$34,000,000	72.9%	\$3,255,200,000
Glass containers	\$42,200,000	\$0	0.0%	\$0
Monetary authorities and depository credit intermediation	\$39,500,000	\$34,200,000	86.6%	\$2,451,200,000
Maintained and repaired nonresidential structures	\$39,000,000	\$35,900,000	92.0%	\$763,400,000
Non-comparable foreign imports	\$36,700,000	\$11,300,000	30.8%	\$285,800,000
All other manufactured food products	\$36,100,000	\$4,400,000	12.2%	\$176,100,000
Medicines and botanicals	\$33,500,000	\$300,000	0.8%	\$39,000,000
Processed poultry meat products	\$32,100,000	\$1,600,000	5.1%	\$17,600,000
All other paper bag and coated and treated paper	\$31,200,000	\$5,900,000	18.9%	\$30,100,000

Sources: IMPLAN and Author's Calculations

As previously mentioned, any potential gap or disconnect suggested by the data will need to be confirmed with additional primary research. However, the purchasing patterns in Table 3.1 and Table 3.2 reveal a number of insights to the AFB cluster:

- Not surprisingly, purchasing patterns among AFB industries reinforce the strong connections among agricultural producers and food and beverage manufacturers. Food and beverage manufacturers in the study area purchase billions of dollars of agricultural products. Milk products, cheese, and cattle are by far the largest agricultural products purchased by food product manufacturers in the region. These magnitudes are expected given the region's large concentration of dairy product manufacturing and animal processing. A large estimated share of milk is purchased within the region. However, a smaller estimated share of cattle used by food manufacturers is provided by local farms;
- While a large share of milk is provided by study area farms, some businesses and organizations suggest that demand is outpacing supply. DATCP's Dairy 30x20 Initiative has a goal of increasing milk production in the state, but regional supply and demand conditions may need to be explored further;
- A relatively small amount of grain is purchased from within the study area, despite a notable amount of overall production in the region. Some of this disconnect may be due to the smaller grain production scales noted in Section 2. A disconnect also could arise from the potential unavailability of specific types of grain needed by local food and beverage manufacturers. For instance, corn accounts for a large share of the grain produced in the region, but food and beverage manufacturers may require a diversity of products. As an example, the recent *Organic Agriculture in Wisconsin 2015 Status Report* notes challenges related to the limited availability of organic grains produced in the region;
- A large estimated share of soybean products is imported into the region by food manufacturers. Similarly, agricultural producers import a large share of soybean and oilseed processing services. These gaps might be partially attributed to the lack of soybean crushing facilities in the study area. Challenges related to the absence of crushing facilities are well-documented by other organizations;
- Wholesale establishments are large providers of goods to both agricultural producers and food and beverage manufacturers. These firms provide a wide variety of products ranging from equipment to agricultural products to packaging goods. Unfortunately, the input-output model used in this analysis combines all wholesale categories into a single industry sector, precluding the analysis of specific wholesale gaps or disconnects;
- Agricultural producers purchase an estimated \$252.3 million in services from establishments classified as support activities for agriculture and forestry. However, the study area only reports \$157.1 million in total output within this industry category. The difference between these two values suggests that demand is outpacing supply in the region. Agricultural support activities include a variety of services such as soil preparation; crop harvesting; crop cleaning; farm management; breeding services; dairy herd improvement activities; livestock spraying; and other activities. The difference in supply and demand could be attributed to a gap in some of these services. However, the gap may also be an artifact of the input-output modeling process. Nonetheless, this category may be worth further analysis;

- A large estimated share of fruit and other miscellaneous crop products are imported by food and beverage manufacturers in the region. A portion of this value may be attributed to the inability of Wisconsin to produce certain products (e.g. bananas). However, part of the gap also may reflect limited regional production of commodities such as hops or peaches. There may be opportunities to further explore this category;
- Despite notable production levels in the study area, a number of chemical product categories suggest sizeable imports into the region. These products include pesticides and other agricultural chemicals; fertilizers; other basic organic chemicals; and other basic inorganic chemicals. These industry categories contain a wide variety of products, so it is difficult to determine whether or not these figures actually constitute a disconnect;
- Several goods and services categories with high levels of importation are not necessarily gaps or disconnects, despite their seemingly large values. Specifically, products produced by petroleum refineries, tire manufacturers, and storage battery manufacturers are all imported into the region. However, these are specialized industries that are not solely tied to AFB firms;
- Food and beverage manufacturers import large shares of flavoring syrups and concentrates; corn sweeteners, corn oils and corn starches; flours and malts; and medicines and botanicals. Again, these are broad categories that encompass many products. However, some of these import levels may reflect the limited number of ingredient manufacturers in the region;
- Both agricultural producers and food and beverage manufacturers are highly dependent on truck transportation. Transportation and distribution services are explored later in Section 3;
- Food and beverage manufacturers are large users of metal, plastic, glass and paper packaging goods. Purchasing patterns for metal container manufacturing suggests a potential disconnect in the region. In contrast, purchases of other packaging materials such as paperboard containers; plastic bottles and other plastic material; and glass containers suggest that demand outpaces supply in the region. All of these packaging categories could suggest supply gaps, and these numbers are not surprising given the somewhat limited number of packaging manufacturing facilities in the region. However, the State of Wisconsin is a national leader in production for many of these packaging materials. It may be that these products do not need to be purchased locally as AFB establishments have access to large concentrations of packaging material manufacturers in other parts of the state.

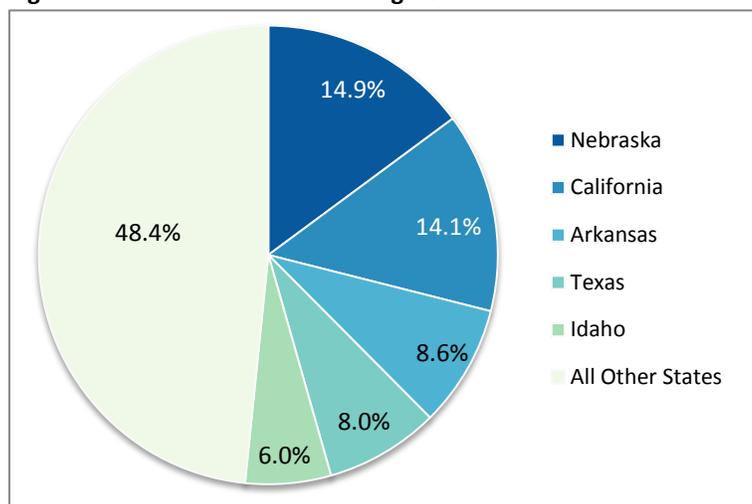
A Note on the AFB Cluster and Water

Water treatment and delivery is a key service needed by AFB establishments. Both freshwater availability and wastewater treatment capacity are vital to the cluster. Certainly agricultural producers (both crop and livestock) depend on water, but food processing also relies on dependable sources of freshwater. Water is used directly in many food products, but is also used in equipment cleaning that sends organic waste and residuals into the sewer system. Consequently, food manufacturers depend on wastewater treatment as well. Firms also are exploring proactive pollution measures that seek to reduce their loads of biochemical oxygen demand, total suspended solids, phosphorus, and other wastes. Research institutions in the region, as well as the state's emerging water technology cluster, may provide opportunities for furthering these efforts.

Availability of freshwater in the region may also provide a potential source of competitive advantage. In particular, the long-term drought in California may provide continued challenges for both producers and processors in the nation's largest agricultural state. NASA's Jet Propulsion Laboratory (JPL) at the California Institute of Technology currently estimates that it will take 11 trillion gallons of water to recover from the current drought. Furthermore, drought maps from NASA's Goddard Space Flight Center suggest that groundwater levels in the U.S. Southwest are at their lowest 2 to 10 percent since 1949.²³ An analysis of the drought from the University of California, Davis suggests that surface water reduction and increased groundwater pumping will result in a total economic cost of \$2.2 billion and 17,100 jobs lost in California (Howitt et al 2014).

The 2012 drought in South-Central Wisconsin should be a reminder that the study area is not immune to water issues or other natural resource constraints. However, both the study area and the overall State of Wisconsin are significantly less dependent on irrigated acreage than California and other states (Figure 3.1 and Figure 3.2). Almost 69 percent of California farms have irrigated acreage, compared to just 4.6 percent of Wisconsin farms. Furthermore, California accounts for 14.1 percent of the nation's total irrigated acres despite accounting for only three percent of the nation's total farmland and three percent of the nation's harvested cropland. Given the nation's reliance on agricultural products produced in California, the drought should be of national alarm. Nonetheless, water concerns in California could present some opportunities for Wisconsin firms and farms.

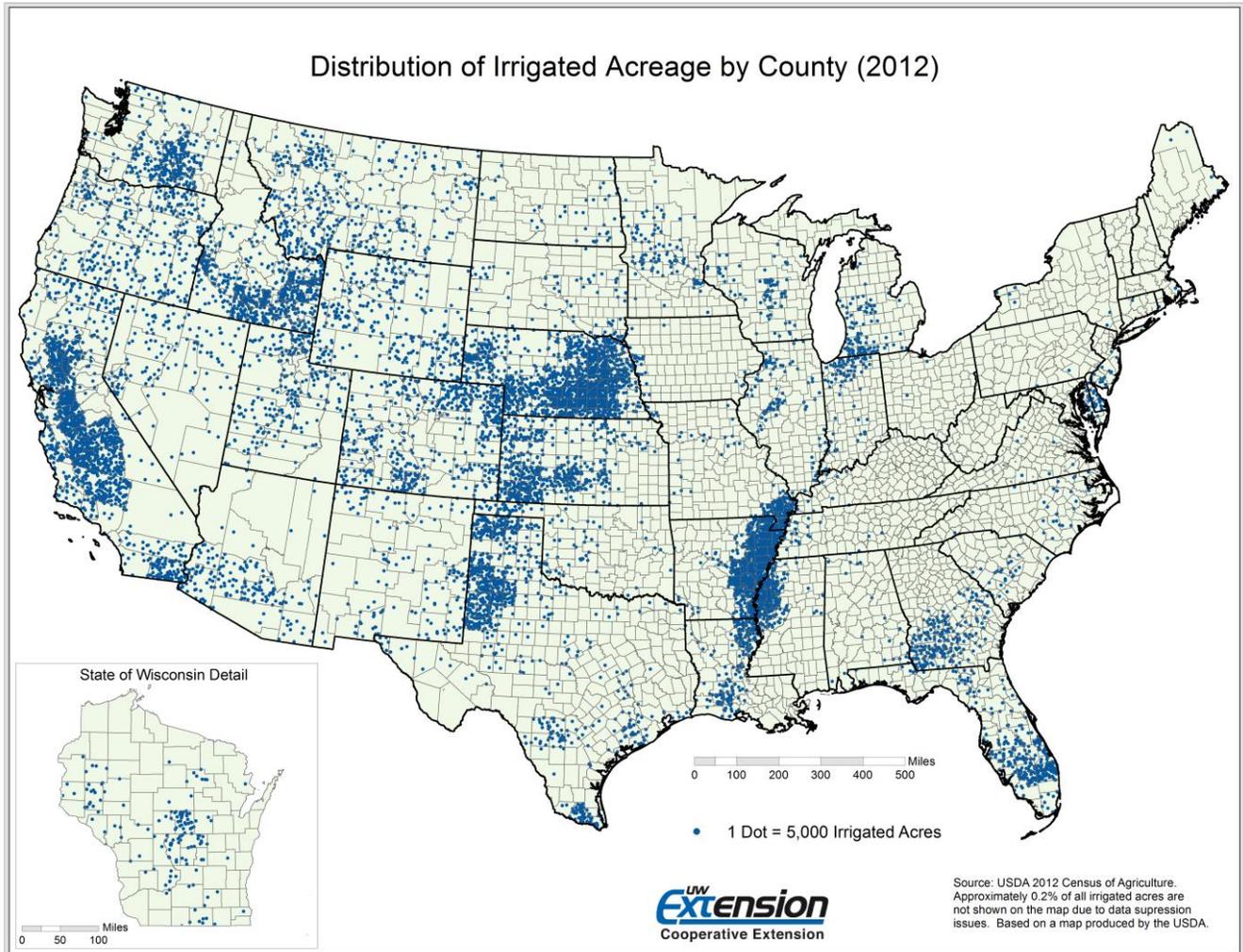
Figure 3.1 – Distribution of U.S. Irrigated Acres



Source: USDA 2012 Census of Agriculture and Author's Calculations

²³ See: <http://www.jpl.nasa.gov/news/news.php?feature=4412>

Figure 3.2 – Distribution of Irrigated Acreage by County (2012)



Support Organizations and Institutions

As noted in the introduction, industry clusters are not comprised solely of for-profit, private-sector firms. Industry clusters recognize the potential assistance and knowledge transfers that universities, trade associations, and government agencies can provide. A full inventory of these support organizations and institutions is not included here, but a number of key institutions and groups are listed below. These institutions and organizations were previously identified in MadREP’s 2014 IMCP application. A number of organizations involved in local/regional food systems are also compiled by UW-Extension Dane County’s Food System website at: fyi.uwex.edu/danefoodsystem/organizations/. As the AFB cluster evolves, additional organizations and institutions should be identified and added to a comprehensive list of cluster partners.

Table 3.3 – Examples of AFB Support Organizations and Institutions

Category	Organizations and Institutions
<i>UW-System</i>	UW-Madison; UW-Platteville; UW-Whitewater; UW-Richland; UW-Rock County; UW-Baraboo/Sauk County; UW-Extension.
<i>Private Colleges</i>	Beloit College; Edgewood College,
<i>Wisconsin Technical College System</i>	Blackhawk Technical College; Madison College; Moraine Park Technical College; Southwest Wisconsin Technical College (SWTC).
<i>Other Educational</i>	Renk Agribusiness Institute; Community Groundworks at Troy Gardens.
<i>State Agencies</i>	Wisconsin Economic Development Corporation; Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP); Wisconsin Housing and Economic Development Authority; Wisconsin Department of Workforce Development.
<i>Training</i>	UW-Madison Center for Integrated Agricultural Systems (CIAS); Wisconsin Center for Dairy Research (CDR) Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP); Organic Processing Institute; Michael Fields Agricultural Institute.
<i>Apprenticeship</i>	Dairy Grazing Apprenticeship via Grassworks, Inc.
<i>Workforce</i>	Workforce Development Board of South Central Wisconsin (WDBSCW); Southwest Wisconsin Workforce Development Board; Wisconsin Women’s Business Initiative Corporation (WWBIC); Urban League of Greater Madison; UW-Madison Office of Corporate Relations (OCR).
<i>Dairy Trade Associations and Non-Profits</i>	WI Milk Marketing Board;; Dairy Council of WI; Professional Dairy Producers of WI; WI Dairy Artisan Network; WI Dairy Business Association; WI Dairy Goat Association; WI Dairy Products Association; WI Milking Shorthorn Association; WI Purebred Dairy Cattle Association; WI Sheep Dairy Cooperative.
<i>Cheese Trade Associations and Non-Profits</i>	Wisconsin Cheese Makers Association; WI Specialty Cheese Institute; Foreign-Type Cheese Makers Association; WI Swiss & Limburger Cheese Association; Central WI Cheese Makers Association; Southwest WI Cheese Makers Association; Southwestern WI Dairy Goat Products Cooperative.
<i>Meat/Livestock Trade Associations and Non-Profits</i>	WI Angus Association, WI Association of Meat Processors, WI Beef Council, WI Bison Producers Association, WI Cattleman’s Association, WI Commercial Deer/Elk Farmers Association, WI Emu Association, WI Holstein Association, WI Independent Livestock Dealers, WI Livestock and Meat Council, WI Livestock Breeders Association, WI Ostrich Association, WI Pork Producers Association, WI Poultry Improvement Association, WI Purebred Cattle Association, WI Sheep Breeders Cooperative, WI Turkey Federation, WI Veal Growers Association
<i>Crops/Specialty Trade Associations and Non-Profits</i>	WI Apple Growers Association, WI Aquaculture Association, WI Berry Growers Association, WI Bird & Game Breeders Association, WI Brewers Guild, WI Carrot Growers Association, WI Cherry Growers, WI Corn Growers Association, WI Cranberry Board, WI Crop Producers Association, WI Egg Producers Association, WI Farm Bureau Federation, WI Farmers Union, WI Fresh Market Vegetable Growers Association, WI Grape Growers Association, WI Honey Producers Association, WI Natural Foods Association, WI Potato & Vegetable Growers Association, WI Soybean Association, WI Winery Association, Shiitake Growers Association of WI, Dane County Farm Bureau
<i>Other Trade Associations and Non-Profits</i>	WI Grocers Association, WI Restaurant Association, World Dairy Expo, World Beef Expo, WI Biotechnology Association, Midwest Equipment Dealers Association, Midwest Food Processors Association, Madison Area CSA Coalition, Midwest Organic Dairy Producers, Cooperative Network, The Cornucopia Institute, Organic Processing Institute.

Source: Wisconsin Department of Agriculture, Trade & Consumer Protection and MadREP.

Domestic Demand Considerations

As noted earlier, food and beverage manufacturers purchase a large amount of inputs from agricultural producers. Food and beverage manufacturers also purchase a large number of products and ingredients from each other. Consequently, the study area’s proximity to the food manufacturing concentrations depicted in Section 1 is a potential geographic advantage for the Madison Region and Driftless Region. However, demand for food and beverage products is ultimately driven by consumers. Consequently, consumer demand trends and characteristics are also important considerations for producers, processors, manufacturers and distributors.

Overall Consumer Demand

Domestic consumer demand for food can be categorized into two distinct categories: 1) expenditures for food at home; and 2) expenditures on food away from home. As defined by the USDA Economic Research Service, food at home expenditures include spending on food to be prepared at an individual’s home or anywhere else except for on the premises where the food was sold. Expenditures on food at home often occur through food stores; other retail stores; home delivery and mail order firms; and direct sales from farmers, manufacturers, and wholesalers.²⁴ In contrast, food away from home includes expenditures on food that is prepared on the premises where it is sold. Food away from home expenditures can include food purchases at restaurants; movie theaters; amusement parks; concession stands; hotels; airlines; vending machines and other venues.

On a per capita basis, expenditures on food at home have remained largely consistent over the past four decades (Figure 3.3). In contrast, per capita expenditures on food away from home have steadily increased over same period. While expenditures on food away from

Figure 3.3 – Per Capita Food Expenditures 1970 to 2013 (in Constant Dollars)

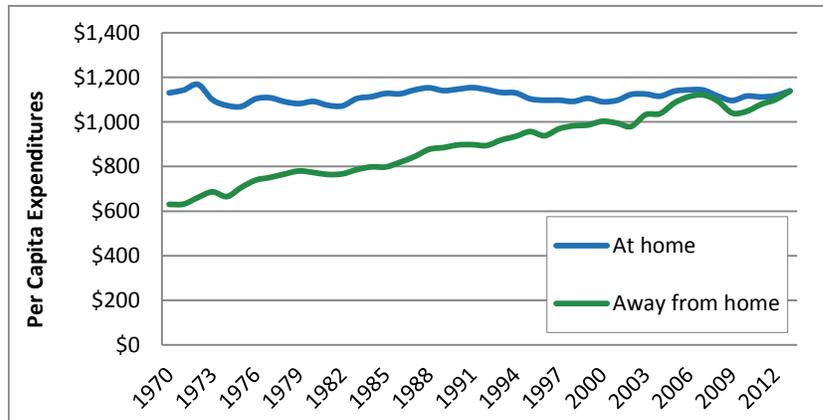
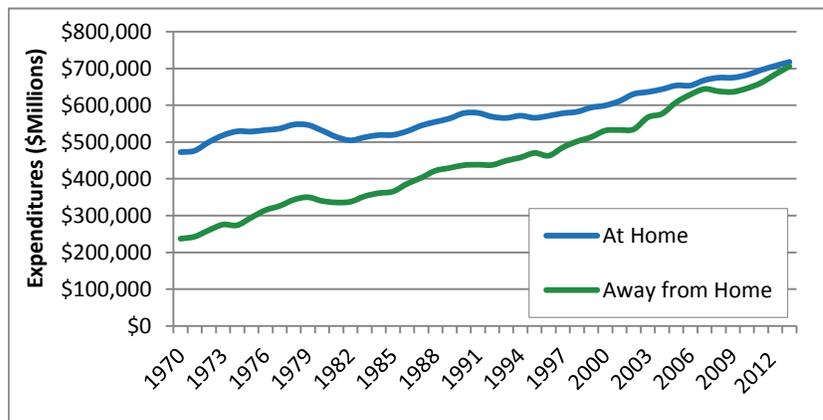


Figure 3.4 – Total U.S. Expenditures on Food at Home and Food Away from Home 1970 To 2013 (In Constant Dollars)



Source USDA Economic Research Service and Author’s Calculations

²⁴ Food at home also includes home production and donations.

home declined somewhat during the recent recessionary period, per capita spending on food at home (\$1,139) and food away from home (\$1,138) was almost identical in 2013. The growing expenditures on food away from home show the increasing importance of sales made outside of traditional food outlets (such as grocery stores, specialty food stores, and general merchandise retailers). However, these spending patterns do vary by household income. In particular, higher income households spend significantly more on food away from home (see Appendix C).

Consistent per capita expenditures on food at home do not mean that total demand has remained unchanged. Increasing population and incomes have driven total U.S. expenditures on food at home from \$472.5 billion in 1970 to \$717.9 billion in 2013. Similarly, expenditures on food away from home increased from \$237.0 billion in 1970 to \$705.9 billion in 2013. While the overall increases are notable, expenditures on food at home increased by an annual average of just 1.2 percent over this period. Expenditures on food away from home increased by an annual average of 4.5 percent. Consequently, overall annual expenditures in the domestic market are growing, but this growth remains somewhat limited by population and income changes.

Food and beverage manufacturers also face shifting consumer preferences that can change rapidly. Recent examples include the development of new artificial sweeteners; organically produced foods; craft beers and liquors; probiotics; Omega 3 fatty acids; gluten-free products; dairy-free goods; vegan foods, and low-sodium options. Convenience is also a factor as consumers with limited time are looking for foods that are pre-prepared or have reduced preparation times (i.e. upscale complete frozen meals; par-baked bread; single-serve portions; etc.). Consequently, food and beverage manufacturing firms rely on market research and product development to identify new consumer preferences and create products. Small firms in the region without in-house research capabilities may benefit from having avenues of access to in-depth market research information.

Emerging consumer preferences provide some insights on potential sources of competitive advantage for the AFB cluster. As previously noted, the emergence of sophisticated and demanding regional customers compels firms to improve and provides insights into existing and future needs of the cluster. Local demand may also uncover market segments where regional firms can differentiate themselves from competitors (Porter 2000). While a detailed analysis of all changing consumer preferences is beyond the scope of this abstract, several domestic consumer trends are worth noting given their potential to differentiate the region. These include fresh vegetable consumption trends; organics; cheese and yogurt consumption; local foods; and craft beverages. Each of these trends is highlighted briefly below.

Fresh Vegetable Trends²⁵

Over the past four decades, per capita consumption of fresh, frozen and canned vegetables has changed in the United States (Figure 3.5). After somewhat steady usage levels in the 1970s, per capita vegetable consumption grew by 30 percent between 1980 and 2004. Increased consumption of fresh vegetables is largely responsible for this overall growth, growing from 86.9 pounds per person in 1970 (43 percent of total vegetable

²⁵This fresh vegetable trend information is based on previous research conducted by the author and previously published elsewhere.

consumption) to 151 pounds per capita in 2004 (55 percent of total consumption). In contrast, the usage of canned vegetables has declined gradually, while per capita consumption of frozen vegetables remains largely unchanged.

Despite the growth in fresh vegetable consumption between 1980 and 2004, per capita usage has experienced more recent declines. Some of these decreases may be tied to consumer sentiment and declining household incomes during the Great Recession. However, a rebounding economy and a growing awareness from health-conscious consumers have the potential to further boost demand. Specifically, the USDA estimates that U.S. residents need to increase vegetable consumption by 25 percent to meet dietary recommendations. While this additional demand arising from dietary concerns is by no means assured, a gradual increase in consumption would be beneficial to vegetable operations.

In addition to overall consumption trends, usage has changed by individual vegetable types as well. For instance, consumption of fresh asparagus, eggplant, romaine lettuce, broccoli, cucumbers and artichokes have all increased by 10 percent or more over the last decade (Figure 3.6). In contrast, per capita usage of fresh cauliflower, cabbage, potatoes and head lettuce has decreased by 10 percent or more. While these consumption trends should not be confused with suitability for production in the region, changing consumer preferences do show the importance of understanding a changing market for different crops. Local producers may benefit from remaining up-to-date with these trends. *The Local Food Prospectus for the Tri-State Region* funded by the Southwest Wisconsin Regional Planning Commission also provides an in-depth overview of fresh vegetable production considerations in the region²⁶

Figure 3.5 – Per Capita Vegetable Consumption 1970 to 2012

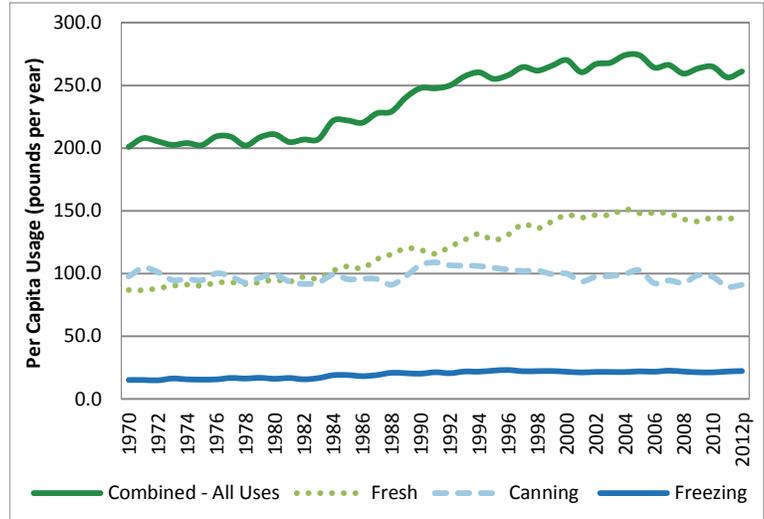
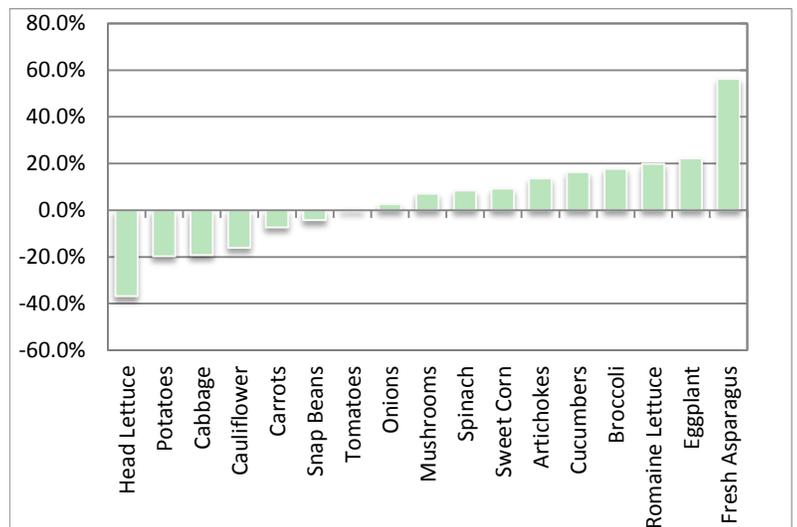


Figure 3.6 – Change in Per Capita Consumption for Selected Fresh Vegetables (2002 to 2012)



Data Source: USDA Economic Research Service Vegetable and Pulses Yearbook

²⁶ The report is available at: <http://swwrpc.org/wordpress/project-produce/the-local-food-prospectus-for-the-tri-state-region/>

Organics

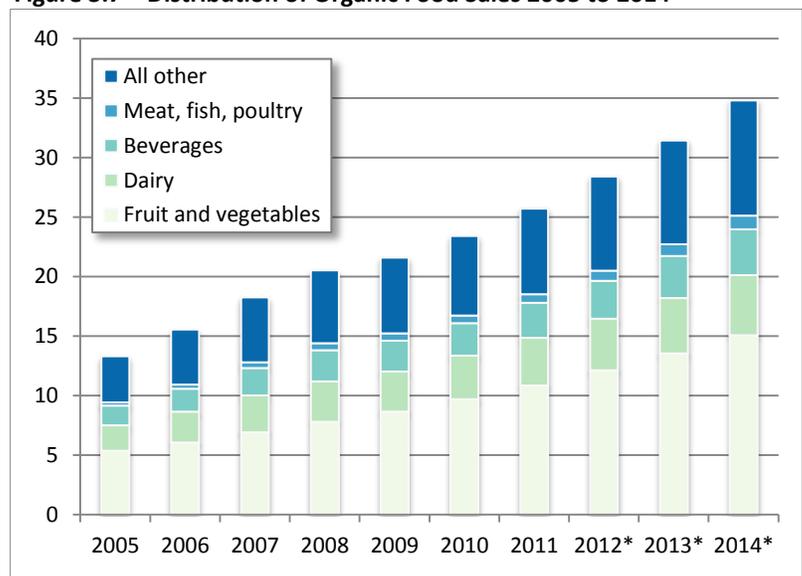
As noted in Section 2, both the State of Wisconsin and the AFB study area are prominent in organic agricultural production. The study area’s overall concentration of farms with organic sales of \$5,000 or more is perhaps the largest in the Midwest and one of the largest in the nation. Furthermore, the State of Wisconsin ranked fourth among all states in the value of organic product sales, with farms in the AFB study area contributing 42 percent of the state’s total organic production value.

While the USDA does not collect official statistics on organic retail sales, information is available from other industry sources.²⁷ According to figures produced the *Nutrition Business Journal* and disseminated by the USDA, domestic sales of organic products reached an estimated \$35 billion in 2014. While this is a relatively small share of overall food sales (approximately four percent), demand for organic goods continues to grow by double digits annually. Information compiled by the USDA suggests that organic consumers prefer organically produced food because of their concerns regarding health, the environment, and animal welfare. These concerns lead to their willingness to pay organic price premiums established in the marketplace. However, organic products have also moved from a niche consumer market to mainstream retail outlets. The Organic Trade Association (OTA) reports that most organic sales (93 percent) occur in conventional and natural food grocers, both independent and chains. The remaining 7 percent of U.S. organic food sales occur through farmers' markets, foodservice, and marketing channels other than retail stores.

According to the *Nutrition Business Journal*, fruit and vegetables account for 43 percent of total organic food sales and are largest selling category of organic food products (Figure 3.7). The prominence of fruit and vegetables within organic food sales has remained steady since organics entered retail markets over 30 years ago. Dairy is the second largest category (15 percent of total sales), followed by packaged/prepared foods (11 percent); beverages (11 percent); bread/grains (9 percent); snack foods (5 percent); meat/fish/poultry (3 percent); and condiments (3 percent).

The prominence and growth of organic fruits and vegetables likely benefits the emerging fresh vegetable production concentration in the region. Trends in organic dairy demand also benefit farms and processors in the region. In particular, rules on organic dairy pasture compliance published by the USDA in

Figure 3.7 – Distribution of Organic Food Sales 2005 to 2014



Source: Based on a chart from the USDA Economic Research Service using data from the National Business Journal. All other category includes packages/prepared foods, beverages, bread/grains, snack foods and condiments. *Estimated value

²⁷ The organic market information published here is provided by the USDA Economic Research Services organic market overview at: <http://www.ers.usda.gov/topics/natural-resources-environment/organic-agriculture/organic-market-overview.aspx>

2010 ensure that large scale producers cannot bypass organic certification requirements. Consequently, these rules somewhat level the playing field for small organic dairy farms, such as those found in the Madison Region and Driftless Region (Greene and McBride 2015).

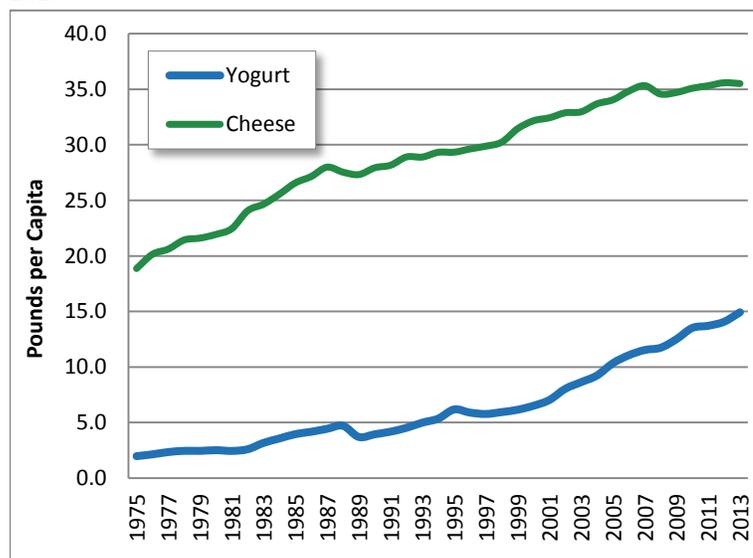
As suggested earlier, the California drought also presents potential opportunities for local organic dairy producers. Increasing costs for irrigation and associated competition for maintaining high value commodities (such as almonds) could reduce some organic vegetable production in California. Furthermore, organic dairy pastures are disappearing in California. The loss of pasture, coupled with high organic feed grain prices, could weaken California organic dairy production. Accordingly, development in organic dairy farms in traditional milk producing regions (including the Madison Region and Driftless Region) could replace some the reduced production from California operations (Greene and McBride 2015).

Cheese and Yogurt Consumption

Per capita consumption of fluid milk and frozen dairy products has declined over the last several decades. Some of the decline in these dairy products has been offset by increasing consumption of cheese and yogurt. Consumption of cheese has increased from 18.9 pounds per capita in 1975 to just over 35 pounds per person in 2013 (Figure 3.8). Per capita yogurt consumption also grew from just 2.0 pounds in 1975 to almost 15 pounds in 2013.

Undoubtedly, the increase in cheese and yogurt production benefits both dairy farms and cheese makers in the region. In particular, cheese consumption trends signal a broader consumer shift that benefits the study area. These cheese consumption trends are partially driven by the increasing quality of cheese available in the United States. More specialty varieties of high quality cheeses are now produced domestically. Consequently, consumers no longer must rely on imported products. The study area is positioned to benefit from these trends as it is home to many specialty and artisan cheese producers. The study area also is home to technical support organizations, such as the Center for Dairy Research, which could further growth opportunities in the region.²⁸

Figure 3.8 – Per Capita Consumption for Cheese and Yogurt -1975 to 2013



Sources: USDA National Agricultural Statistics Service, USDA Farm Service Agency, USDA Foreign Agricultural Service, USDA Agricultural Marketing Service, U.S. Department of Commerce Bureau of the Census, California Department of Food and Agriculture, USDA Economic Research Service calculations.

²⁸ For more perspectives on Wisconsin cheese production, see Jesse and Mitchell (2014).

Local Foods

As noted in Section 2, interest in food produced locally has grown over the past decade. Again, this abstract considers local foods to be those products sold through direct-to-consumer channels and intermediated sales. From an economic development perspective, it is important to recognize that local foods are an emerging market. Currently, direct-to-consumer and intermediate sales of local foods account for 2.0 percent of gross farm sales nationally (Low and Vogel 2011). *However, the small share of agricultural sales sold to local consumers also suggests a significant potential opportunity for growth, particularly for those producers who can overcome expansion issues and understand consumer preferences.*

Local food market development faces several key barriers to entry and expansion. The issues of scale and capacity are well documented. Small scale producers may not be able to meet high volume demands, offer consistent quality, make timely deliveries, or provide products that are out-of-season. Farmers also face risks related to price competition, buyer specification, logistical requirements, and non-binding contracts (Martinez et al 2010). CSA's, aggregation hubs, new distribution models, and production pooling provide some opportunities for overcoming these issues, particularly for producers wanting to sell to supermarkets, restaurants and institutions. In fact, a wide variety of initiatives, organizations and businesses that support local food production and distribution are already present in the study area. Continued assistance from these groups will be needed to help this market segment grow further.

Local food producers also face new issues related to food safety policies. The 2011 Food Safety Modernization Act (FSMA) designates proactive measures related to food safety. Examples of these measures that could impact local food producers include: minimum safety standards for producing and harvesting fruits and vegetables; mandated inspection frequencies; greater authority to issue product recalls; and enhanced production tracing abilities. Not all of these measures will apply to local food producers, but the FSMA creates uncertainty nonetheless. Training and educating local food producers about FSMA requirements may help alleviate some of this uncertainty and lessen potential burdens associated with compliance (Holcomb, Palma and Velandia 2013). New technologies related to recordkeeping and labeling can also ease concerns related to traceability requirements (Martinez et al 2010). *The region's concentration of food system educational organizations (such as UW-Extension), software developers, and logistics providers could offer opportunities for overcoming these food safety concerns.*

Understanding consumer preferences within local food markets can also help producers differentiate themselves from competitors. Importantly, consumers' willingness to pay a premium for local foods is not limited to high income households (Martinez et al 2010). Instead, research suggests that consumers base their purchase of local foods on factors such as perceived health benefits and a desire to support local farmers and the local economy. Not surprisingly, local food consumers believe that local produce is superior in terms of its freshness, eating quality, food safety, and nutritional value. However, consumers also note that a lack of consistently available local foods, particularly produce, is a weakness (Onozaka, Nurse and McFadden 2010). Continued efforts to extend the region's somewhat limited growing season through the development of hoop houses, greenhouses and other technologies could help overcome this potential disadvantage in the region.

Craft Beverages

As noted in Section 1, the study area is home to a growing number of breweries, wineries and distilleries. In fact, the number of these establishments likely is undercounted due to industrial classification schemes and the emergence of new firms that started production since the beginning of 2013. Almost all of the establishments noted in Section 1 would be considered craft beverage producers. Craft breweries are particularly prominent in the region and are part of more than 100 craft breweries in the state currently tracked by the Wisconsin Brewers Guild.²⁹

While craft breweries account for slightly less than 20 percent of overall beer sales, figures from the Brewers Association suggest that craft brewery sales increased by 22 percent in 2014. In comparison, the overall beer market grew by just 0.5 percent. Craft brewery growth in 2014 is part of a longer growth trend that is expected to continue. The Madison Region and the Driftless Region are well positioned to benefit from any future increase in craft brewer demand. In addition to a growing number of breweries, the study area is home to fresh water resources, malt producers, and an increasing level of hops production. UW-Madison will begin offering a fermentation certificate in 2015 and is also home to the Kikkoman Fermentations Laboratory and faculty expertise. Breweries, wineries, and distilleries also have direct access numerous stainless steel tank and equipment fabricators in Wisconsin. In fact, Wisconsin is home to one of the nation's largest concentrations of stainless steel equipment manufacturers.

²⁹ The Brewers Association defines craft brewers according to three criteria:

1. Small – “Annual production of 6 million barrels or less”;
2. Independent – “Less than 25 percent of the craft brewery is owned or controlled by an alcoholic beverage industry member that is not a craft brewer”; and
3. Traditional – “A brewer that has a majority of its total beverage alcohol volume in beers whose flavor derives from traditional or innovative brewing ingredients and their fermentation.”

Cited from: www.brewersassociation.org/statistics/craft-brewer-defined/

International Export Trends

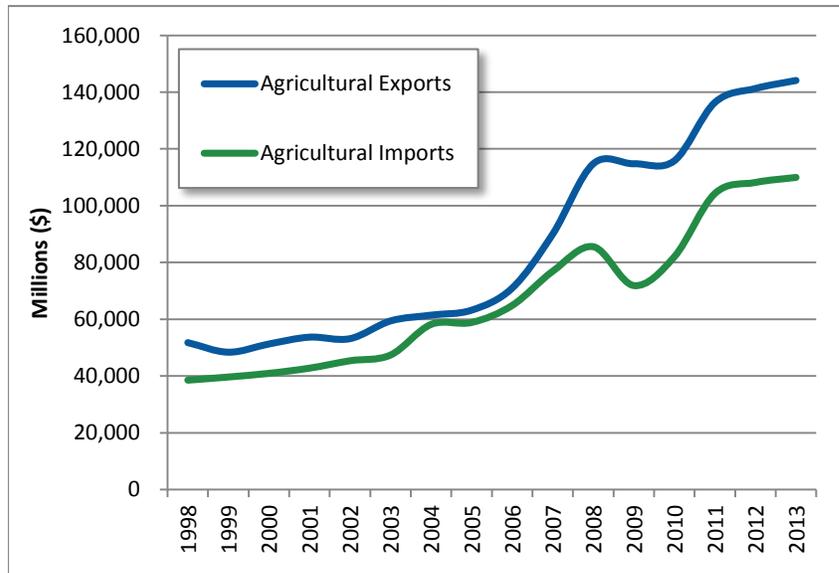
As domestic growth in overall food expenditures is somewhat limited, international markets are becoming an important source of revenue growth for both Wisconsin and U.S. firms. Between 2005 and 2013, the export value of agricultural and food products more than doubled in the United States. While agricultural imports have also increased during this period, the balance of trade between imports and exports has grown notably since 2006 (Figure 3.9). Canada and Mexico are primary destinations for exports, largely due to their proximity and advantages arising from the North American Free Trade Agreement (NAFTA). However, Japan, South Korea, and the Netherlands are also key markets, as are the so-called BRIC countries (Brazil, Russia, India and China).

Agricultural export estimates specific to the 14-county study area are unavailable from existing datasets. However, state-level data provide some perspectives on agricultural export trends in the region. While Wisconsin's actual agricultural export value cannot be measured directly, the USDA Economic Research Service has developed methods that provide

indirect estimates of exports. These methods overcome some of the challenges often associated with measuring exports. Specifically, agricultural commodity exports often pass through several processing points before arriving at a final destination. As the commodity passes through these points, the state-of-origin often is lost or the product is commingled with similar product from other states. Consequently, export data often reflects the state from which the commodity last started its export journey, not necessarily the state in which the commodity was produced. The ERS adjusts for these differences to measure exports by their "origin of production." More information on this methodology is available at: www.ers.usda.gov/data-products/state-export-data/documentation.aspx

In 2012, Wisconsin's agricultural exports totaled \$3.3 billion dollars, an increase from \$1.9 billion in 2009 (Table 3.4). Dairy products accounted for the largest amount (\$724.1 million), followed by the combined category of all other products (\$607.3 million), soybeans (\$548.8 million), and corn (\$299.7 million). The largest destinations for Wisconsin agricultural exports largely mimic those found for the entire U.S. and include Canada, Mexico, China, Korea, and Japan. Exports from Wisconsin and the study area have an opportunity to grow, but will likely require assistance from regional, state and national partners who can help local firms access and understand international markets. Helping local producers with export assistance is one opportunity for MadREP. DATCP and WEDC also provide assistance in connecting local producers to international buyers.

Figure 3.9 – U.S. Balance of Trade for Agricultural and Food Products



Source: USDA Economic Research Service

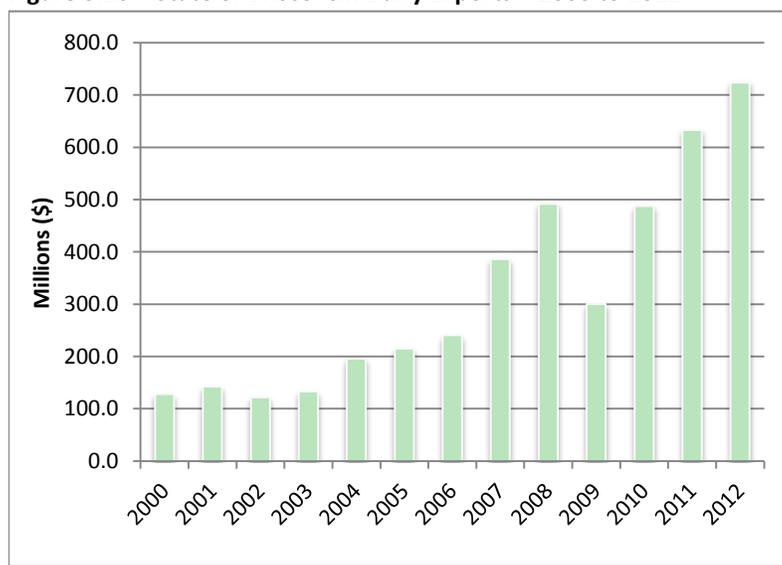
Table 3.4 – State of Wisconsin Agricultural Exports – 2008 to 2012 (Millions of Dollars)

Product	2008	2009	2010	2011	2012
Beef and veal	54.0	51.1	68.1	106.4	104.1
Pork	33.7	27.6	30.9	38.9	38.0
Hides and skins	34.9	24.3	38.1	52.2	52.4
Dairy products	492.3	300.4	487.8	632.9	724.1
Chicken meat	16.6	14.5	13.8	15.5	20.1
Vegetables, fresh	57.0	50.8	49.9	57.6	59.3
Vegetables, processed	92.3	81.8	77.7	93.3	111.4
Fruits, fresh	74.0	54.2	57.2	61.2	74.3
Fruits, processed	48.5	34.7	35.5	39.1	43.4
Tree nuts	0.0	0.0	0.0	0.0	0.0
Wheat	112.0	45.9	47.1	117.6	75.2
Rice	0.0	0.0	0.0	0.0	0.0
Corn	335.5	192.3	284.7	455.2	299.7
Grain products	91.8	75.2	105.7	142.6	149.2
Feeds and fodder	94.5	84.3	137.0	174.8	188.2
Soybeans	277.5	278.8	420.8	348.6	548.8
Soybean meal	57.6	59.4	79.5	63.8	109.4
Vegetable oils	63.0	49.0	81.6	72.0	83.2
Planting seeds	12.9	12.0	13.5	14.7	16.8
Other products*	451.9	427.3	464.1	566.1	607.3
Total agricultural exports	2,399.9	1,863.5	2,492.6	3,052.6	3,304.8

Source: USDA Economic Research Service

Wisconsin’s agricultural exports have increased across most commodity categories. However, the growth in dairy product exports has been particularly notable over the past decade, growing from \$127.9 million in 2000 to \$724 million in 2012 (Figure 3.10). Future growth in dairy exports presents an opportunity for producers and manufacturers in the Madison Region and Driftless Region. In particular, markets in China, North Africa and the Middle East are receiving attention as growth opportunities.

In recognizing the importance of international markets, Stephenson and Cropp (2014) note a number of issues that could help expand dairy exports. Just as consumer market research is important domestically, dairy producers will also need to learn international customer preferences. For instance, butter produced for U.S. markets is manufactured with 80 percent butterfat, but world markets expect 82 percent. Furthermore, international markets desire skim milk powder and while the U.S. currently produces non-fat dry milk. Understanding these nuances and other differences in international markets are one step in growing dairy exports.

Figure 3.10 – State of Wisconsin Dairy Exports – 2000 to 2012

Source: USDA Economic Research Service

Distribution

The variety of products produced in the region presents both challenges and opportunities related to their distribution. Specifically, distribution of food products to end users and consumers cannot be approached from a one-size-fits-all approach. The diversity of distribution considerations by scale, scope and destination precludes an in-depth examination within this abstract. Distribution data are also somewhat limited at the regional levels. However, the following overview of distribution considerations provides some perspectives on areas deserving future research or consideration. The overview also identifies several sources of comparative advantage for the Madison Region and Driftless Region.

Marketing Channels

Distribution of agricultural and food products occur through a variety of marketing channels. Many products may be moved from producers or manufacturers to end users or consumers through somewhat traditional intermediated wholesale channels. Some wholesale firms purchase raw agricultural products from agricultural producers and then re-sell these products to other users, including food and beverage manufacturers, retailers and restaurants. Other wholesalers purchase products produced by food and beverage manufacturing establishments and sell them to grocery stores, restaurants, public institutions or other retail outlets.

Marketing channels can also bypass the wholesale system and sell direct to consumers. Certainly farms with direct sales (as noted in Section 2) are an example of this distribution channel. However, agricultural producers and manufacturers also are increasingly selling direct to grocery stores, warehouse clubs and other food retailers. Direct marketing channels lower the prices paid by retail establishment, but also compromise wholesale revenues.

Marketing channels can also be categorized by their geographic reach. Specifically, King et al (2010) classify distribution models into *mainstream* and *local* supply chains. Local supply chains deliver local food products from producers to consumers, resulting in fewer miles traveled. These supply chains tend to handle a small share of a given product's overall demand and may be directed at a unique market niche. Local supply chains are more likely to provide product information that allows consumers to establish a bond with a local producer. Notably, participation in a local supply chain does not necessarily result in better financial outcomes for producers. However, producers in local supply chains tend to receive higher revenues on a per unit basis and retain a larger share of retail prices than those participating in mainstream chains.

In contrast, mainstream supply chains depend on national and international distribution networks. Despite a greater geographic extent, mainstream chains may still perform some local supply chain functions (e.g. retail distribution) and purchase in-season, locally-grown products. Prices paid to producers are more likely to be linked to national or international commodity prices. Mainstream supply chains may ship products over longer distances, but at greater fuel efficiencies per unit of product (King et al 2010).

When considering the variety of distribution channels, it is important to note that one channel is not necessarily superior to another. In fact, a robust and efficient distribution system will provide access to all of these options. A diverse distribution system is particularly important to the region’s AFB cluster given the wide variety of products produced in the region. Distribution also depends on a geographic reach that ranges from the emerging needs of local food producers to the requirements of firms exporting to international markets.

Distribution channels in the AFB sector are partly reflected in the study area’s diversity of wholesale establishments (Table 3.6). In the combined Madison Region and Driftless Region, there are 304 grocery and related product wholesale establishments (NAICS 4244); 213 farm product wholesalers (NAICS 4245) and 58 beer, wine and distilled alcoholic beverage wholesalers (NAICS 4248). The region is home to a number of large firms such as Sysco, Certco, and Wisconsin Distributors. However, most firms are smaller establishments employing 1 to 9 employees or 10 to 99 employees. Not surprisingly, the region has a sizeable presence of dairy product merchant wholesalers (64 establishments) and livestock merchant wholesalers (89 establishments).

Table 3.5 – Wholesale and Transportation Establishments in the 14-County Study Area

NAICS	Description	Total Establishments	Establishments by Number of Employees			
			1 to 9	10 to 99	100 to 499	500 or More
4841	General Freight Trucking	202	177	23	2	0
4842	Specialized Freight Trucking	27	18	8	1	0
49312	Refrigerated Warehousing and Storage	16	11	5	0	0
49313	Farm Product Warehousing and Storage	20	16	4	0	0
4244	Grocery and Related Product Merchant Wholesalers	304	245	45	13	1
42441	General Line Grocery Merchant Wholesalers	53	49	2	2	0
42442	Packaged Frozen Food Merchant Wholesalers	5	2	1	1	1
42443	Dairy Product Merchant Wholesalers	64	45	13	6	0
42444	Poultry & Poultry Product Merchant Wholesalers	15	12	3	0	0
42445	Confectionery Merchant Wholesalers	15	12	3	0	0
42446	Fish and Seafood Merchant Wholesalers	4	4	0	0	0
42447	Meat and Meat Product Merchant Wholesalers	13	8	4	1	0
42448	Fresh Fruit and Vegetable Merchant Wholesalers	19	13	4	2	0
42449	Other Grocery & Related Products Merchant Whlsle.	116	100	15	1	0
4245	Farm Product Raw Material Merchant Wholesalers	213	188	24	1	0
42451	Grain and Field Bean Merchant Wholesalers	57	46	10	1	0
42452	Livestock Merchant Wholesalers	89	77	12	0	0
42459	Other Farm Product Raw Material Merchant Whlsle.	67	65	2	0	0
4248	Beer, Wine, and Distilled Alcoholic Beverage Whlsle.	58	42	14	2	0

Source: National Establishment Time Series Data – 2013 Summary

Transportation Modes and Market Access

Distributors of agricultural, food and beverage products rely on a variety of transportation modes. Unfortunately, product transportation characteristics specific to the Madison Region and Driftless Region are unavailable. However, national shipment characteristics of agricultural and food products provide perspectives on how the cluster typically moves goods from producers to consumers. In terms of total value of shipments, the food manufacturing industry relies heavily on single-mode truck transportation (95.4 percent of total shipment values), using either for-hire services or through privately-owned fleets (Table 3.6). Rail alone (3.8 percent), or rail in combination with truck (2.4 percent) also account for a small share. However, when measured by weight, rail is responsible for almost 11 percent of food manufacturing shipments.

Shipment characteristics of specific types of agricultural products vary somewhat (see Appendix D for the full distribution of transportation modes by commodity type). Live animals are almost exclusively shipped by truck, as are meat, fish and seafood preparations. In contrast, milled grain and bakery products; prepared foodstuffs and oils; and other agricultural products depend on rail for 6 percent to 10 percent of the weight of their shipments. Cereal grains also have a large dependence on rail and shallow draft water shipping, with these two modes combining to account for approximately 45 percent of shipments by both weight and value.

Table 3.6 – National Shipment Characteristics for Food Manufacturing

Mode	Value (million \$)	Tons (thousands)	Ton-miles (millions) ²	Average miles per shipment
All modes	585,676	568,950	264,425	305
Single modes	95.4%	93.5%	87.8%	184
Truck	91.1%	81.5%	64.0%	170
For-hire truck	63.9%	50.7%	54.8%	567
Private truck	27.3%	30.8%	9.3%	61
Rail	3.8%	10.5%	23.3%	1,059
Water	0.3%	S	0.5%	1,106
Shallow	0.1%	S	S	S
Deep draft	0.1%	0.1%	0.2%	1,225
Air (incl. truck and air)	0.1%	0.0%	0.1%	1,991
Pipeline	0.0%	0.0%	S	S
Multiple modes	3.2%	4.7%	11.2%	922
Parcel, U.S.P.S. or courier	0.4%	0.0%	0.1%	914
Truck and rail	2.4%	3.7%	9.2%	1,116
Truck and water	0.3%	S	S	1,805
Rail and water	S	S	S	S
Other multiple modes	0.0%	S	S	S
Other and unknown modes	1.4%	1.8%	1.0%	96

S= suppressed ² Ton-miles estimates are based on estimated distances traveled along a modeled transportation network.

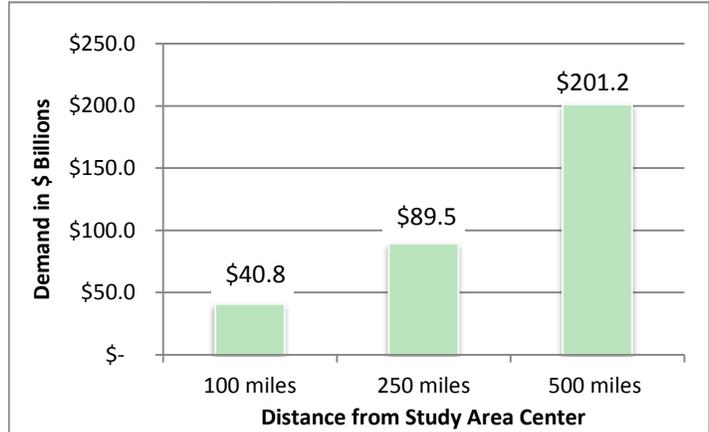
Sources: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics and U.S. Department of Commerce, U.S. Census Bureau, 2007 Economic Census: Transportation Commodity Flow Survey, December 2009.

The average shipment distances for food products also provide insights on the movement of goods within the AFB cluster. Truck shipments average 170 miles, with private trucks averaging just 61 miles and for-hire trucks averaging over 550 miles. These distances suggest that trucks shipments largely move between 50 and 500 miles. Rail and multi-modal shipments comprise a smaller share product movement, but occur over large

distances. Note that these transportation characteristics do not include international shipments, but rail and multi-modal transportation may be used to move products to coastal ports for shipment overseas.

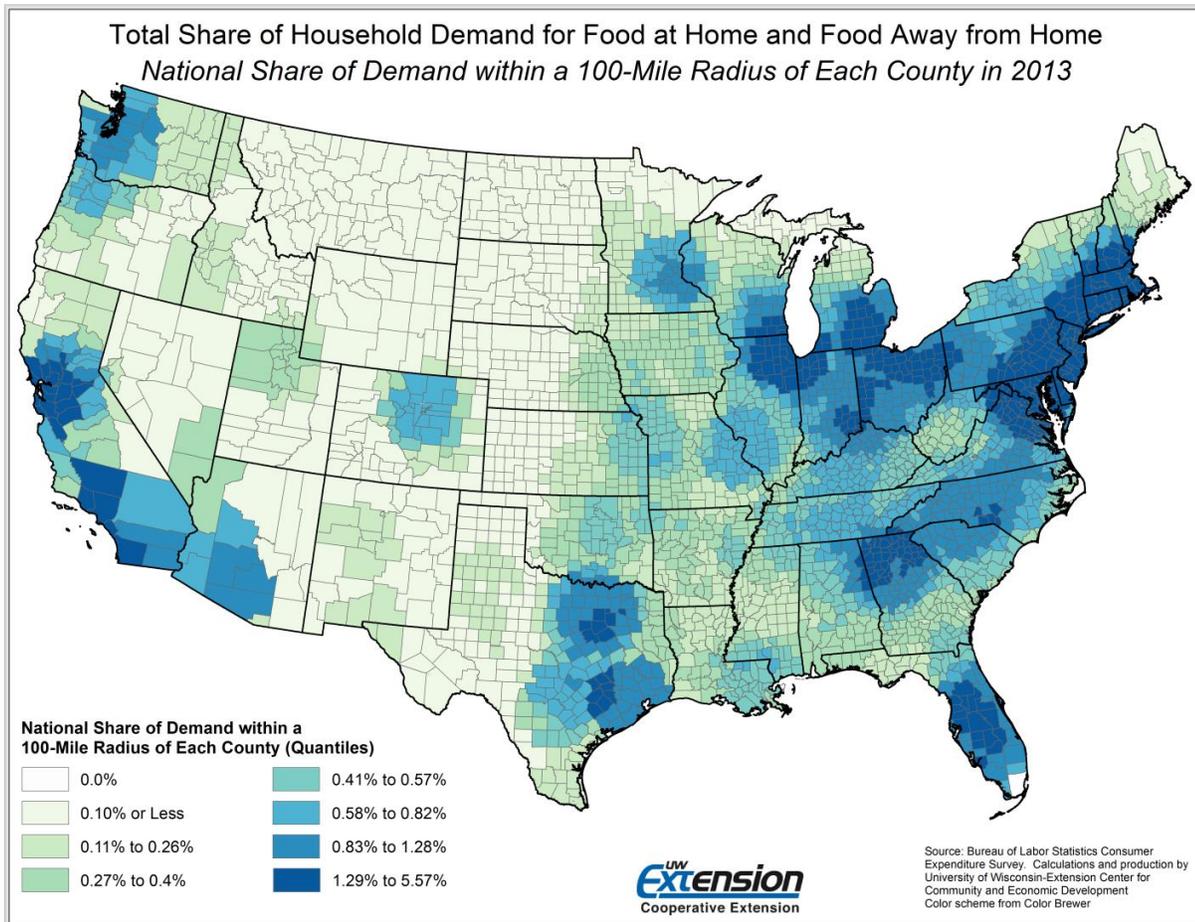
Significant household demand exists within typical trucking distances of the Madison Region and Driftless Region. Approximately \$40.8 billion in household demand for food is located within 100 miles of the 14 county study area (Figure 3.11). Within 250 miles, demand increases to \$89.5 billion (9.0 percent of the U.S. total). A 500 mile radius around the study area encompasses \$201.2 billion in total household demand, or 20 percent of total domestic demand. Proximity to large urban markets such as Chicago, Milwaukee and Minneapolis-St. Paul accounts for a notable portion of this demand. Chicago is particularly important as it has one of the nation’s largest concentrations of food demand (Figure 3.12).

Figure 3.11 – Household Food Demand within 100, 250 and 500 Miles of the Study Area (2013)



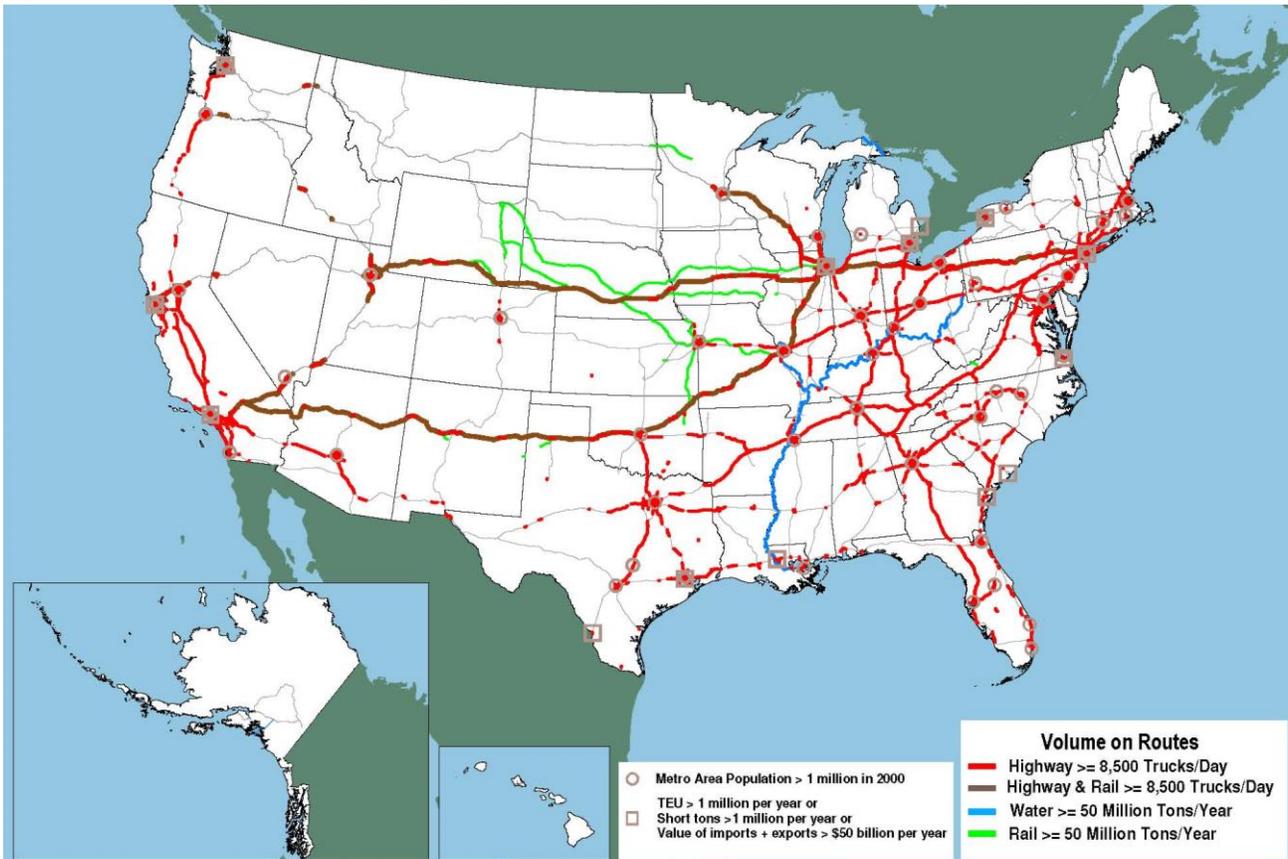
Source: U.S. Bureau of Labor Statistics Consumer Expenditure Survey, U.S. Census Bureau and Author’s Calculations.

Figure 3.12 – National Share of Household Food Demand within a 100-mile Radius of each County



Given the AFB cluster’s general reliance on truck shipments, availability of truck transportation and proximity to major highways are primary site selection considerations for firms. The region has almost 230 trucking establishments, including a number that specialize in the transportation of agricultural commodities (Table 3.5). Many of the aforementioned wholesale firms in the region also operate trucking operations. The study area’s highway network is also a noteworthy asset. While major and local highways connect all portions of the study area, one of the nation’s largest highway freight corridors runs through a significant portion of the region (Figure 3.13). This corridor traverses Monroe, Sauk, Columbia, Dane and Rock counties, connecting the study area with both the Chicago-Naperville-Elgin, IL-IN-WI MSA (the nation’s third largest) and the Minneapolis-St. Paul-Bloomington, MN-WI MSA (the nation’s 16th most populous).

Figure 3.13 – Components of Major Freight Corridors



Source: U.S. Department of Transportation, Federal Highway Administration, Office of Freight Management and Operations, 2008.

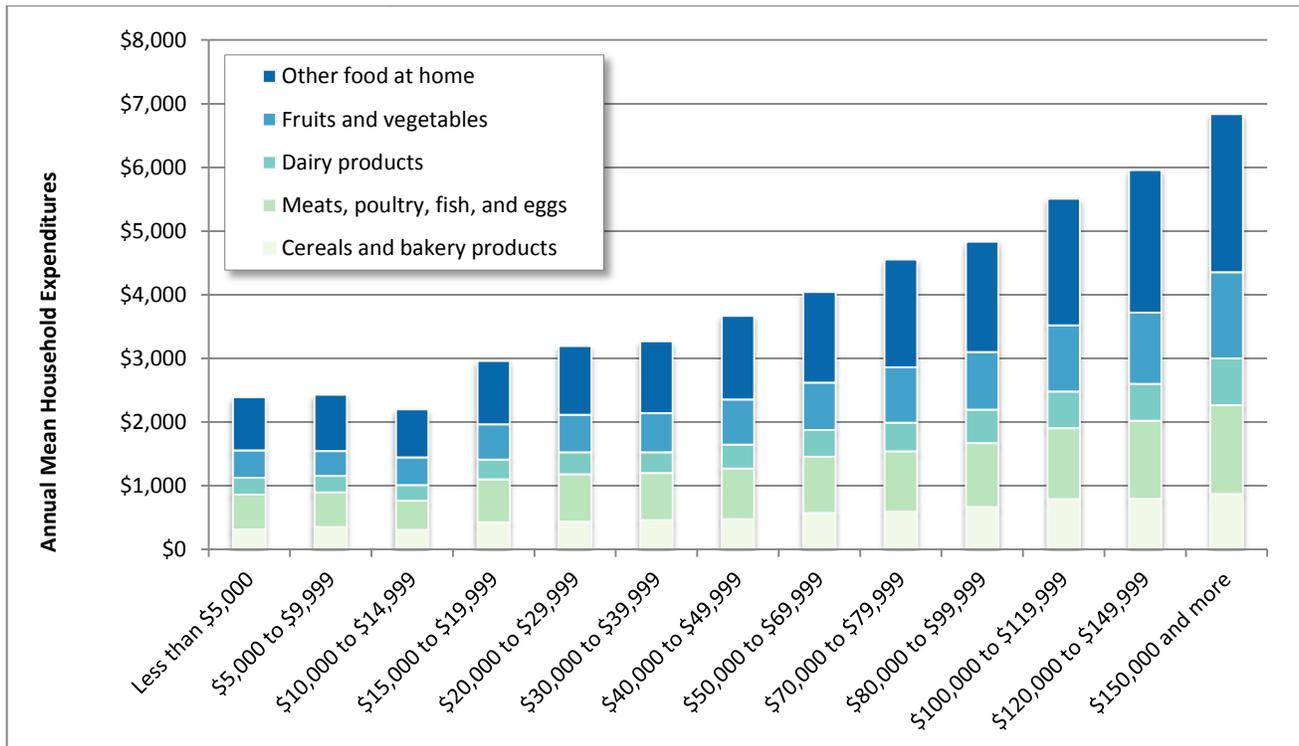
While rail is responsible for a smaller share of food and beverage product movement, rail is an important connection between the region and more distant markets. Rail is also an important link to international markets in North America, as well as ports serving overseas demand. Both short-line and Class 1 rail providers (BNSF, Canadian Pacific, and Union Pacific) are present in the study area. However, rail transportation is somewhat constrained by the limited intermodal facilities in the region. Efforts to increase demand for rail services and develop intermodal loading facilities could facilitate further movement of agriculture food and beverage products from the Madison Region and Driftless Region.

Conclusion

The region's AFB cluster has a strong presence of suppliers, distributors, highways and support organizations. The region also has emerging competitive advantages stemming from consumer demand in organics, craft beverages, local foods, fresh vegetables, and specialty cheeses. The region's geographic position provides access to 20 percent of the nation's household food demand within a 500 mile radius. However, this overview of support industries, consumer demand and distribution also presents opportunities for further cluster development. For instance, potential supply gaps and disconnects related to soybean processing, packaging materials, grain production, ingredient manufacturing and other specialty products deserve additional research. International export assistance through DATCP or other organizations for could help grow international markets. Furthermore, intermodal facilities could help in diversifying distribution channels for the region's food and beverage products. Exploring these opportunities will require working with many of the partner organizations and institutions in the region.

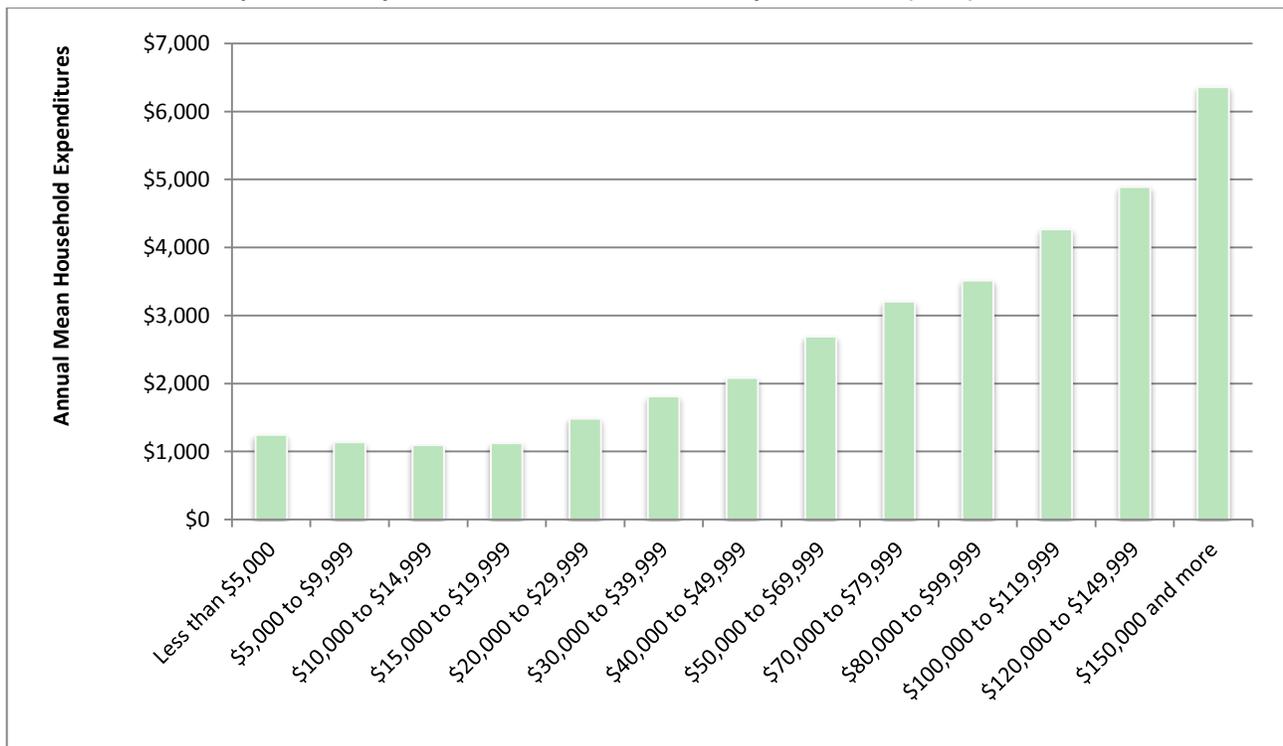
Appendix C – Annual Expenditures by Household Income

Annual Household Expenditures by Household Income on Food at Home (2013)



Source: Bureau of Labor Statistics Consumer Expenditure Survey

Annual Household Expenditures by Household Income on Food away From Home (2013)



Source: Bureau of Labor Statistics Consumer Expenditure Survey

Appendix D – Transportation Modes

National Shipment Characteristics for Live Animals and Live Fish (2007)

Mode	2007 Value (million \$)	2007 Tons (thousands)	2007 Ton-miles (millions) ²	2007 Average miles per shipment
All modes	10,833	6,150	3,973	739
Single modes	97.9%	98.8%	99.6%	315
Truck	95.8%	98.4%	98.9%	236
For-hire truck	72.9%	73.8%	91.3%	708
Private truck	22.9%	24.7%	7.6%	S
Rail	S	S	S	S
Air (includes truck and air)	S	S	S	1,463
Multiple modes	S	0.2%	0.3%	1,152
Parcel, U.S.P.S. or courier	S	0.2%	0.3%	1,152
Other and unknown modes	S	S	S	1,538

S= suppressed 2 Ton-miles estimates are based on estimated distances traveled along a modeled transportation network.

Sources: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics and U.S. Department of Commerce, U.S. Census Bureau, 2007 Economic Census: Transportation Commodity Flow Survey, December 2009.

National Shipment Characteristics for Cereal Grains

Mode	2007 Value (million \$)	2007 Tons (thousands)	2007 Ton-miles (millions) ²	2007 Average miles per shipment
All modes	84,851	514,151	203,446	139
Single modes	89.6%	90.7%	89.0%	129
Truck	43.6%	45.5%	8.6%	84
For-hire truck	23.1%	23.9%	5.7%	106
Private truck	20.5%	21.6%	2.9%	64
Rail	32.5%	31.4%	56.7%	800
Water	13.2%	13.5%	23.7%	1,008
Shallow draft	12.1%	12.5%	23.5%	1,022
Great Lakes	S	S	S	S
Deep draft	1.0%	1.0%	S	26
Air (includes truck and air)	S	S	S	S
Pipeline	S	S	S	S
Multiple modes	6.5%	6.2%	10.8%	1,007
Parcel, U.S.P.S. or courier	-	-	S	834
Truck and rail	S	S	S	1,145
Truck and water	S	S	S	920
Rail and water	2.1%	2.3%	S	784
Other multiple modes	2.2%	2.1%	4.0%	884
Other and unknown modes	S	S	S	101

S= suppressed 2 Ton-miles estimates are based on estimated distances traveled along a modeled transportation network.

Sources: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics and U.S. Department of Commerce, U.S. Census Bureau, 2007 Economic Census: Transportation Commodity Flow Survey, December 2009.

National Shipment Characteristics for Other Agricultural Products

Mode	2007 Value (million \$)	2007 Tons (thousands)	2007 Ton-miles (millions) ²	2007 Average miles per shipment
All modes	143,637	211,890	88,207	354
Single modes	91.0%	89.5%	81.8%	216
Truck	82.7%	72.7%	50.4%	207
For-hire truck	42.0%	35.4%	43.4%	966
Private truck	40.8%	37.4%	7.0%	103
Rail	3.9%	7.6%	15.8%	998
Water	3.9%	9.1%	15.3%	1,024
Shallow draft	3.2%	7.9%	14.9%	991
Great Lakes	S	S	S	S
Deep draft	S	S	S	1,050
Air (includes truck and air)	0.6%	S	S	972
Multiple modes	6.7%	8.1%	17.5%	982
Parcel, U.S.P.S. or courier	2.0%	-	0.1%	982
Truck and rail	3.3%	5.3%	11.0%	920
Truck and water	1.0%	2.0%	4.8%	1,732
Rail and water	S	S	S	S
Other multiple modes	S	0.8%	1.6%	S
Other and unknown modes	2.2%	2.4%	0.7%	S

S= suppressed ² Ton-miles estimates are based on estimated distances traveled along a modeled transportation network.

Sources: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics and U.S. Department of Commerce, U.S. Census Bureau, 2007 Economic Census: Transportation Commodity Flow Survey, December 2009.

National Shipment Characteristics for Animal Feed and Products of Animal Origin Not Elsewhere Classified

Mode	2007 Value (million \$)	2007 Tons (thousands)	2007 Ton-miles (millions) ²	2007 Average miles per shipment
All modes	90,472	246,436	76,188	499
Single modes	87.8%	92.4%	75.4%	144
Truck	82.2%	82.8%	47.8%	136
For-hire truck	40.2%	37.4%	33.8%	298
Private truck	42.1%	45.4%	14.0%	81
Rail	5.5%	9.4%	27.3%	884
Water	S	S	0.3%	2,241
Shallow draft	-	0.1%	0.2%	919
Deep draft	S	S	S	2,304
Air (includes truck and air)	-	-	S	S
Pipeline	S	S	S	S
Multiple modes	10.1%	6.3%	23.8%	1,006
Parcel, U.S.P.S. or courier	1.1%	0.1%	0.1%	998
Truck and rail	7.9%	4.4%	18.8%	1,461
Truck and water	S	S	S	2,575
Rail and water	S	S	S	S
Other multiple modes	-	S	S	S
Other and unknown modes	2.0%	1.3%	0.8%	77

S= suppressed ² Ton-miles estimates are based on estimated distances traveled along a modeled transportation network.

Sources: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics and U.S. Department of Commerce, U.S. Census Bureau, 2007 Economic Census: Transportation Commodity Flow Survey, December 2009.

National Shipment Characteristics for Meat, Fish, Seafood and their Preparations

Mode	2007 Value (million \$)	2007 Tons (thousands)	2007 Ton-miles (millions) ²	2007 Average miles per shipment
All modes	277,251	98,413	48,549	247
Single modes	97.4%	97.2%	87.4%	140
Truck	96.3%	95.8%	83.0%	128
For-hire truck	53.5%	53.9%	69.9%	581
Private truck	42.7%	41.9%	13.0%	66
Rail	0.5%	1.0%	3.2%	980
Water	0.3%	0.3%	0.8%	952
Shallow draft	-	-	S	50
Deep draft	0.3%	0.3%	0.8%	977
Air (includes truck and air)	0.4%	0.1%	0.4%	1,799
Multiple modes	1.6%	1.8%	5%	1,021
Parcel, U.S.P.S. or courier	0.4%	0.1%	0.2%	1,029
Truck and rail	0.4%	0.5%	1.4%	S
Truck and water	0.7%	1.2%	S	1,621
Rail and water	S	S	S	S
Other multiple modes	-	S	S	1,134
Other and unknown modes	1.0%	0.9%	0.5%	S

S= suppressed ² Ton-miles estimates are based on estimated distances traveled along a modeled transportation network.

Sources: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics and U.S. Department of Commerce, U.S. Census Bureau, 2007 Economic Census: Transportation Commodity Flow Survey, December 2009.

National Shipment Characteristics for Milled Grain Products and Preparations, and Bakery Products

Mode	2007 Value (million \$)	2007 Tons (thousands)	2007 Ton-miles (millions) ²	2007 Average miles per shipment
All modes	143,139	120,023	50,732	403
Single modes	93.6%	93.6%	87.6%	104
Truck	90.7%	85.3%	69.7%	103
For-hire truck	48.6%	48.6%	56.2%	497
Private truck	42.1%	36.7%	13.5%	63
Rail	2.8%	7.8%	17.8%	1,065
Water	S	S	S	S
Shallow draft	0.1%	S	-	15
Deep draft	-	S	S	S
Air (includes truck and air)	S	S	S	1,504
Pipeline	-	0.1%	S	S
Multiple modes	4.9%	4.2%	10.9%	1,151
Parcel, U.S.P.S. or courier	2.5%	0.2%	0.6%	1,151
Truck and rail	2.2%	3.7%	9.6%	1,359
Truck and water	0.2%	0.2%	0.7%	949
Rail and water	-	-	-	2,711
Other multiple modes	-	0.1%	-	S
Other and unknown modes	1.5%	2.2%	1.5%	S

S= suppressed ² Ton-miles estimates are based on estimated distances traveled along a modeled transportation network.

Sources: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics and U.S. Department of Commerce, U.S. Census Bureau, 2007 Economic Census: Transportation Commodity Flow Survey, December 2009.

National Shipment Characteristics for Other Prepared Foodstuffs and Fats and Oils

Mode	2007 Value (million \$)	2007 Tons (thousands)	2007 Ton-miles (millions) ²	2007 Average miles per shipment
All modes	479,757	468,435	171,452	268
Single modes	95.6%	96.1%	90.1%	100
Truck	92.7%	89.9%	72.0%	95
For-hire truck	49.8%	44.4%	60.5%	518
Private truck	42.9%	45.4%	11.5%	47
Rail	2.5%	5.7%	17.6%	1,092
Water	0.2%	0.5%	S	S
Shallow draft	0.1%	0.5%	S	S
Deep draft	-	-	0.1%	S
Air (includes truck and air)	0.1%	-	-	1,706
Pipeline	S	S	S	S
Multiple modes	3.1%	2.5%	8.8%	1,132
Parcel, U.S.P.S. or courier	1.3%	0.1%	0.2%	1,129
Truck and rail	1.5%	2.1%	7.3%	1,452
Truck and water	0.3%	0.3%	1.2%	1,716
Rail and water	-	S	S	6,136
Other multiple modes	-	-	-	3,254
Other and unknown modes	1.3%	1.4%	1.1%	114

S= suppressed ² Ton-miles estimates are based on estimated distances traveled along a modeled transportation network.

Sources: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics and U.S. Department of Commerce, U.S. Census Bureau, 2007 Economic Census: Transportation Commodity Flow Survey, December 2009.

