Abstract of the Madison Region's Agriculture, Food and Beverage Industry Cluster

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by
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MADISON REGION
ECONOMIC PARTNERSHIP

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Introduction

Contemporary economic development strategies recognize that regional assets are the true drivers of employment and income growth. The Madison Region is endowed with many potential assets, including competitive industry concentrations; high levels of human and social capital; robust physical infrastructure; and unique natural resources. While these assets influence many aspects of the regional economy, a notable number are connected in food production, processing and consumption. Diverse agricultural producers; established food and beverage manufacturing enterprises; nascent entrepreneurs; university resources; and a skilled labor force all provide a foundation for growing the region's agriculture, food and beverage industries.[1] However, the mere presence of these regional strengths does not guarantee future prosperity. Instead, the Madison Region must find ways to leverage these food-related assets in innovative manners that build economic opportunities, but also maintain the region's quality of life.

Over the past two decades, industry cluster initiatives have become a popular means for leveraging competitive assets in communities and regions. While a more in-depth discussion is provided below, industry clusters are geographically-concentrated businesses that are connected through 1) the products they produce; 2) the supplies, services, infrastructure and technologies they require; and 3) a common labor force. In other words, industry clusters are "groups of industries closely related by skill, technology, supply, demand, and/or other linkages" (Delgado, Porter and Stern 2014, p. 2). Importantly, industries in a cluster also share some level of common opportunities and threats. Developing an industry cluster initiative around the region's agriculture, food and beverage (AFB) sectors provides one opportunity for addressing any potential opportunities and threats by ultimately making these industries more competitive.

The Madison Region certainly possesses the necessary components to build an AFB cluster. However, Southern Wisconsin is by no means the only region attempting to build a cluster around its food-related assets. Cities, regions and states across the nation are aggressively pursuing cluster opportunities in the areas of food manufacturing; agricultural production; food and agricultural technology; and other related industries. *The challenge for the Madison Region is to build the AFB cluster around its comparative advantages in a manner that differentiates itself from other food-related cluster initiatives.* Accordingly, this abstract's primary goal is to begin understanding the region's AFB cluster in a way that identifies its potential comparative advantages.

Understanding Industry Clusters

While industry clusters are popular as economic development strategies, cluster initiatives are often misunderstood and misused. Many economic development practitioners fail to understand how clusters operate from a theoretical perspective, leading to poor participation of cluster stakeholders and improper implementation. Consequently, identifying potential sources of comparative advantage for the AFB cluster requires a basic understanding of industry cluster theory. Importantly, potential cluster stakeholders do not

[1] The recently completed *Advance Now* economic development strategy formally identifies agriculture and food systems as a legacy industry target or cluster initiative that holds promise for the Madison Region.

need an in-depth knowledge of this theory, but they should recognize how cluster components interact with each other.

As previously suggested, industry clusters are groups of industries connected by skills, technologies, supply chains, demand sources and other linkages. More commonly, industry clusters are "geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions (e.g. universities, standards agencies, trade associations) in a particular field that compete but also cooperate" (Porter 1998 p. 197). Several key terms in this definition provide guidance for this study of the region's AFB cluster:

- *Industry clusters involve interconnected companies, specialized suppliers, service providers, and firms in related industries* - The concept of clusters goes beyond the recognition of a single industry sector or classification. The cluster acknowledges important connections and relationships among industries and other business types that support each other through supply chains and service provision. In theory, the presence of these quality local suppliers and services creates efficiencies and increases firm competitiveness. For instance, nearby firms in the AFB cluster's supply chain might offer lower transportation costs, provide quicker delivery, or create better access to support;

  The recently completed *Advance Now* comprehensive economic development strategy broadly defines the agriculture, food and beverage (AFB) cluster to include industries related to plant and animal cultivation; food processing (including beverages); and food systems development and distribution. While these categories include a breadth of industries, they do not encompass the full spectrum of enterprises that would be considered part of an AFB cluster initiative. The region's AFB cluster certainly includes food and beverage manufacturing establishments and agricultural producers in the region. However, the cluster also includes businesses that support food producers and processors through supply chains and other types of support including packaging materials, equipment manufacturing, waste treatment, and professional and technical services (Figure i.1);

- *Industry clusters include associated institutions* – Industry clusters are not comprised solely of for-profit, private-sector firms. Industry clusters recognize the potential assistance and knowledge spillovers (transfers) that universities, trade associations, and government agencies can provide.[2] The participation of these institutions in cluster-based initiatives can provide research, labor training, advocacy, and other support for cluster establishments. While the Madison Region Economic Partnership (MadREP) will be a key partner in developing the AFB cluster, the initiative will also depend on support and participation from state agencies; other economic development organizations; local municipalities; educational institutions; workforce development entities; and non-profit enterprises that work with AFB-related businesses;

[2] Knowledge transfers can also occur among individual firms in an industry cluster.

Figure i.1 –Examples of Industries in the Agriculture, Food and Beverage Cluster

Agricultural Production

Oilseeds and Grains

Examples:

- Canola
- Soybeans
- Safflower
- Cottonseed
- Corn
- Oats
- Barley

Vegetable and Melons

Examples:

- Squash
- Melons
- Greens
- Cabbage
- Carrots
- Potatoes
- Beans

Fruits and Tree Nuts

Examples:

- Apples
- Cherries
- Pears
- Bananas
- Berries
- Citrus
- Almonds

Other Crops

Examples:

- Sugar cane
- Sugar beets
- Maple syrup
- Herbs
- Spices
- Hops

Beef, Poultry, Eggs and Pork

Examples:

- Beef cattle
- Veal calves
- Chickens
- Turkeys
- Ducks
- Pheasant
- Eggs

Dairy Producers

Examples:

- Dairy cattle and milk production

Seafood and Other Animal Products

Examples:

- Fish
- Shellfish
- Goats and goat milk
- Wild game
- Apiculture
- Bison

Food and Beverage Manufacturing

Grain and Oilseed Milling

Examples:

- Flour
- Malt
- Rice
- Corn Syrup
- Starches
- Oils
- Breakfast cereals

Sugar & Confectionery Products

Examples:

- Cane sugars and syrups
- Molasses
- Chocolate bars
- Cocoa products
- Candies and gum
- Granola Bars

Dairy Products

Examples:

- Fluid Milk
- Cheese
- Butter
- Whey & Casein
- Yogurt
- Ice Cream
- Infant Formula

Animal Processing

Examples:

- Fresh Beef, Pork, Lamb, or Poultry
- Sausages
- Bacon and Ham
- Animal fat and oil rendering
- Cured meats

Fruit and Vegetable Preserving & Specialty Foods

Examples:

- Fruit Juices
- Frozen/canned vegetables
- Frozen Dinners
- Pizzas
- Tomato and Pasta Sauces
- Jams and Jellies
- Soups

Seafood and Other Animal Products

Examples:

- Fresh fish
- Frozen seafood
- Pre-prepared seafood dinners
- Canned seafood
- Seafood soups

Bakery and Tortilla Products

Examples:

- Fresh and Frozen Breads
- Tortillas
- Pies and cakes
- Pastries
- Fresh or dried pasta
- Cookies and crackers

Other Food

Examples:

- Chips
- Coffee roasting
- Spices and extracts
- Sauces and dips
- Mayonnaise
- Fresh prepared vegetables

Soft Drinks and Ice

Examples:

- Soft drinks
- Flavored drinks
- Iced tea
- Bottled water
- Ice

Breweries, Wineries and Distilleries

Examples:

- Beer
- Wine
- Cider (alcoholic)
- Distilled liquor
- Packaged mixed drinks (alcoholic)

Support Services and Distribution

Packaging Materials

Examples:

- Plastic, metal and glass containers
- Paperboard boxes
- Plastic films and bags
- Printing services

Machinery and Equipment

Examples:

- Food product machinery
- Packaging machinery
- Conveyors and handling equipment
- Farm equipment
- Equipment repair

Professional and Technical Services

Examples:

- Soil sciences
- Accounting
- Marketing
- Food testing
- Engineering and design
- Veterinary

Utilities

Examples:

- Electrical power generation
- Natural gas distribution
- Water and wastewater

Distribution

Examples:

- Farm, grocery and related wholesale
- Truck and rail transportation
- Logistics services
- Warehousing

- *Industry clusters have a geographic concentration* – Clusters and their associated components are concentrated in a distinct geographic area. Geographic concentration allows for increased interaction and efficiencies to be developed among companies in a cluster. While the exact geographic extent of a cluster will depend on a variety of factors, the geographic scope of a cluster relates to the distance in which informational, transactional, incentive, and other efficiencies occur (Porter 2000). Accordingly, the geographic boundaries of clusters are defined by inter-company relationships and *not* political boundaries (Rosenfeld 2001). While the geographic area for this cluster analysis is based on a pre-determined geography (see below), there may be instances where AFB cluster opportunities extend into nearby areas. The State of Wisconsin also has a statewide food manufacturing cluster effort that should complement and support the Madison Region's AFB cluster initiative;

- *Industry cluster firms compete, but also cooperate* - Individual firms within an industry cluster are in competition with each other, but also exhibit a level of cooperation. Cooperation in an area allows firms to engage in activities such as joint-contract bidding; developing custom labor force training programs; coordinating research efforts; providing a unified voice on industry-wide issues; and improving their industry's visibility. The precondition of cooperation requires that private industry stakeholders and industry champions have key roles in an industry cluster. *Without cooperation, a region does not have an industry cluster, but rather a simple industry concentration of loosely-related firms.* Broad participation of cluster firms in the Madison Region will be vital to the success of an AFB cluster initiative. The true challenge is providing authentic motivations to firms and stakeholders that engage them in the cluster.

Study Area and Broader Context

The AFB study area is a 14-county region that stretches across south-central and southwest Wisconsin (Figure i.3). The study area is divided into two separate regions: the eight-county Madison Region served by the Madison Region Economic Partnership and a six-county "Driftless Region." The Madison Region consists of Columbia, Dane, Dodge, Green, Iowa, Jefferson, Rock, and Sauk counties. The six-county Driftless Region used in this analysis includes the counties of Crawford, Grant, Monroe, Lafayette, Richland and Vernon.[3] While these Driftless Region counties are served by other regional economic development organizations (Prosperity Southwest and 7 Rivers Alliance), the area has numerous economic and geographic connections to the Madison Region that are important components of the AFB Cluster.

As suggested earlier, it is also important to recognize that the AFB Cluster in the Madison Region is part of a larger food production and processing economy in the State of Wisconsin. The cluster is important as agricultural producers and food/beverage manufacturers make notable contributions to Wisconsin's gross domestic product (GDP). An industry's GDP is measured as its total output (e.g. sales) minus the cost of goods and services used in the production process. In other words, an industry's GDP is a measure of the value added to the economy through its labor and capital located in a state.[4] In 2012, food and beverage

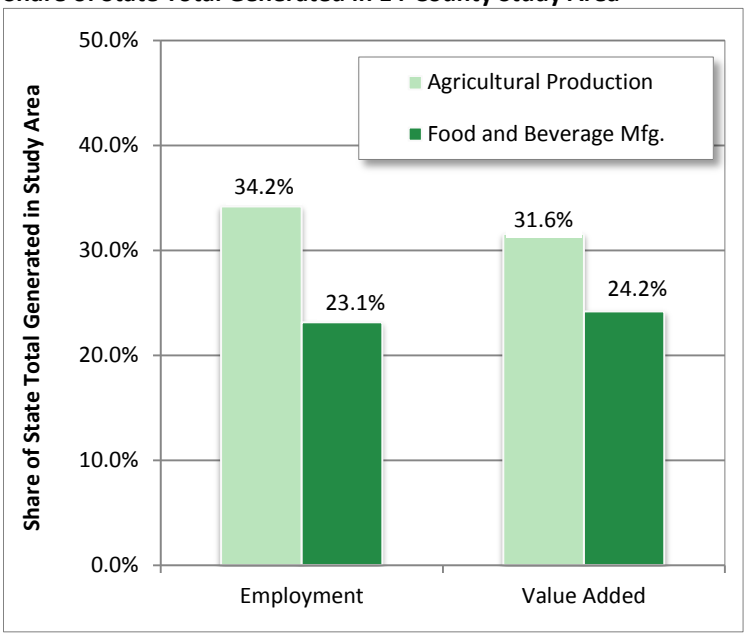
[3] The Driftless Region is a part of a larger area across the Upper Mississippi River Basin that was unglaciated during the most recent continental glacial period, resulting in steep, undulating topography.

[4] As noted by IMPLAN, value added consists of compensation of employees, taxes on production and imports (less subsidies) and gross operating surplus (e.g. proprietor's income, corporate profits, depreciation, etc.).

manufacturing accounted for 2.6 percent of Wisconsin's GDP. *While this figure may seem small, only nine states derived a higher share of their GDP from food and beverage manufacturing.* Similarly, agriculture production (farms) contributed 1.8 percent of Wisconsin's GDP, placing it 13th among all states (Figure i.4).

Food and beverage manufacturing establishments and agricultural production enterprises in the 14-county study area are responsible for notable contributions to the state's concentration of these industries. While the study area accounts for 20.7 percent of the state's population, the region produces an estimated 31.6 percent of Wisconsin's total value added (GDP) in agricultural production and 24.2 percent in food and beverage manufacturing (Figure i.2). Similarly, the study area contributes 34.2 percent of Wisconsin's total employment in agricultural production and 23.1 percent of food and beverage manufacturing employment. Consequently, the success of the state's food production and processing economy is largely dependent upon industries in the study area.

Figure i.2 – Wisconsin's Employment and Value Added in Agricultural Production and Food and Beverage Manufacturing – Share of State Total Generated in 14-County Study Area



Source: IMPLAN

Figure i.3 –Madison Region and Driftless Region Study Area

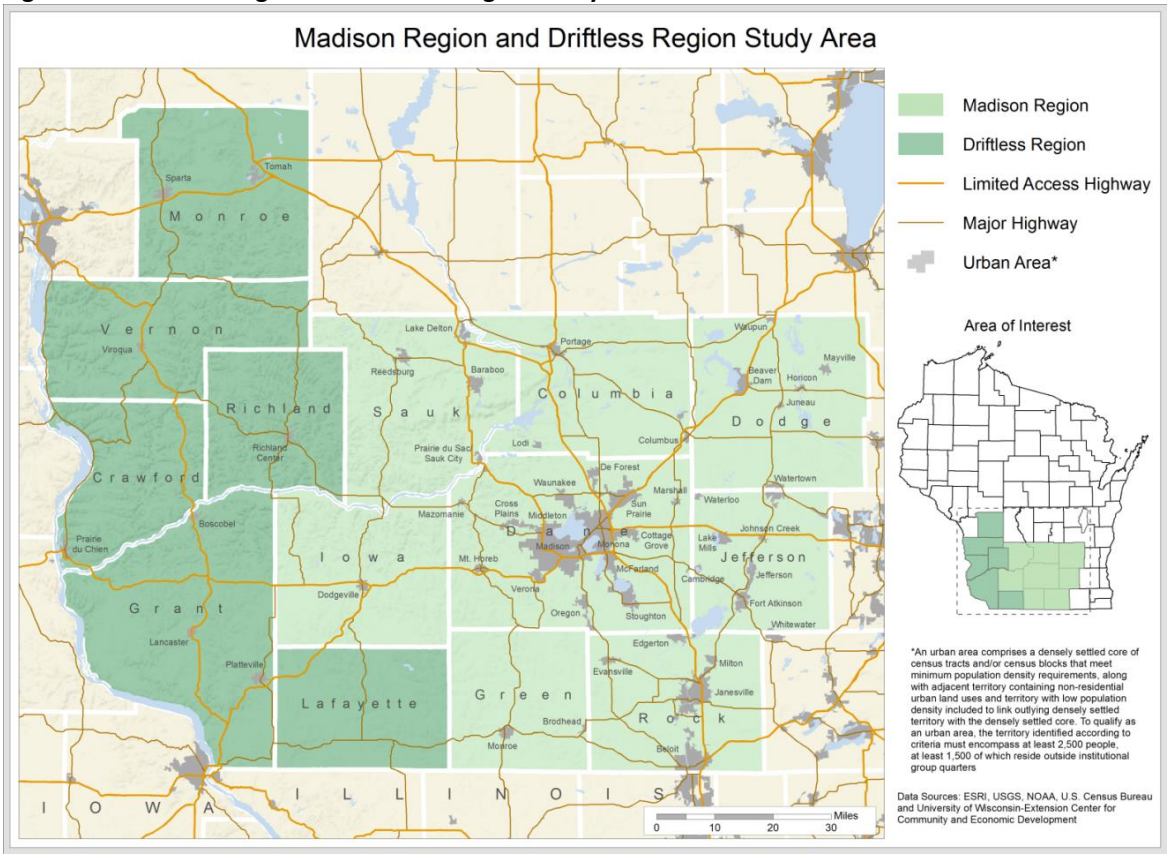
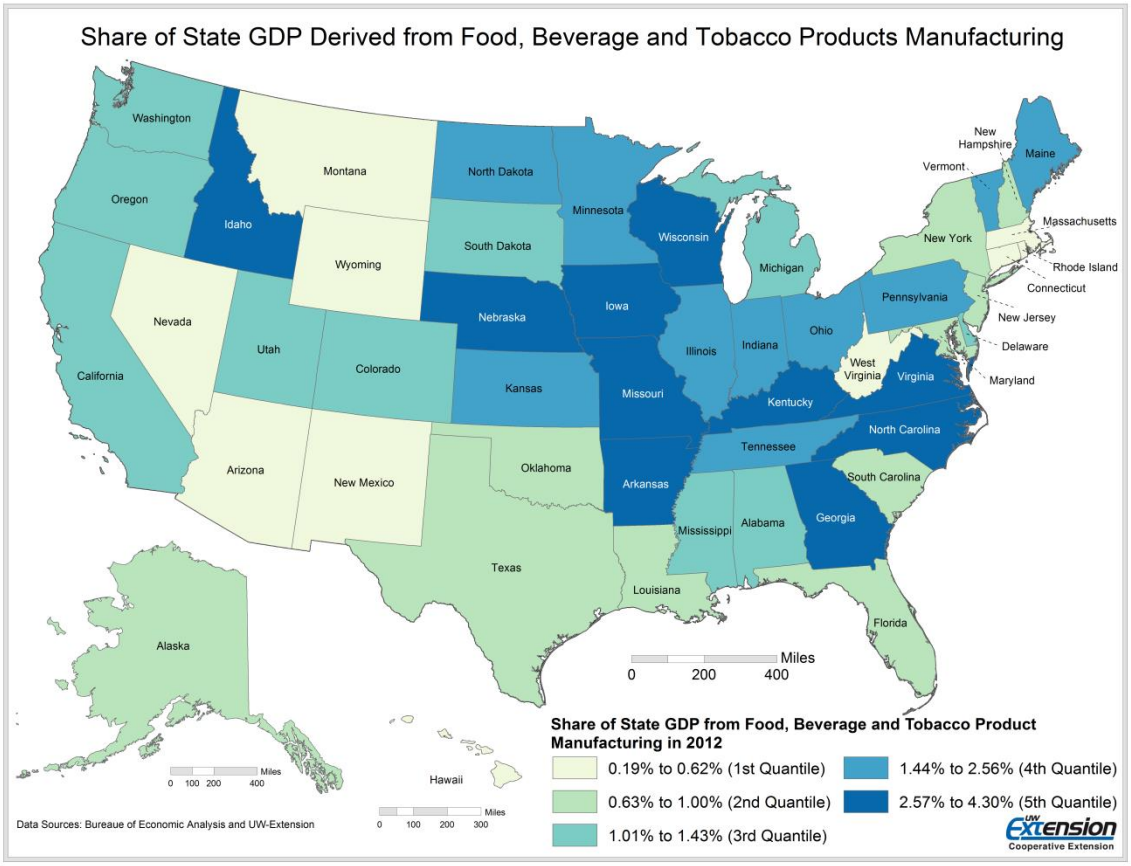
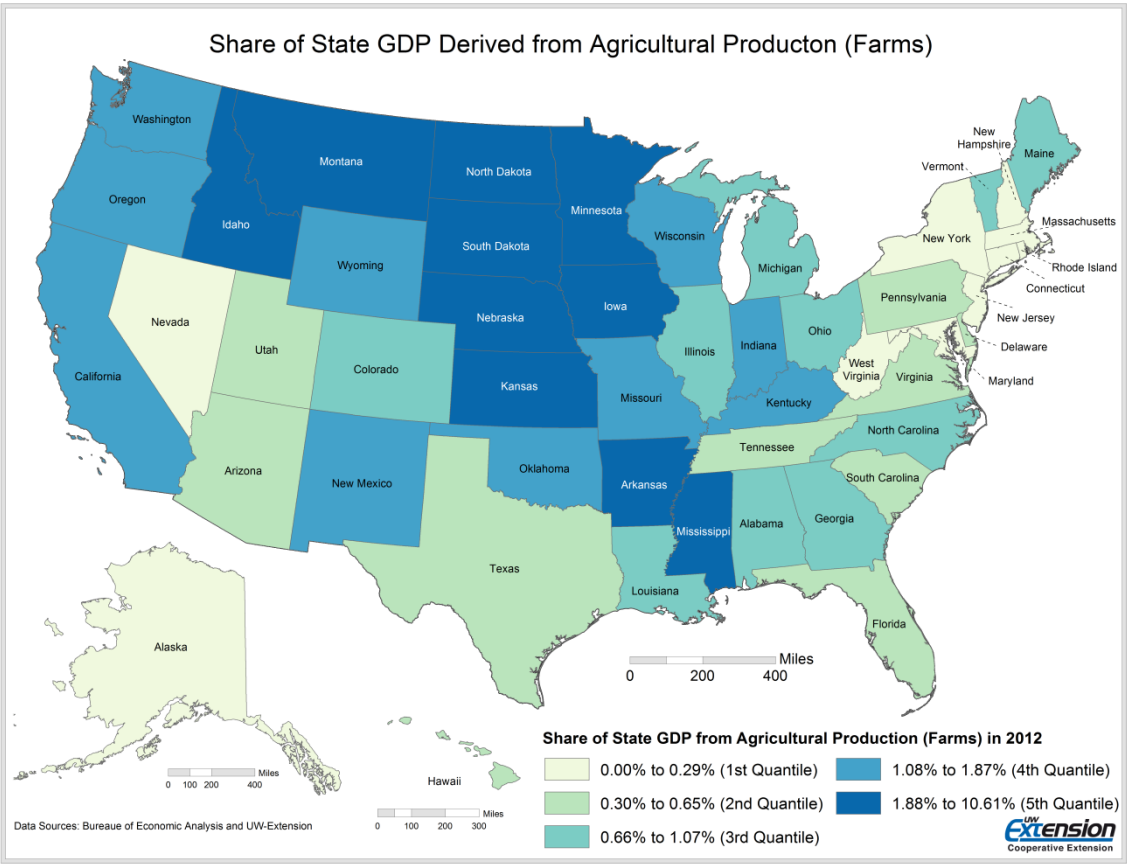


Figure i.4 – State GDP Contributions of Food, Beverage and Tobacco Manufacturing and Agricultural Production





Report Outline

Based on the preceding discussion, a successful AFB cluster initiative will require: 1) understanding the needs of the region's agricultural production enterprises and food/beverage manufacturing firms; 2) identifying potential supporting industries and supply chains; 3) developing the cluster's labor force; 4) enhancing the competitive environment; and 5) building opportunities for collaboration and engagement. To explore these cluster requirements, the remainder of this AFB cluster abstract is organized as follows:

- *Section 1- Employment and Establishments in the Region's Food and Beverage Manufacturing Industries* – This section considers the numbers and types of food and beverage manufacturing establishments in the region and their employment levels. Section 1 provides important context into the magnitude and direction of these industries in the region and across the United States;

- *Section 2 - Agricultural Production* – The study area has a large and diverse number of agricultural producers. Section 2 explores the types of agricultural products produced in the region; financial and operational characteristics of farms; and farm employment trends;

- *Section 3 – Support Industries, Demand Perspectives and Distribution Considerations* – Section 3 considers industries that potentially support the AFB cluster through technical assistance; facilities management and operation; packaging; distribution; and other services. The analysis attempts to suggests where potential gaps and disconnects in supply chain support may exist in the region. Section 3 also examines consumer demand across national and international markets;

- *Section 4 – AFB Human Capital* – The competitiveness of an industry cluster is partially driven by the quality of its labor force, entrepreneurs and research capacity. Section 4 evaluates occupations, wages, age distributions, and other characteristics of human capital tied to the AFB cluster.

- *Section 5 - Positioning the AFB Cluster for Success* - Cluster implementation is perhaps the most challenging component of the cluster development process. Implementation is process-intensive and requires developing a shared identity and clear vision supported by cluster stakeholders. Section 5 considers a general overview of implementation in the context of a competitive, rapidly-changing industry cluster;

Finally, readers of this abstract should note that the broad appeal of cluster initiatives often leads to high expectations for results. Despite all of the proposed benefits to regions and firms, it is important to recognize that the success of clusters as an economic development strategy is uncertain, even when fully understood and properly implemented. While examples of successful cluster initiatives exist, empirical evidence on the ability of clusters to increase competitiveness, generate job growth, and produce new economic activity is being actively debated among researchers (for examples see: Palazuelos 2005; McDonald et al 2007; Motoyama 2008; Woodward 2012; and Delgado et al 2014). *Nonetheless, the lack of conclusive evidence does not mean that regions should abandon cluster initiatives. Clusters can succeed with proper guidance and participation. Furthermore, industry clusters remain beneficial as a framework for analyzing the AFB industries as they can identify the potential connections and synergies among firms in the region.*

Section 1 - Employment and Establishments in the Region's Food and Beverage Manufacturing Industries

Food manufacturing enterprises (NAICS 311)[5] comprise a central part of the AFB industry cluster. With over 30,000 establishments and 1.47 million employees, food manufacturing is one of the nation's largest manufacturing sub-sectors in terms of employment, output and gross domestic product. Food manufacturing establishments depend upon agricultural products, but the industry does not directly produce livestock or crops. Instead, firms in the industry process fruits, vegetables, animals, nuts and other goods into value-added products. Products are typically distributed to consumers through wholesalers and retailers, but the industry also includes direct-selling establishments primarily found in retail baking and candy products.

Beverage manufacturing establishments (NAICS 3121) are also an important part of the cluster, albeit at a smaller level than food manufacturing. Nationally, beverage manufacturing accounts for 6,500 establishments and 185,000 employees. The industry converts inputs into both non-alcoholic and alcoholic beverages. Ice manufacturing is also included as a component of non-alcoholic beverage manufacturing, as it uses the same production process as purification for bottled water.

The food and beverage manufacturing industries are segmented into groups distinguished by the specific raw materials used to process products. Specific categories include:[6]

- *"Animal Food Manufacturing (NAICS 3111)* – Establishments primarily engaged in manufacturing food and feed for animals from ingredients such as grains, oilseed mill products, and meat products;
- *Grain and Oilseed Milling (NAICS 3112)* – Establishments involved in flour milling; malt manufacturing; starch and vegetable fats and oils manufacturing; and breakfast cereal manufacturing;
- *Sugar and Confectionery Product Manufacturing (NAICS 3113)* – Establishments that process agricultural products such as sugarcane, beet, and cacao to produce a new product (sugar or chocolate), or those that begin with sugar and chocolate and process these further;
- *Fruit and Vegetable Preserving and Specialty Food Manufacturing (NAICS 3114)* - Includes establishments that freeze food and those that use preservation processes, such as pickling, canning, and dehydrating. The industry is split into two sub-categories:
    1. Frozen foods including frozen fruit; frozen juices; frozen vegetables; and frozen specialty foods such as pizza, dinners, entrees, and side dishes;
    2. Fruit and vegetable canning, pickling, and drying which includes canned, pickled, and dried fruits, vegetables, and specialty foods. The category also includes products such as canned juices; canned baby foods; canned soups; canned dry beans; canned tomato-based sauces (catsup, salsa, etc.); pickles, relishes, jams and jellies; dried soup mixes and bullions; and sauerkraut.

[5] NAICS is the North American Industrial Classification System. As noted by the U.S. Census Bureau, "NAICS is the standard used by Federal statistical agencies in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy." For more information see: http://www.census.gov/eos/www/naics/

[6] Industry descriptions are based on NAICS definitions from the U.S. Census Bureau at: http://www.census.gov/eos/www/naics/index.html

- *Dairy Product Manufacturing (NAICS 3115)* **-** Establishments that manufacture dairy products from raw milk, processed milk, and dairy substitutes such as: fluid milk, butter, cheese, ice cream and dry/condensed/evaporated products;

- *Animal Slaughtering and Processing (NAICS 3116)* **-** Establishments engaged in slaughtering animals; preparing processed meats and meat byproducts; and rendering or refining animal fat, bones, and meat scraps. The category also includes establishments primarily involved in the cutting and packing of fresh and processed meats (bacon, sausage, lunch meat, hams, etc.) from purchased carcasses;

- *Seafood Product Preparation and Packaging (NAICS 3117)* - Includes establishments primarily engaged in one or more of the following: canning seafood; smoking, salting, and drying seafood; cleaning fresh fish; shucking and packing fresh shellfish; processing marine fats and oils; and freezing seafood;

- *Bakeries and Tortilla Manufacturing (NAICS 3118)* **–** Produce products including bread and bakery products (by both retail and commercial bakeries); frozen cakes, pies and other pastries; cookies, crackers, pasta, dough and flour mixes; and tortillas;

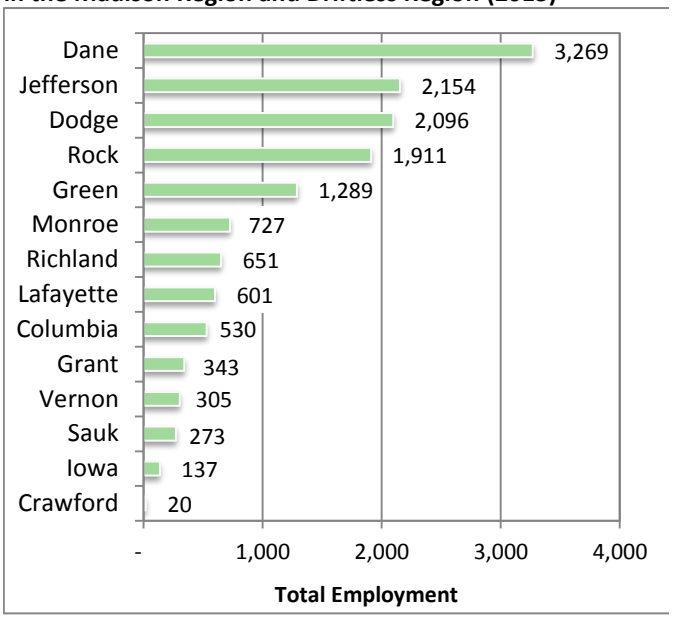
- *Other Food Manufacturing (NAICS 3119)* **–** Establishments manufacturing a variety of products including snack foods; coffee and tea; flavoring syrup and concentrates; seasonings and dressings; spices and extracts; perishable prepared foods; and all other miscellaneous food products;

- *Beverage Manufacturing (NAICS 3121)* - Beverage manufacturing encompasses three categories of establishments: 1) those that manufacture nonalcoholic beverages (including ice); 2) those that produce alcoholic beverages through a fermentation process; and 3) firms that distil alcoholic beverages."

Employment

Food manufacturing accounts for over 11,600 jobs in the Madison Region and 2,600 jobs in the Driftless Region (Figure 1.1). When combined, these two regions comprise approximately 23 percent of all food manufacturing employment in the State of Wisconsin. While the highest employment levels are found in the most populous counties of Dane, Dodge, Jefferson and Rock, the food manufacturing industry employs over 100 workers in all counties but Crawford. *Due to confidentiality concerns from reporting agencies, employment data for beverage manufacturing in the region is largely suppressed*. However, Dane, Jefferson and Green Counties each report over 100 employees in the beverage manufacturing industry.

Figure 1.1 – Food Manufacturing Employment by County in the Madison Region and Driftless Region (2013)



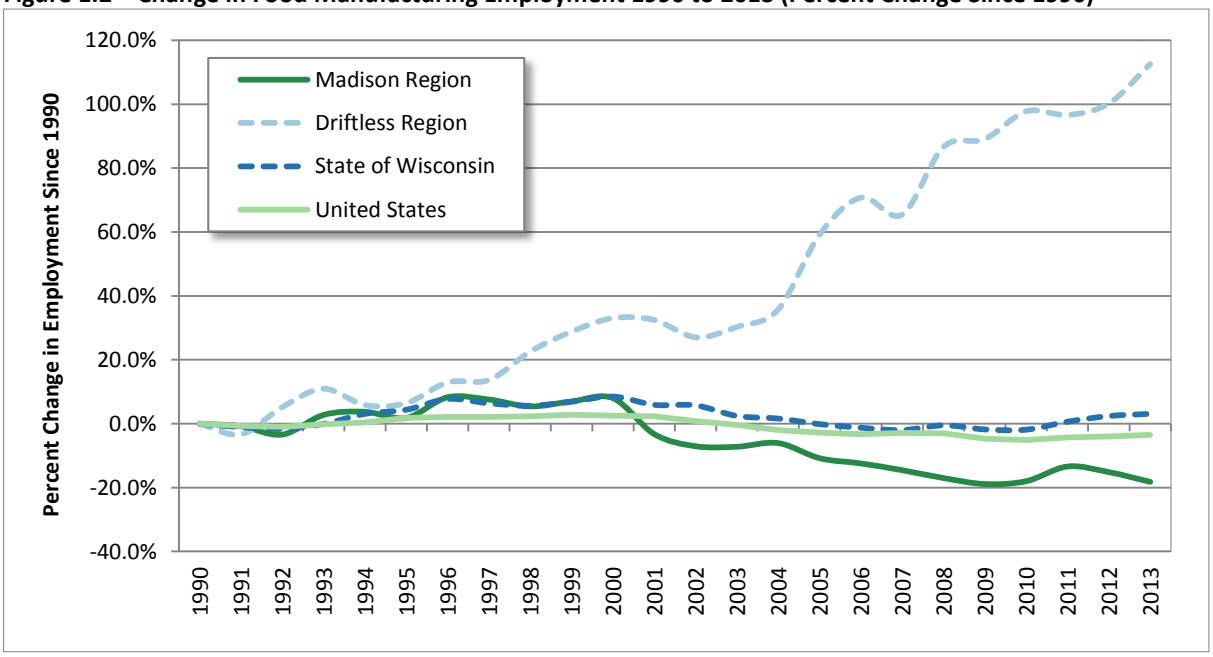
Source: U.S. Census Bureau LEHD, U.S. Bureau of Labor Statistics and Author's Calculations. Some figures are estimated.

Nationally, employment changes in food manufacturing tend to be less volatile than those found in many other manufacturing sub-sectors. Since 1990, year-over-year total U.S. employment in food manufacturing has varied by no more than +/- 1.7 percent (Figure 1.2). The industry's relative stability is also reflected in its limited employment growth. Specifically, total U.S. employment in food manufacturing peaked in 1999 at 1.56 million jobs and since has steadily declined to 1.47 million in 2013.

Food manufacturing in the State of Wisconsin shows a somewhat similar employment trend as that of the United States. On a percentage basis, food manufacturing employment in the state grew faster than the national average in the 1990s, but also experienced employment declines in the 2000s. More recently, food manufacturing jobs have rebounded somewhat in Wisconsin, with employment growing by 5.0 percent (3,000 jobs) between 2010 and 2013. While U.S. employment also increased by 1.7 percent over this three-year period, national employment in food manufacturing continues to remain below job levels in 1990.

Food manufacturing employment trends in the Madison Region and the Driftless Region have diverged from state and national trends. Since 1990, employment in the Madison Region has dropped by -18.2 percent, with the largest declines occurring after 1999. *In contrast, employment in the Driftless Region has increased by 112.5 percent.* While the percentage change in the Driftless Region is somewhat intensified by its relatively small employment baseline in 1990, the increase is significant nonetheless.

Figure 1.2 – Change in Food Manufacturing Employment 1990 to 2013 (Percent Change Since 1990)



Source: U.S. Census Bureau LEHD, Bureau of Labor Statistics, and Author's Calculations

The relative employment stability of the food manufacturing sector might suggest that the industry is somewhat recession-proof or immune to large changes. However, the food manufacturing industry is highly competitive and is swayed by macroeconomic conditions. While domestic population growth and international export potential can increase overall demand for food products, factors such as changing disposable income levels, consumer confidence, and unemployment rates can influence overall spending. Food categories such as snack foods, premium prepared meals, branded foods, fresh vegetables, canned foods

and frozen products are particularly susceptible to changes in the economy, both positive and negative. Furthermore, consumer preferences can change quickly, leading to increased spending for some products and reduced demand for others. Accordingly, innovation and capitalization on market trends are two factors of success in the industry.

The food manufacturing employment declines in the Madison Region should be a reminder of the competitiveness of the industry. Unfortunately, data confidentiality and suppression issues do not allow for a detailed analysis of employment trends in sub-categories of food manufacturing. However, sufficient data exist to suggest that the Madison Region's drop in food manufacturing employment is largely explained by job losses in dairy manufacturing and animal processing. Some of these declines are the result of nine mass layoff and plant closing events in the region's dairy processing industry, affecting more than 600 employees between 2000 and 2010. Furthermore, the job declines in animal processing are largely attributed to gradual employment reductions at Oscar Mayer in Madison, which is by far the largest animal processing facility in the region. *Consequently, the employment changes are not necessarily indicative of overall declining regional competitiveness in food manufacturing, but rather structural changes within individual firms and categories.*

Location Quotients

Location quotients provide another means of analyzing food manufacturing employment in the region. A location quotient (LQ) is calculated by comparing food manufacturing's share of local employment to the industry's share of overall national employment:

$$\textit{Location Quotient (LQ) for food manufacturing} = \frac{\dfrac{\text{Food manufacturing employment in the region}}{\text{Total employment in the region (all industries)}}}{\dfrac{\text{Food manufacturing national employment}}{\text{Total national employment (all industries)}}}$$

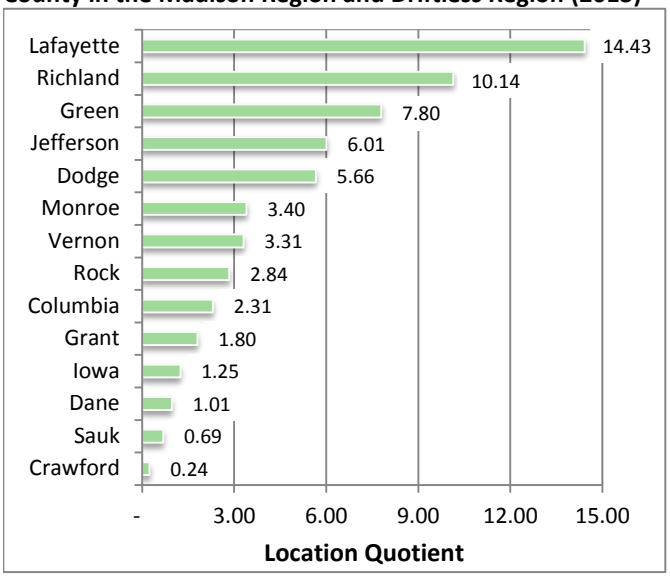
The critical value for a location quotient is 1.0. An LQ of 1.0 means an area has the *same* proportion of local employment in an industry as the nation. An LQ *greater* than 1.0 denotes that an area's share of employment in a given industry is more than its national share. Conversely, an LQ *less* than 1.0 indicates an area's employment in an industry is below the national percentage. Due to accuracy issues with employment data, location quotients between 0.75 and 1.25 are generally considered not to be significantly different from 1.0.[7]

Location quotients greater than 1.25 are important as they imply that an area has a specialization in a given industry. More specifically, an LQ greater than 1.25 suggests that an industry is producing more goods or services than can be consumed locally. These goods and services are in turn exported out of the region, connecting the area to external economies and bringing outside dollars into local communities (i.e. they have an export-orientation). In contrast, an LQ less than 0.75 suggests that local industries are not meeting demand (demand is greater than supply) and the good or service must be imported into the region.

[7] Differences in local demand preferences compared to national conditions, or the efficiency of a local industry, have the potential to skew the results of a location quotient analysis.

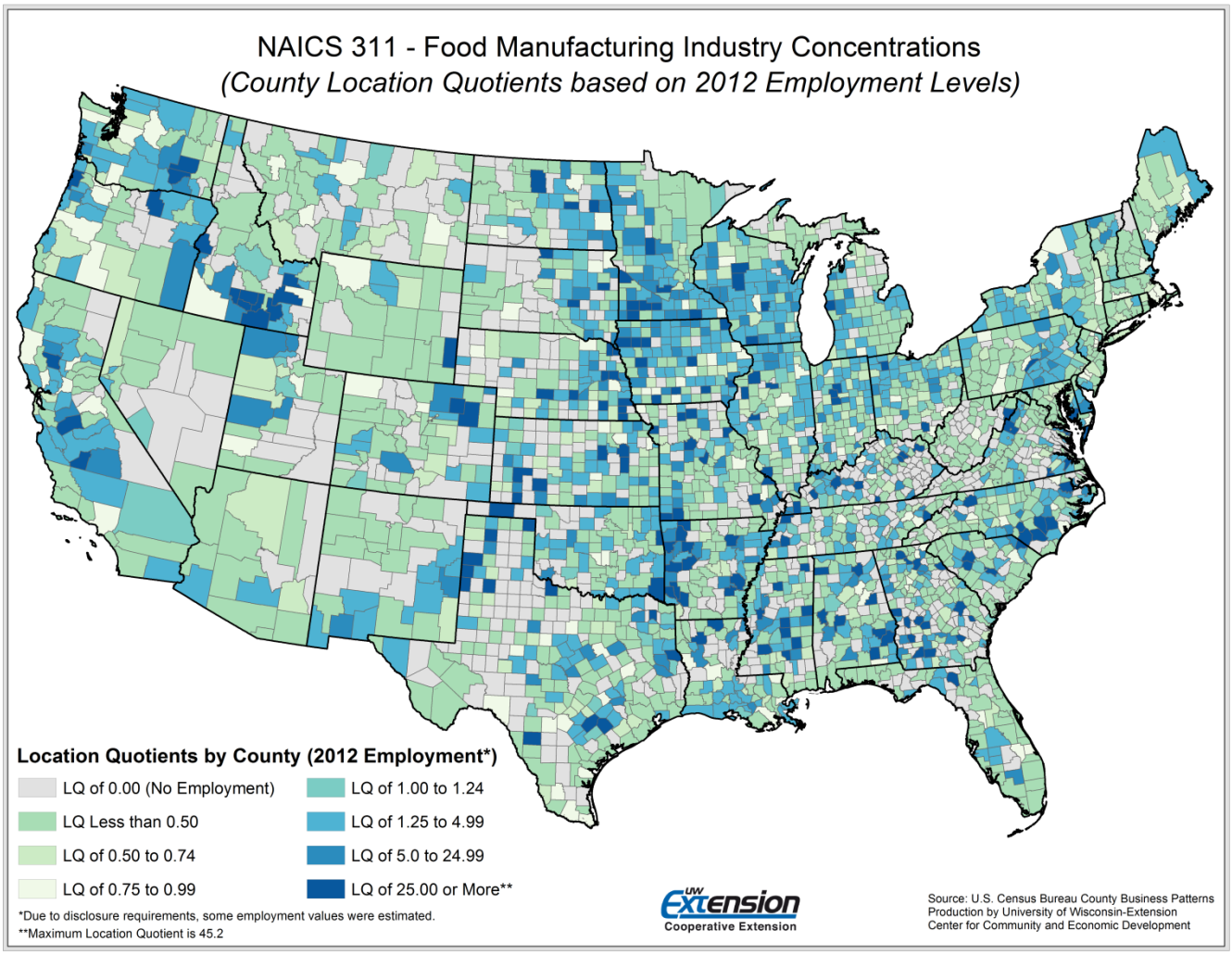
With the exceptions of Sauk and Crawford, every county in the study area has a food manufacturing location quotient either at or above 1.0 (Figure 1.3). In most instances county location quotients are significantly greater than 1.0, with Dodge, Jefferson, Richland and Lafayette counties having LQs above 5.0. These high location quotients all suggest that food manufacturing injects outside dollars into the regional economy and is a source of specialization. These figures reiterate the importance of food manufacturing as an export industry across the rural-urban continuum found in the study area. The high location quotients in study area counties also show the geographic specialization of the region relative to other areas in the United States (Figure 1.4).

Figure 1.3 – Food Manufacturing Location Quotients by County in the Madison Region and Driftless Region (2013)



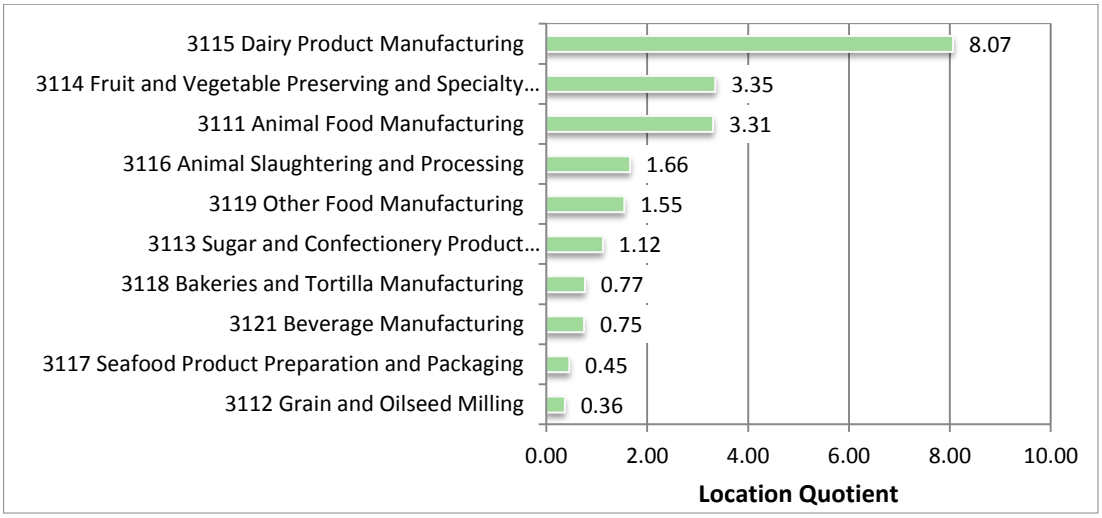
Source: U.S. Census Bureau LEHD, U.S. Bureau of Labor Statistics and Author's Calculations. Some figures are estimated.

Figure 1.4 – Food Manufacturing Location Quotients by County



Location quotients for several sub-categories of food manufacturing are also significant within the fourteen-county study area (Figure 1.5). Large regional LQs are found in dairy product manufacturing (LQ = 8.07); fruit and vegetable preserving and specialty food manufacturing (3.35); animal food manufacturing (3.31); animal slaughtering and processing (1.66); and other food manufacturing (1.55). While these categories of food manufacturing are broad in scope, their relative concentrations may provide one opportunity to differentiate the region from other food-related clusters and concentrations suggested by the map in Figure 1.4. Geographic concentrations of specific food and beverage manufacturing categories are examined later in this abstract.

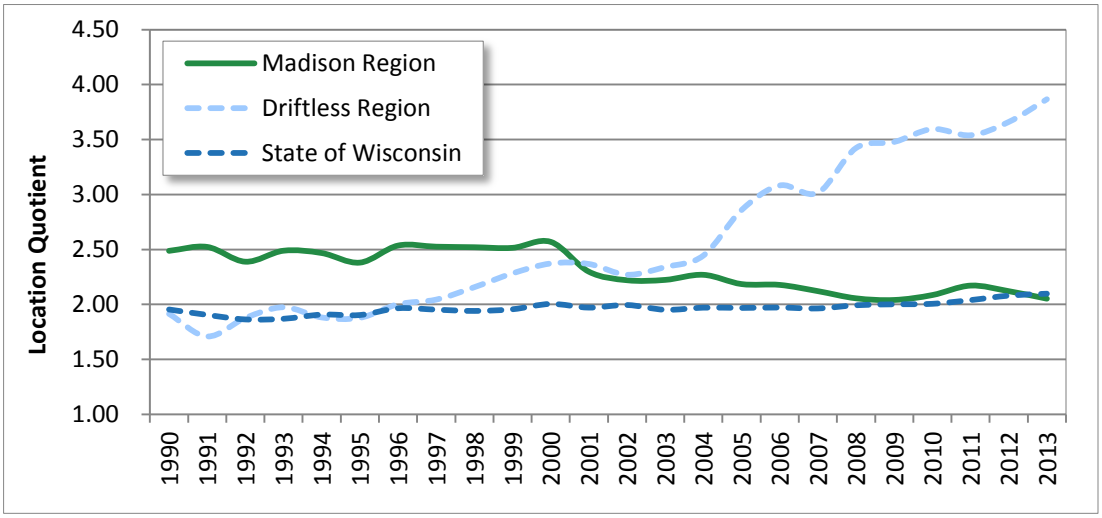
Figure 1.5 – Fourteen County Study Area Location Quotients in Food Manufacturing Sub-Categories



Source: IMPLAN (2011 figures)

Trends in food manufacturing location quotients provide one final perspective on industry change (Figure 1.6). Between 1996 and 2013, the Driftless Region's food manufacturing location quotient increased from 1.97 to 3.87. The increasing LQ reflects the regional employment gains previously noted in Figure 1.2. In contrast, the Madison Region's food manufacturing LQ decreased from 2.54 to 2.05, which is indicative of the region's waning employment. Again, this trend may not necessarily reflect the region's overall competitiveness in the industry, but rather structural changes within specific firms in the region.

Figure 1.6 – Change in Food Manufacturing Location Quotient 1990 to 2013



Source: U.S. Census Bureau LEHD, U.S. Bureau of Labor Statistics and Author's Calculations. Some figures are estimated.

Establishments

The fourteen county study area is home to 341 food manufacturing establishments. The Madison Region accounts for 280 of these establishments (Table 1.1), while the Driftless Region is responsible for the remaining 61 locations (Table 1.2). These establishments vary dramatically in their size, products produced, and ownership structure. With 108 establishments, firms categorized under bakeries and tortilla manufacturing (NAICS 3118) account for the largest share (31.2 percent) of food manufacturing locations in the study area. While this percentage may seem high, it is actually lower than the national average, where bakeries and tortilla manufacturing facilities account for 41.3 percent of all food manufacturing establishments. These facilities include numerous neighborhood retail bakeries in addition to a few larger facilities that produce products on a more significant commercial scale (such as Bimbo Bakeries USA).

Dairy product manufacturing (NAICS 3115) establishments are highly concentrated and potentially represent the largest source of differentiation for the region's AFB cluster. With a combined 69 establishments, the Madison Region and Driftless Region have one of the largest regional concentrations of dairy product manufacturing in the entire nation (See map in Appendix A). These firms span standalone, branch and headquarter facilities and include locally-owned producers (such as Carr Valley, Hooks, and Crave Brothers); establishments networked through cooperatives (including Foremost Farms and AMPI); and locations attached to large corporations (e.g. Saputo Inc. and Kraft Foods Global). While the industry has ten locations with 100 to 499 employees, it is largely comprised of establishments with 10 to 99 employees and 1 to 9 employees.

In terms of total establishments, animal slaughtering and processing (NAICS 3116) is the study area's third largest food manufacturing category. Similar to dairy product manufacturing, the industry includes numerous small processors located throughout the region. However, the region's animal processing industry also contains a number of corporate branch facilities with larger employment levels such as those attached to Johnsonville, Hormel and Tyson. This category also includes Oscar Mayer, which is the single largest employer in the region's food manufacturing industry.

Fruit and vegetable preserving and specialty foods (NAICS 3114) include 24 establishments across diverse categories of production. Establishments in fruit and vegetable preserving and specialty foods include small-to-midsize, locally-owned facilities (such as Quince and Apple, Emil's Pizza, and J.G. Van Holten and Sons). The category also accounts for large canning and frozen food processing facilities owned by firms such as Seneca Foods Corporation and McCain Foods USA Inc. Other food manufacturing (NAICS 3119) includes 34 facilities producing a breadth of syrups, snack foods, seasonings, flavor extracts, spices and refrigerated salads.

Twenty-five beverage manufacturing establishments are found in the region. These facilities include producers of bottled water, soft drinks, beer, wine and distilled beverages. Importantly, a number of notable beverage firms are not included in these statistics. For instance, Potosi Brewery and Ale Asylum are classified elsewhere in the NAICS classification scheme. Similar omissions are also found among the region's brewpubs, which are classified under eating and drinking places. The exclusion of these firms (and likely others) are important as they show the limitation of any data set used to examine the regional economy. Consequently, MadREP has been provided with several lists of firms to help identify gaps in the data. Furthermore, there are likely establishments that produce a diversity of food and beverage products, but are only classified in a single category of manufacturing in Table 1.1 and Table 1.2.

Table 1.1 – Food and Beverage Manufacturing Establishments in the Madison Region

NAICS	Description	Total Establishments	Establishments by Number of Employees			
			1 to 9	10 to 99	100 to 499	500 or More
311	***Food Manufacturing - Total***	***280***	***147***	***108***	***24***	***1***
3111	Animal Food Manufacturing	25	9	15	1	0
3112	Grain and Oilseed Milling	10	5	5	0	0
3113	Sugar and Confectionery Product Manufacturing	20	11	7	2	0
3114	Fruit and Vegetable Preserving & Specialty Foods	24	9	12	3	0
3115	Dairy Product Manufacturing	49	12	30	7	0
3116	Animal Slaughtering and Processing	33	15	11	6	1
3117	Seafood Product Preparation and Packaging	1	1	0	0	0
3118	Bakeries and Tortilla Manufacturing	90	68	19	3	0
3119	Other Food Manufacturing	28	17	9	2	0
3121	***Beverage Manufacturing Total***	***28***	***18***	***8***	***2***	***0***
31211	Soft Drink and Ice Manufacturing	6	3	1	2	0
31212	Breweries	9	3	6	0	0
31213	Wineries	12	11	1	0	0
31214	Distilleries	1	1	0	0	0

Source: National Establishment Time Series Data – 2013 Summary

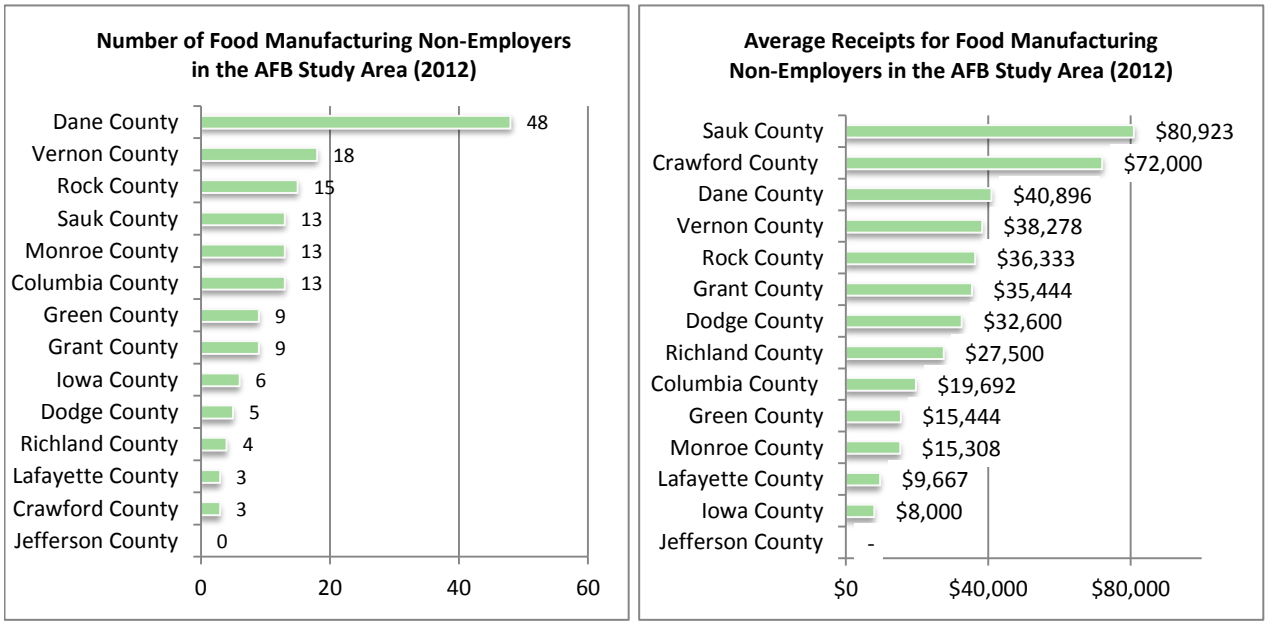
Table 1.2 – Food and Beverage Manufacturing Establishments in the Driftless Region

NAICS	Description	Total Establishments	Establishments by Number of Employees			
			1 to 9	10 to 99	100 to 499	500 or More
311	***Food Manufacturing - Total***	***61***	***42***	***15***	***4***	***0***
3111	Animal Food Manufacturing	6	4	2	0	0
3112	Grain and Oilseed Milling	2	2	0	0	0
3113	Sugar and Confectionery Product Manufacturing	0	0	0	0	0
3114	Fruit and Vegetable Preserving & Specialty Foods	0	0	0	0	0
3115	Dairy Product Manufacturing	20	8	9	3	0
3116	Animal Slaughtering and Processing	10	7	3	0	0
3117	Seafood Product Preparation and Packaging	0	0	0	0	0
3118	Bakeries and Tortilla Manufacturing	18	17	1	0	0
3119	Other Food Manufacturing	5	4	0	1	0
3121	***Beverage Manufacturing Total***	***7***	***6***	***1***	***0***	***0***
31211	Soft Drink and Ice Manufacturing	2	1	1	0	0
31212	Breweries	0	0	0	0	0
31213	Wineries	5	5	0	0	0
31214	Distilleries	0	0	0	0	0

Source: National Establishment Time Series Data – 2013 Summary

The establishment counts in Table 1.1 and Table 1.2 may not include some firms in the Madison Region and the Driftless Region classified as *non-employers*. Non-employer figures originate from tax return information collected by the Internal Revenue Service and provide some perspective on the so-called "1099" economy. Non-employers are sole-proprietors who may have small enterprises located at home or elsewhere. These businesses may or may not be the sole source of income for their operators. However, these non-employers may be a potential source of nascent entrepreneurs looking to grow their business. In 2012, more than 150 food manufacturing non-employers were found in the study area (Figure 1.7).[8] While these individuals may be difficult to identify, they may provide one opportunity for growing the region's AFB cluster.

Figure 1.7 - Food Manufacturing Non-Employers



Source: U.S. Census Bureau Non-Employer Statistics and Author's Calculations

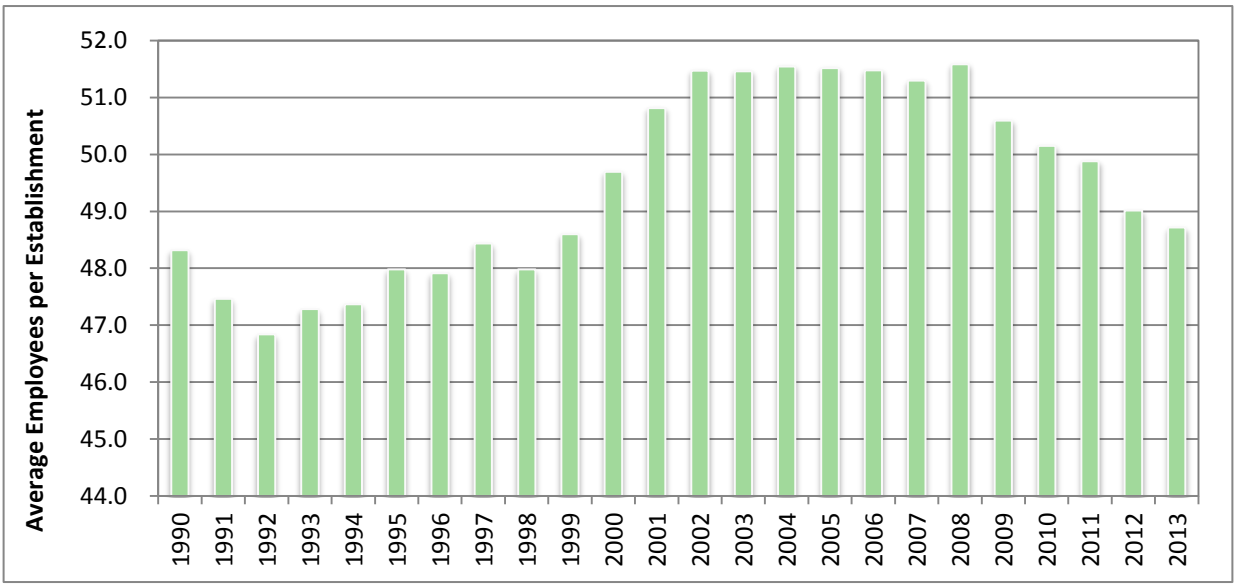
The establishment distributions in Table 1.1 and Table 1.2 show that the majority of food and beverage manufacturing establishments in the study area are small employers. Smaller establishments also dominate the industry on a national basis. Not including retail bakeries, 86 percent of national food processing establishments have fewer than 100 employees. However, facilities with 100 or more employees are responsible for almost 77 percent of employment in the sector.[9]

Despite the prominence of small establishments, consolidation is occurring across the food manufacturing industry. Some of this consolidation is being driven by merger and acquisition activities as large companies look to increase market shares. New technologies are also allowing plant sizes to increase sharply and benefit from economies of scale that lower per unit costs and minimize labor needs. These trends are particularly apparent in the dairy and meatpacking industries (Ollinger et al 2005). Consolidation activity and economies of scale are also somewhat reflected in the recent decline in the national average number of employees per food manufacturing establishment (Figure 1.8).

[8] Data suppression does not allow for an analysis of beverage manufacturing non-employers.

[9] Source: Bureau of Labor Statistics and Author's Calculations.

Figure 1.8 – National Average Number of Employees per Establishment (Food Mfg. Establishments with Employees)



Source: Bureau of Labor Statistics and Author's Calculations

Regardless of industry consolidation trends, the diversity of establishments in the region creates both opportunities and challenges. In particular, the variety of products manufactured in the region presents several opportunities for economic growth. *However, this diversity also suggests that the cluster cannot be supported using a one-size-fits all approach.* Producers of various products likely will have some common needs, but also may face unique challenges. Consequently, the AFB cluster will require the support of many affiliated stakeholders and organizations.

As firms change in size, their needs and requirements for support also vary. Identifying firms by *stage* provides broad insights on resources that might be provided by a community. For instance, economic development strategies targeting larger establishments will likely tilt toward business retention and workforce development activities. In contrast, smaller firms may require support in the form of access to capital and technical assistance.

One particular type of firm often overlooked by economic and business development activities are Stage 2 firms, or so-called second-stage companies. Stage 2 companies are distinct from other firms as they have survived the start-up process, but also reached a position where the complexity of running the company has exceeded the capacity of one owner or CEO. Consequently, more formal operational structures and strategy may be needed to continue growth and evolve into the next stage of business. However, the time, expertise and revenue are often unavailable within the firm to support these changes (Edward Lowe Foundation 2013). Due to their unique position, these firms often fall between economic development efforts that look to generate start-ups and those that work with the retention and attraction of larger firms.

Importantly, research from the Edward Lowe Foundation suggests that second-stage companies provide an important source of employment growth. For instance, second-stage companies represented only 11.6 percent of U.S. establishments between 1995 and 2012, but generated nearly 34 percent of jobs and about 34.5 percent of sales over this period.[10] *In contrast, employment within Stage 4 (large firms) has declined in*

[10] Based on figures from the National Establishment Time Series database.

both the food manufacturing industry and across all combined industry sectors. Second-stage establishments typically have 10-99 employees and $1 million to $50 million in revenue. Accordingly, many of the study area's food and beverage manufacturing firms potentially fit into this definition. While not all of these firms may want to grow, dedicated programs to support enterprises in this growth stage could provide a unique opportunity for the region.

Figure 1.9 – Business Stages

1. **Self-Employed/Non-Employer (1 employee) – "**Includes small-scale business activity that can be conducted in homes as well as sole proprietorships";
2. **Stage 1 (2-9 employees) – "**Includes partnerships, lifestyle businesses and startups. This stage is focused on defining a market, developing a product or service, obtaining capital and finding customers";
3. **Stage 2 (10-99 employees) – "**At this phase, a company typically has a proven product, and survival is no longer a daily concern. Companies begin to develop infrastructure and standardize operational systems. Leaders delegate more and wear fewer hats";
4. **Stage 3 (100-499 employees) – "**Expansion is a hallmark at this stage as a company broadens its geographic reach, adds new products and pursues new markets. Stage 3 companies introduce formal processes and procedures, and the founder is less involved in daily operations and more concerned with managing culture and change";
5. **Stage 4 (500 or more employees) –** "By Stage 4, an organization dominates its industry and is focused on maintaining and defending its market position. Key objectives are controlling expenses, productivity, global penetration and managing market niches".

Source: Edward Lowe Foundation/YourEconomy.org

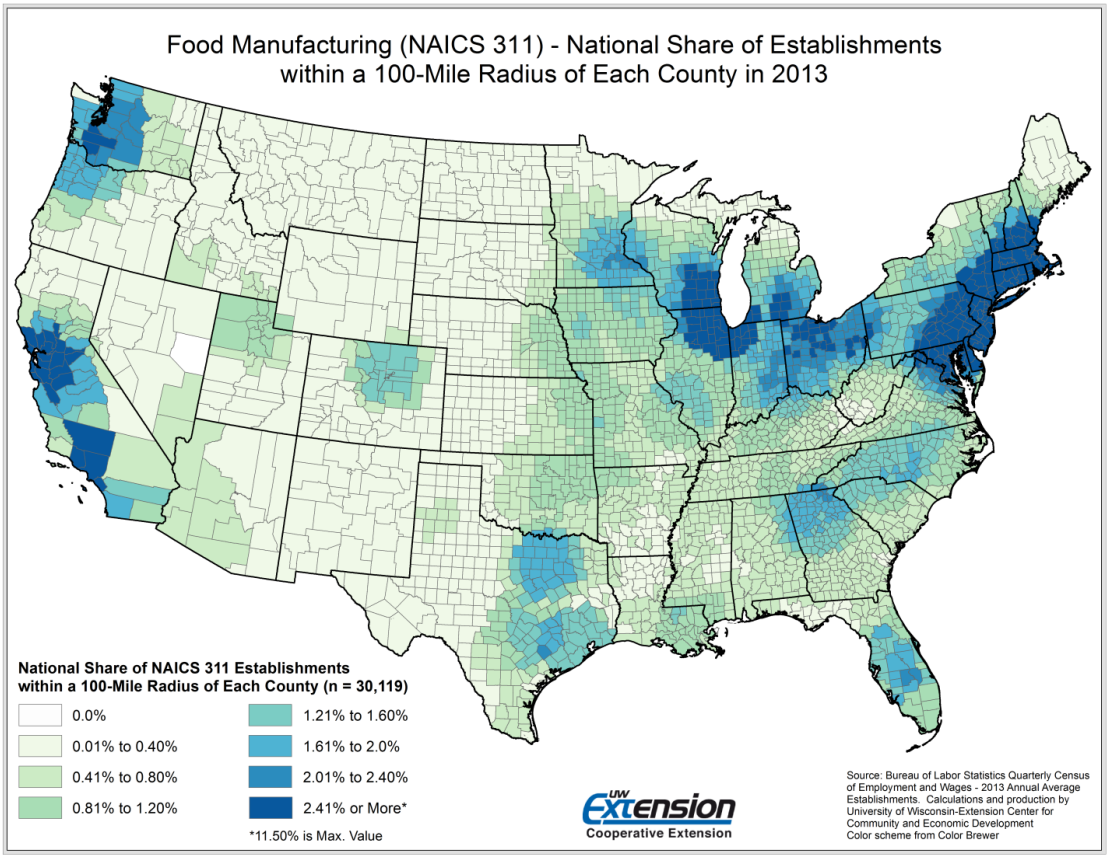
Geographic Distribution

The 341 food manufacturing establishments found in the Madison Region and Driftless Region are also part of a larger intensity of food manufacturing that extends into Southeast Wisconsin and Northeast Illinois. When combined, this concentration of food manufacturing facilities is one the largest in the nation (Figure 1.10). Specifically, over 2,600 establishments (8.8 percent of the national total) are within 100 miles of the study area.[11] Over 16 percent of food manufacturing establishments are within 250 miles. While the number of establishments around the Madison Region may seem irrelevant, food manufacturing establishments commonly buy and sell products to one another, creating a large potential market for local firms. Buy-sell relationships among food and beverage manufacturers are considered in more detail in Section 3.

Overall, food and beverage manufacturing establishments are somewhat skewed toward non-metro areas. Specifically, non-metro counties account for just 15 percent of the nation's population, but 22 percent of all food and beverage manufacturing establishments. Nonetheless, metropolitan areas account for 78 percent of all food and beverage manufacturing enterprises, with the top 50 metro areas listed in Table 1.3 and Table 1.4. As population is a driver of food manufacturing demand, it is not surprising that eight of the top ten metro areas for food manufacturing establishments also rank among the nation's ten most populous metropolitan areas.

[11] A 100-mile radius is one common distance used to define short-haul trucking opportunities.

Figure 1.10 – Distribution of Food Manufacturing Establishments



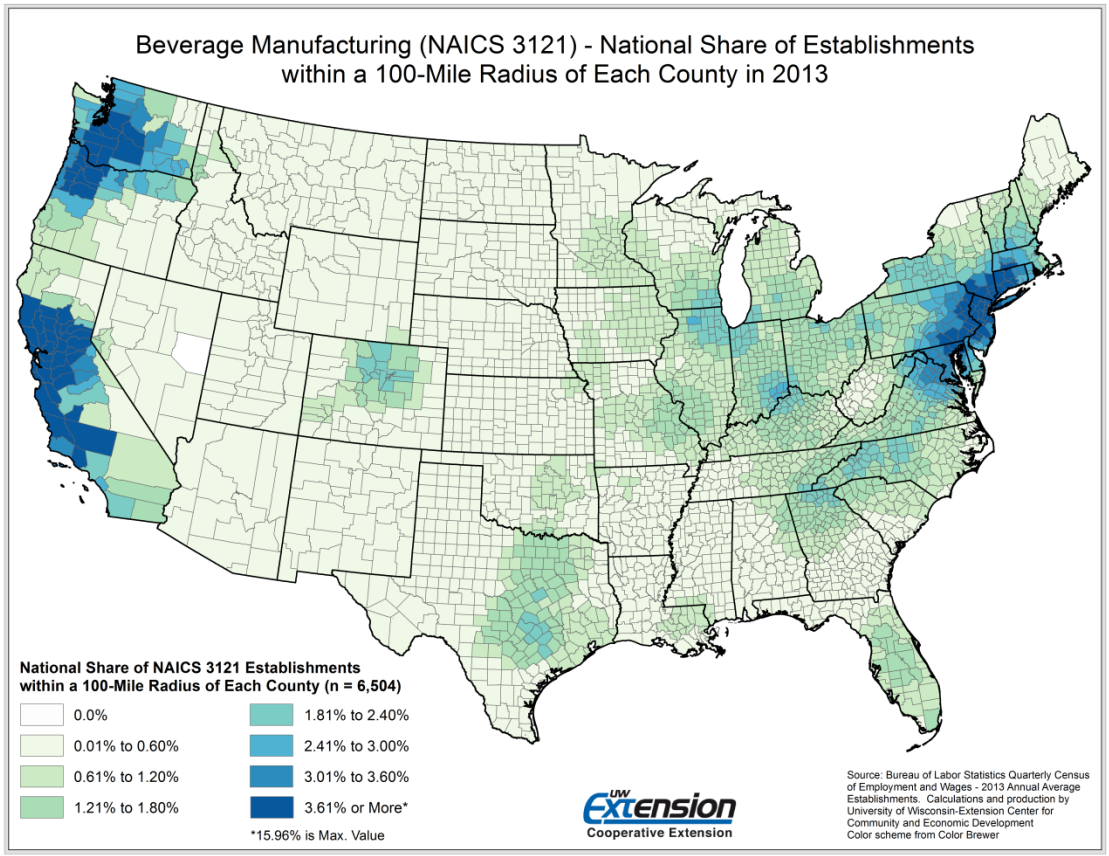


Table 1.3 – Regional MSA Rankings by Total Food Manufacturing Establishments (2013)

Rank	Name	Establishments	Employment
1.	New York-Newark-Jersey City, NY-NJ-PA MSA	2,356	S
2.	Los Angeles-Long Beach-Anaheim, CA MSA	1,311	45,272
3.	Chicago-Naperville-Elgin, IL-IN-WI MSA	1,149	S
4.	Miami-Fort Lauderdale-West Palm Beach, FL MSA	565	8,192
5.	Boston-Cambridge-Newton, MA-NH MSA	523	19,989
6.	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD MSA	496	20,097
7.	San Francisco-Oakland-Hayward, CA MSA	495	15,281
8.	Seattle-Tacoma-Bellevue, WA MSA	438	14,226
9.	Dallas-Fort Worth-Arlington, TX MSA	436	18,269
10.	Houston-The Woodlands-Sugar Land, TX MSA	348	S
11.	Portland-Vancouver-Hillsboro, OR-WA MSA	331	S
12.	Minneapolis-St. Paul-Bloomington, MN-WI MSA	326	S
13.	Atlanta-Sandy Springs-Roswell, GA MSA	305	23,654
14.	Detroit-Warren-Dearborn, MI MSA	294	6,456
15.	San Juan-Carolina-Caguas, PR MSA	293	8,261
16.	Providence-Warwick, RI-MA MSA	250	5,421
17.	St. Louis, MO-IL MSA	243	8,562
18.	Denver-Aurora-Lakewood, CO MSA	237	7,675
19.	Riverside-San Bernardino-Ontario, CA MSA	226	7,431
20.	Washington-Arlington-Alexandria, DC-VA-MD-WV MSA	223	4,464
21.	San Diego-Carlsbad, CA MSA	193	5,238
22.	Baltimore-Columbia-Towson, MD MSA	190	9,023
23.	Urban Honolulu, HI MSA	186	4,778
24.	Cincinnati, OH-KY-IN MSA	179	11,405
25.	Cleveland-Elyria, OH MSA	178	5,638
26.	Kansas City, MO-KS MSA	176	6,558
27.	Milwaukee-Waukesha-West Allis, WI MSA	176	9,684
28.	San Antonio-New Braunfels, TX MSA	166	7,320
29.	Phoenix-Mesa-Scottsdale, AZ MSA	165	9,835
30.	Tampa-St. Petersburg-Clearwater, FL MSA	164	3,467
31.	Pittsburgh, PA MSA	158	5,006
32.	Charlotte-Concord-Gastonia, NC-SC MSA	152	8,650
33.	Orlando-Kissimmee-Sanford, FL MSA	144	4,750
34.	Austin-Round Rock, TX MSA	140	2,207
35.	Columbus, OH MSA	139	7,077
36.	Salt Lake City, UT MSA	138	5,222
37.	New Orleans-Metairie, LA MSA	137	4,251
38.	Fresno, CA MSA	131	11,439
39.	Las Vegas-Henderson-Paradise, NV MSA	129	2,955
40.	**Madison, WI MSA**	**126**	**5,192**
41.	Modesto, CA MSA	122	8,955
42.	San Jose-Sunnyvale-Santa Clara, CA MSA	122	4,198
43.	Oklahoma City, OK MSA	120	3,572
44.	Lancaster, PA MSA	114	7,514
45.	Buffalo-Cheektowaga-Niagara Falls, NY MSA	110	5,233
46.	Rochester, NY MSA	110	5,089
47.	Hartford-West Hartford-East Hartford, CT MSA	105	2,616
48.	Sacramento--Roseville--Arden-Arcade, CA MSA	103	3,988
49.	Louisville-Jefferson County, KY-IN MSA	97	6,620
50.	New Haven-Milford, CT MSA	95	1,842

Source: Bureau of Labor Statistics. S = suppressed

Table 1.4 – Regional MSA Rankings by Total Beverage Manufacturing Establishments (2013)

Rank	Name	Establishments	Employment
1.	Napa, CA MSA	352	8,860
2.	Santa Rosa, CA MSA	281	6,600
3.	New York-Newark-Jersey City, NY-NJ-PA MSA	166	S
4.	Portland-Vancouver-Hillsboro, OR-WA MSA	166	S
5.	Seattle-Tacoma-Bellevue, WA MSA	121	2,180
6.	San Francisco-Oakland-Hayward, CA MSA	119	2,513
7.	San Luis Obispo-Paso Robles-Arroyo Grande, CA MSA	110	1,616
8.	Los Angeles-Long Beach-Anaheim, CA MSA	104	S
9.	Chicago-Naperville-Elgin, IL-IN-WI MSA	88	S
10.	Washington-Arlington-Alexandria, DC-VA-MD-WV MSA	85	S
11.	Dallas-Fort Worth-Arlington, TX MSA	83	S
12.	Santa Maria-Santa Barbara, CA MSA	80	1,284
13.	Walla Walla, WA MSA	70	S
14.	Kennewick-Richland, WA MSA	64	S
15.	Sacramento--Roseville--Arden-Arcade, CA MSA	63	1,934
16.	Riverside-San Bernardino-Ontario, CA MSA	62	2,882
17.	Denver-Aurora-Lakewood, CO MSA	60	3,617
18.	Stockton-Lodi, CA MSA	54	1,600
19.	Atlanta-Sandy Springs-Roswell, GA MSA	53	S
20.	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD MSA	53	S
21.	Miami-Fort Lauderdale-West Palm Beach, FL MSA	51	1,636
22.	Boston-Cambridge-Newton, MA-NH MSA	47	1,997
23.	St. Louis, MO-IL MSA	47	S
24.	Austin-Round Rock, TX MSA	44	841
25.	Houston-The Woodlands-Sugar Land, TX MSA	44	S
26.	Salinas, CA MSA	43	901
27.	San Diego-Carlsbad, CA MSA	43	1,870
28.	Minneapolis-St. Paul-Bloomington, MN-WI MSA	39	1,814
29.	San Jose-Sunnyvale-Santa Clara, CA MSA	39	953
30.	Detroit-Warren-Dearborn, MI MSA	38	2,527
31.	Rochester, NY MSA	38	1,452
32.	Salem, OR MSA	37	527
33.	Tampa-St. Petersburg-Clearwater, FL MSA	35	2,763
34.	Cincinnati, OH-KY-IN MSA	33	2,515
35.	San Juan-Carolina-Caguas, PR MSA	32	S
36.	Wenatchee, WA MSA	32	283
37.	Charlotte-Concord-Gastonia, NC-SC MSA	31	S
38.	Baltimore-Columbia-Towson, MD MSA	30	973
39.	Charlottesville, VA MSA	28	679
40.	Kansas City, MO-KS MSA	28	S
41.	Medford, OR MSA	27	226
42.	Boise City, ID MSA	26	286
43.	Boulder, CO MSA	26	488
44.	Fresno, CA MSA	26	1,110
45.	Indianapolis-Carmel-Anderson, IN MSA	26	1,803
46.	Louisville-Jefferson County, KY-IN MSA	26	S
47.	Pittsburgh, PA MSA	26	S
48.	Yakima, WA MSA	26	209
49.	Columbus, OH MSA	25	2,004
50.	Eugene, OR MSA	25	476

Source: Bureau of Labor Statistics. S = suppressed

The Madison Metropolitan Statistical Area (MSA) is comprised of four counties in the study area: Dane, Columbia, Iowa and Green. While the MSA excludes a large share of the study area, the metropolitan area still ranks 40th among all metro areas in terms of food manufacturing establishments. The MSA would likely rank even higher in terms of total employment as the Madison metro area reports more employees than many MSAs ranked higher in Table 1.3. The MSA ranks somewhat lower among metro areas for beverage manufacturing (53rd). The Madison MSA ranking among beverage manufacturing regions is not surprising as many top metro areas are home to a large number of wineries, which are less prevalent in the Madison Region.

The geographic distributions of food and beverage manufacturing establishments provide some perspective on competition, as well as those regions with a large number of potential prospects for recruitment. However, individual categories of food and beverage manufacturing are concentrated throughout specific geographic regions not necessarily captured by the overall industry distribution. Animal food manufacturing is concentrated in Pennsylvania, the Midwest and in California's Central Valley. Not surprisingly, grain and oilseed milling is largely located in the grain producing regions of Iowa, Minnesota and Wisconsin, but also in Northern Indiana, Central Ohio, California, Missouri and Eastern Arkansas. Sugar and confectionary product manufacturing is highly concentrated in the Chicago Region, California metro areas, and along the East Coast from Connecticut to Eastern Pennsylvania.

The largest fruit and vegetable preserving/specialty food manufacturing regions include the Lake Michigan coast extending from Eastern Wisconsin to Northern Indiana; Northern California; the Pacific Northwest; and the New Jersey-New York-Pennsylvania tri-state area. As expected, dairy product manufacturing establishments are largely concentrated in Wisconsin, Central California, and the New York-New Jersey area. Animal slaughtering and processing is also found in these areas, as well as the Chicago metro area, Central Ohio, Northern Georgia and throughout the eastern portion of the Great Plains. Seafood products are found primarily in coastal regions, while bakeries and tortilla manufacturing establishments are concentrated somewhat proportionally around metropolitan areas of various populations throughout the nation. Establishments in the other food manufacturing category are also largely concentrated around urban areas.

Maps showing the sub-categories of food and beverage manufacturing are included in Appendix A. Table 1.5 also lists notable metropolitan areas that contain various concentrations of food manufacturing sub-categories. The metropolitan areas listed in Table 1.5 are not necessarily ranked according to prominence. Instead, the MSAs listed are those that are significant in either their total industry employment or their number of establishments (or both).

Table 1.5 – Metropolitan Statistical Areas with Notable Concentrations of Food and Beverage Manufacturing Industries

NAICS 3111 Animal food manufacturing
- St. Louis, MO-IL MSA
- Kansas City, MO-KS MSA
- Los Angeles-Long Beach-Anaheim, CA MSA
- Modesto, CA MSA
- Minneapolis-St. Paul-Bloomington, MN-WI MSA
- Chicago-Naperville-Elgin, IL-IN-WI MSA

NAICS 3112 Grain and oilseed milling
- Decatur, IL MSA
- Chicago-Naperville-Elgin, IL-IN-WI MSA
- Los Angeles-Long Beach-Anaheim, CA MSA
- Kansas City, MO-KS MSA
- New York-Newark-Jersey City, NY-NJ-PA MSA
- Houston-The Woodlands-Sugar Land, TX MSA

NAICS 3113 Sugar and confectionery product manufacturing
- New York-Newark-Jersey City, NY-NJ-PA MSA
- Chicago-Naperville-Elgin, IL-IN-WI MSA
- Los Angeles-Long Beach-Anaheim, CA MSA
- San Francisco-Oakland-Hayward, CA MSA
- Boston-Cambridge-Newton, MA-NH MSA
- Miami-Fort Lauderdale-West Palm Beach, FL MSA

NAICS 3114 Fruit and vegetable preserving and specialty food mfg.
- Chicago-Naperville-Elgin, IL-IN-WI MSA
- Los Angeles-Long Beach-Anaheim, CA MSA
- Appleton, WI MSA
- Fresno, CA MSA
- Kennewick-Richland, WA MSA
- Dallas-Fort Worth-Arlington, TX MSA

NAICS 3115 Dairy product manufacturing
- Los Angeles-Long Beach-Anaheim, CA MSA
- Green Bay, WI MSA
- Chicago-Naperville-Elgin, IL-IN-WI MSA
- Madison, WI MSA
- Minneapolis-St. Paul-Bloomington, MN-WI MSA
- New York-Newark-Jersey City, NY-NJ-PA MSA

NAICS 3116 Animal slaughtering and processing
- Chicago-Naperville-Elgin, IL-IN-WI MSA
- Atlanta-Sandy Springs-Roswell, GA MSA
- Gainesville, GA MSA
- Omaha-Council Bluffs, NE-IA MSA
- Philadelphia-Camden-Wilmington, PA-NJ-DE-MD MSA
- Fresno, CA MSA

NAICS 3117 Seafood product preparation and packaging
- Seattle-Tacoma-Bellevue, WA MSA
- Boston-Cambridge-Newton, MA-NH MSA
- Providence-Warwick, RI-MA MSA
- Mobile, AL MSA
- Bellingham, WA MSA
- Portland-South Portland, ME MSA

NAICS 3118 Bakeries and tortilla manufacturing
- New York-Newark-Jersey City, NY-NJ-PA MSA
- Los Angeles-Long Beach-Anaheim, CA MSA
- Chicago-Naperville-Elgin, IL-IN-WI MSA
- Boston-Cambridge-Newton, MA-NH MSA
- San Francisco-Oakland-Hayward, CA MSA
- Philadelphia-Camden-Wilmington, PA-NJ-DE-MD MSA

NAICS 3119 Other food manufacturing
- New York-Newark-Jersey City, NY-NJ-PA MSA
- Los Angeles-Long Beach-Anaheim, CA MSA
- Chicago-Naperville-Elgin, IL-IN-WI MSA
- Atlanta-Sandy Springs-Roswell, GA MSA
- Bakersfield, CA MSA
- Minneapolis-St. Paul-Bloomington, MN-WI MSA

NAICS 31211 Soft drink and ice manufacturing
- Los Angeles-Long Beach-Anaheim, CA MSA
- Chicago-Naperville-Elgin, IL-IN-WI MSA
- Tampa-St. Petersburg-Clearwater, FL MSA
- Phoenix-Mesa-Scottsdale, AZ MSA
- Dallas-Fort Worth-Arlington, TX MSA
- Detroit-Warren-Dearborn, MI MSA

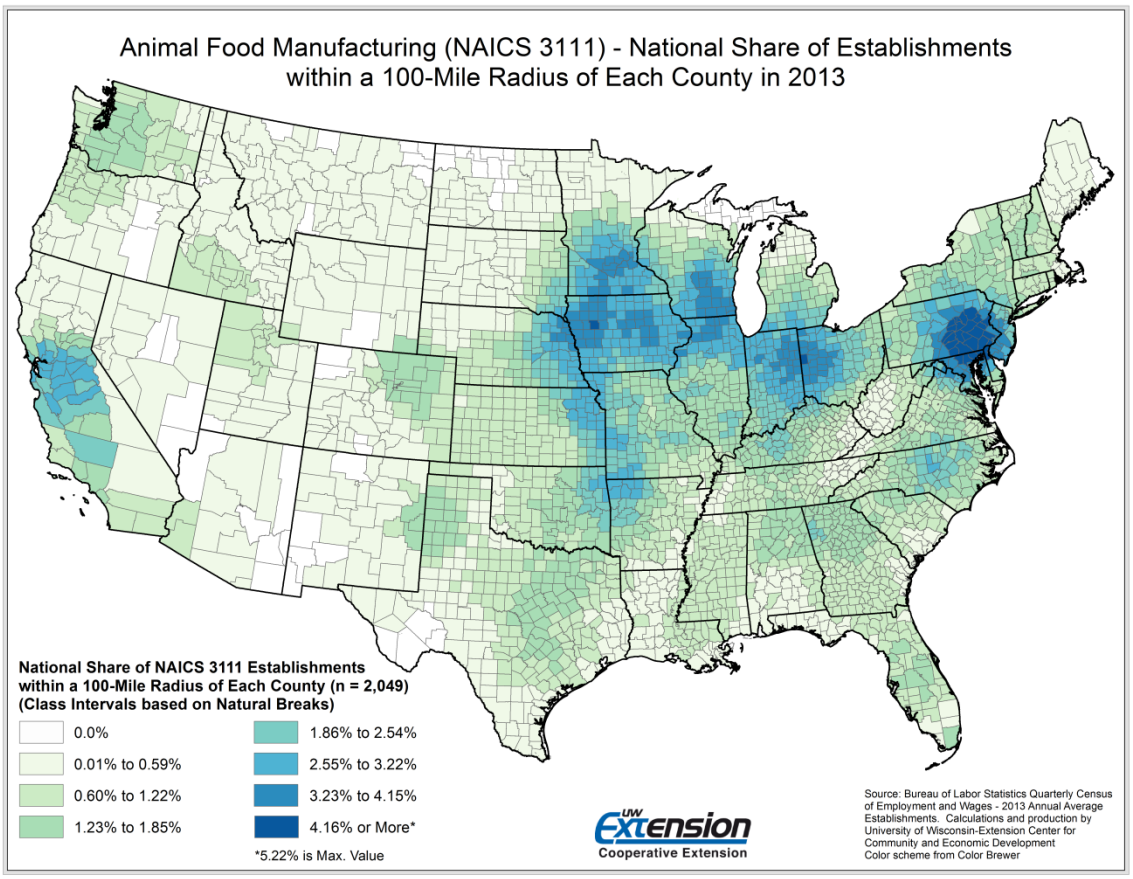
NAICS 31212 Breweries
- Denver-Aurora-Lakewood, CO MSA
- Portland-Vancouver-Hillsboro, OR-WA MSA
- New York-Newark-Jersey City, NY-NJ-PA MSA
- San Diego-Carlsbad, CA MSA
- Fort Collins, CO MSA
- Seattle-Tacoma-Bellevue, WA MSA

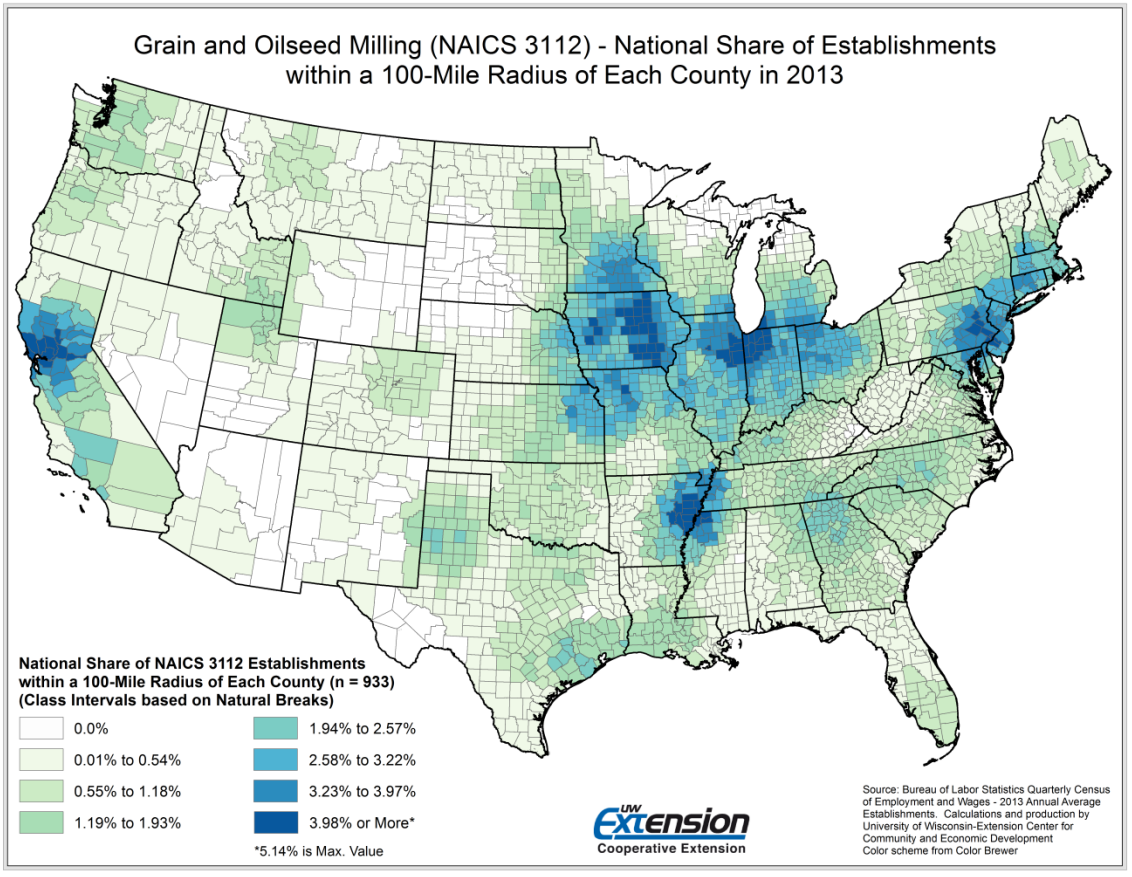
NAICS 31213 Wineries
- Napa, CA MSA
- Santa Rosa, CA MSA
- San Luis Obispo-Paso Robles-Arroyo Grande, CA MSA
- Santa Maria-Santa Barbara, CA MSA
- Portland-Vancouver-Hillsboro, OR-WA MSA
- San Francisco-Oakland-Hayward, CA MSA

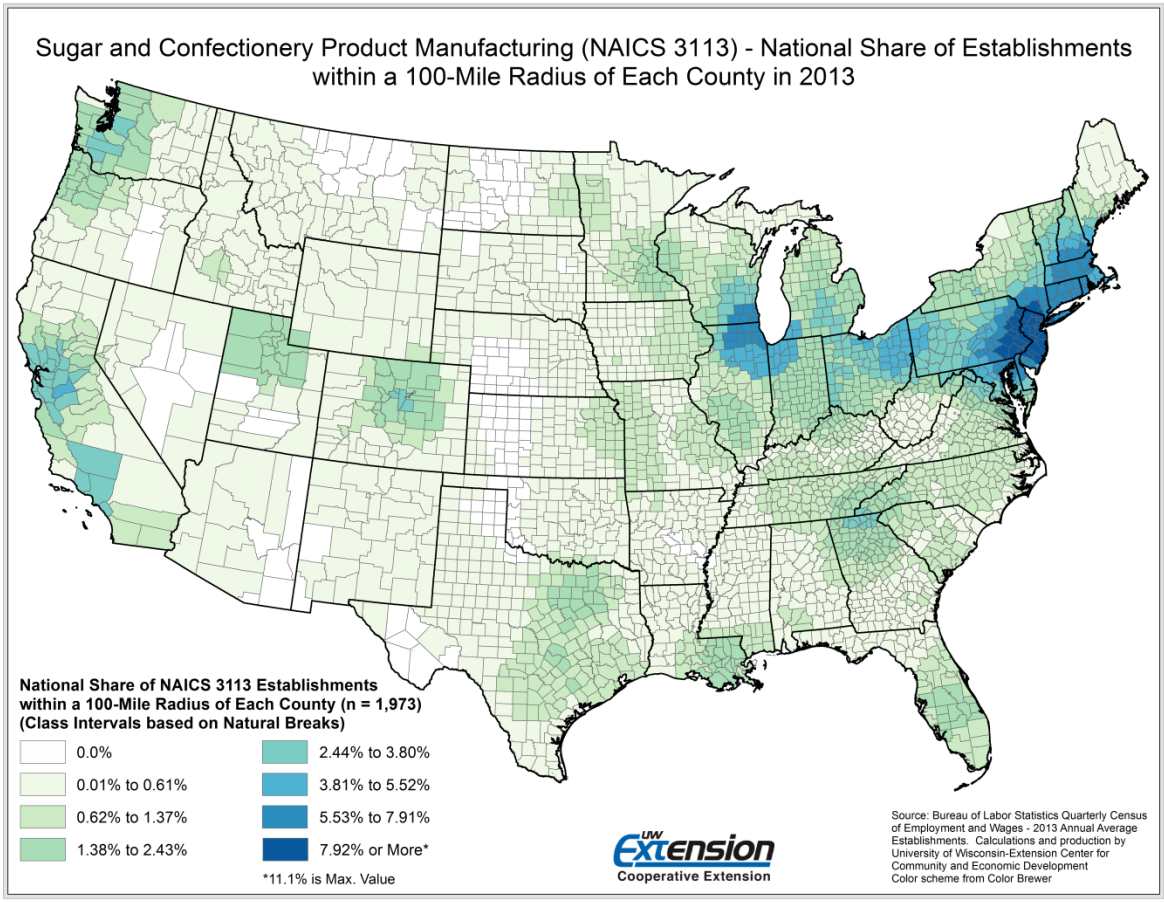
NAICS 31214 Distilleries
- Louisville-Jefferson County, KY-IN MSA
- Seattle-Tacoma-Bellevue, WA MSA
- New York-Newark-Jersey City, NY-NJ-PA MSA
- San Francisco-Oakland-Hayward, CA MSA
- Chicago-Naperville-Elgin, IL-IN-WI MSA
- Portland-Vancouver-Hillsboro, OR-WA MSA

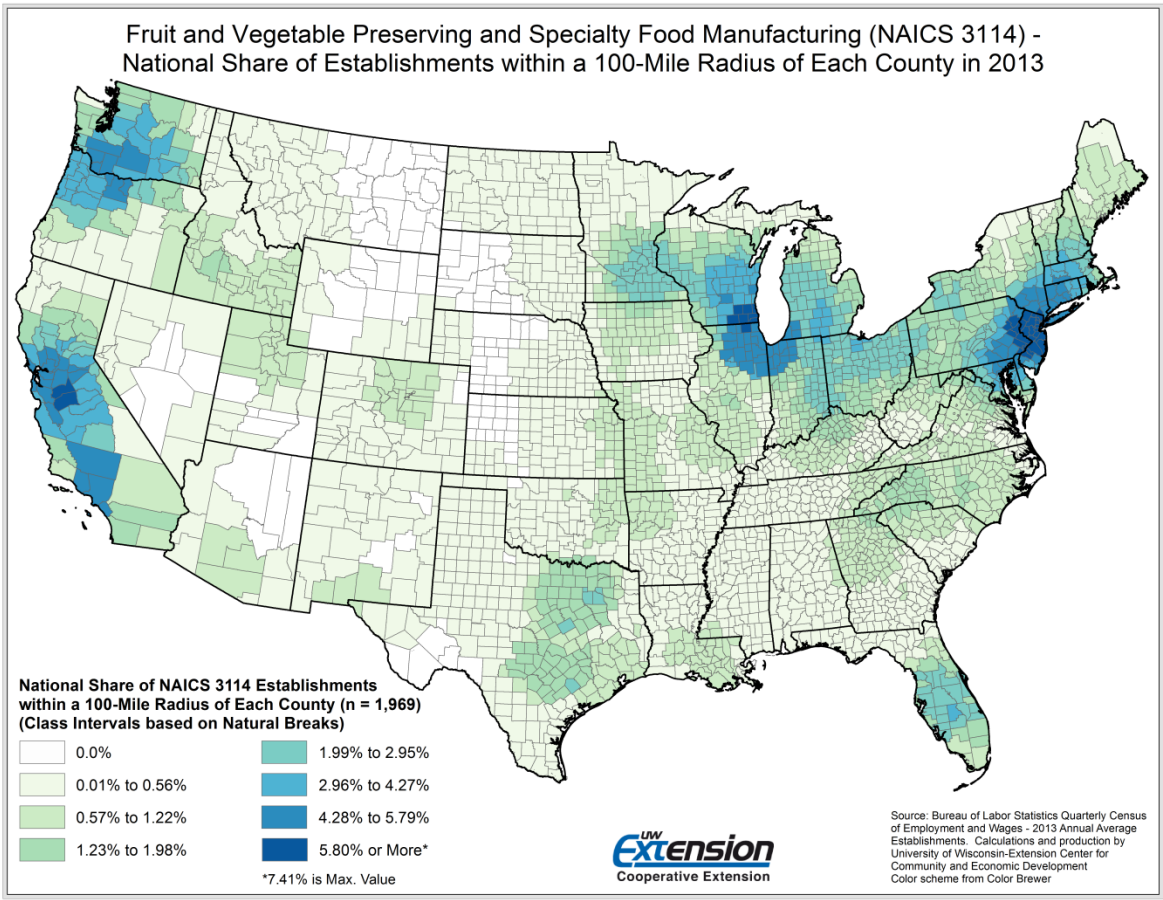
Source: Bureau of Labor Statistics

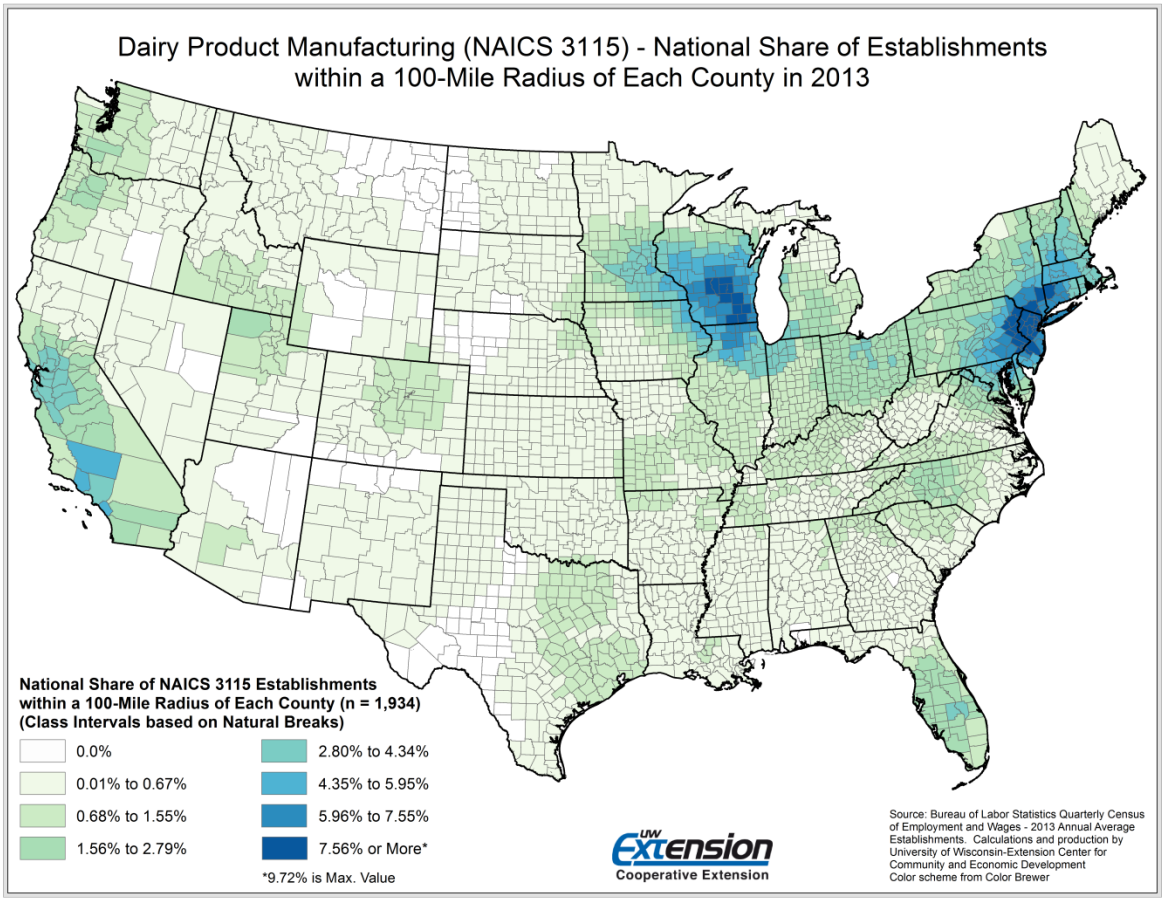
Appendix A – Additional Food and Beverage Manufacturing Distribution Maps

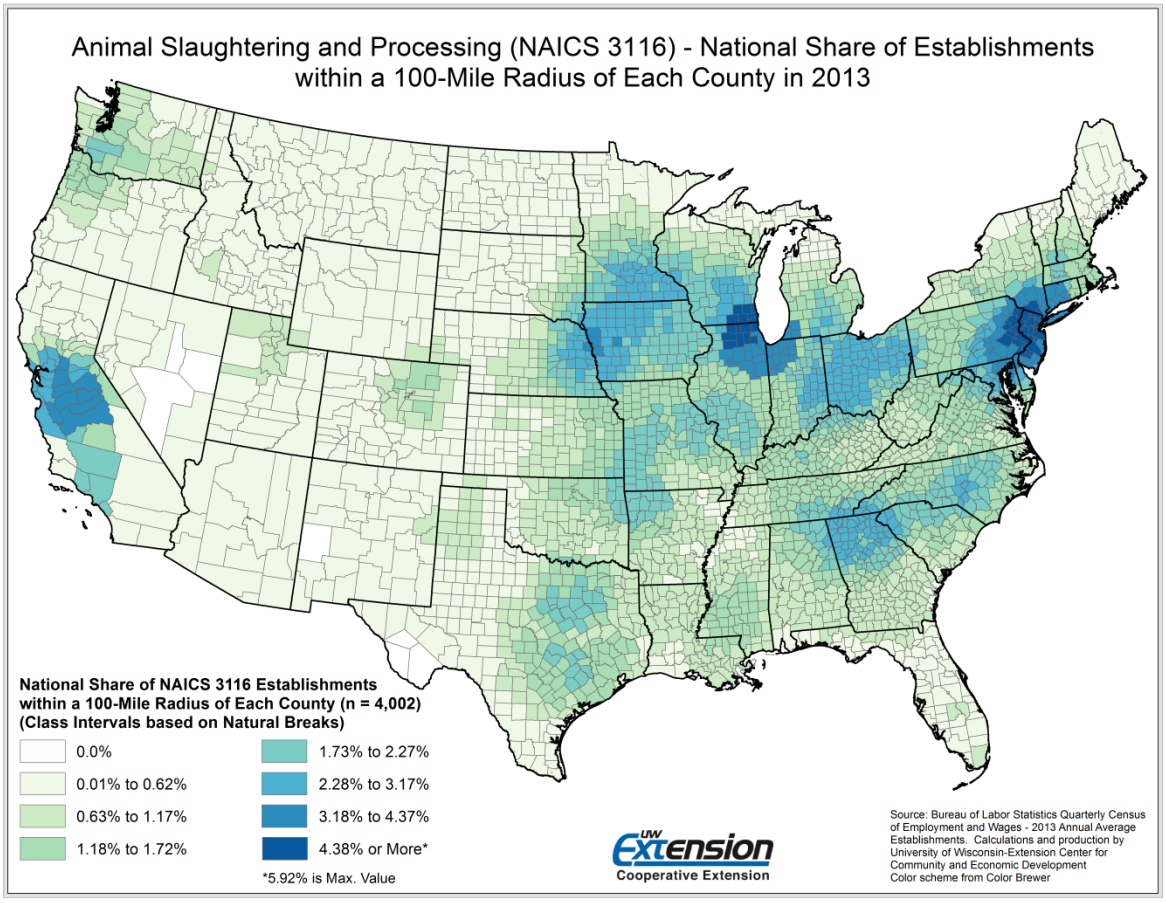


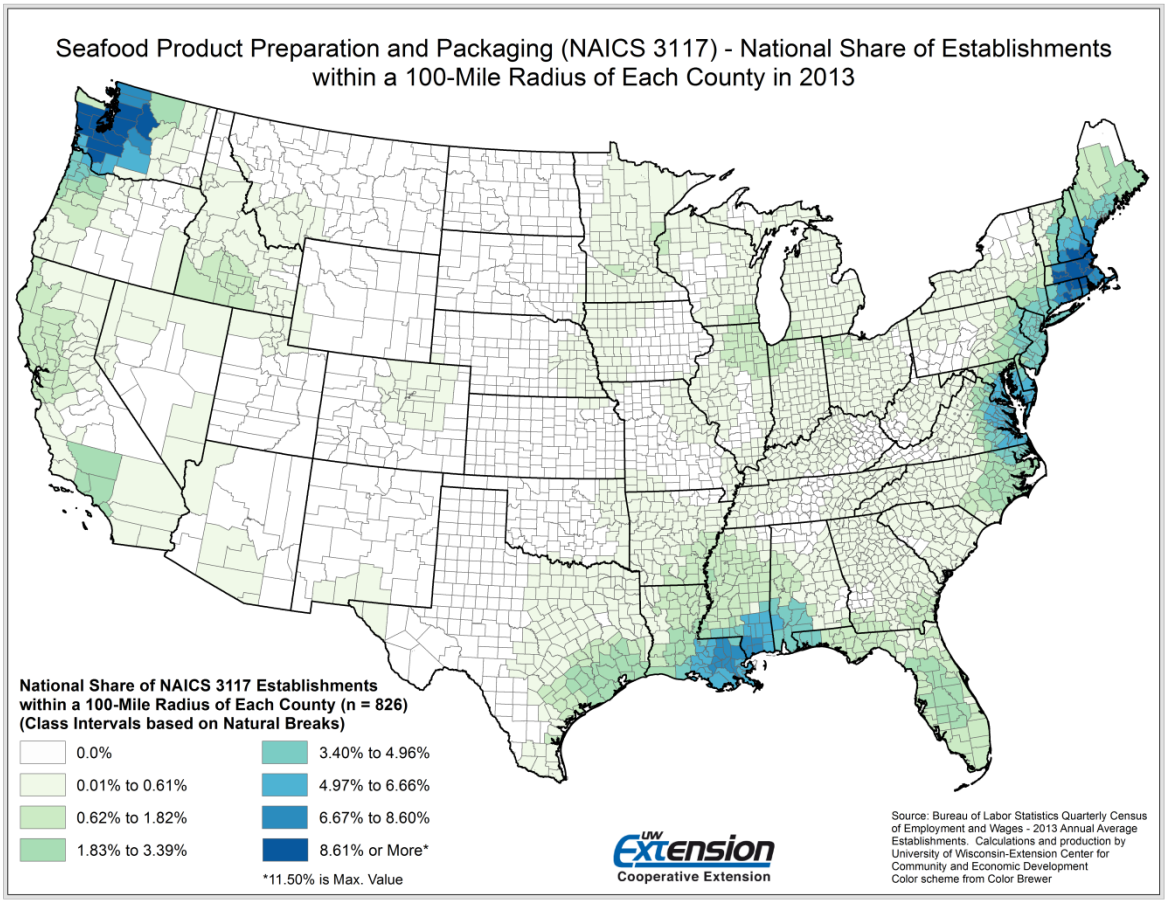


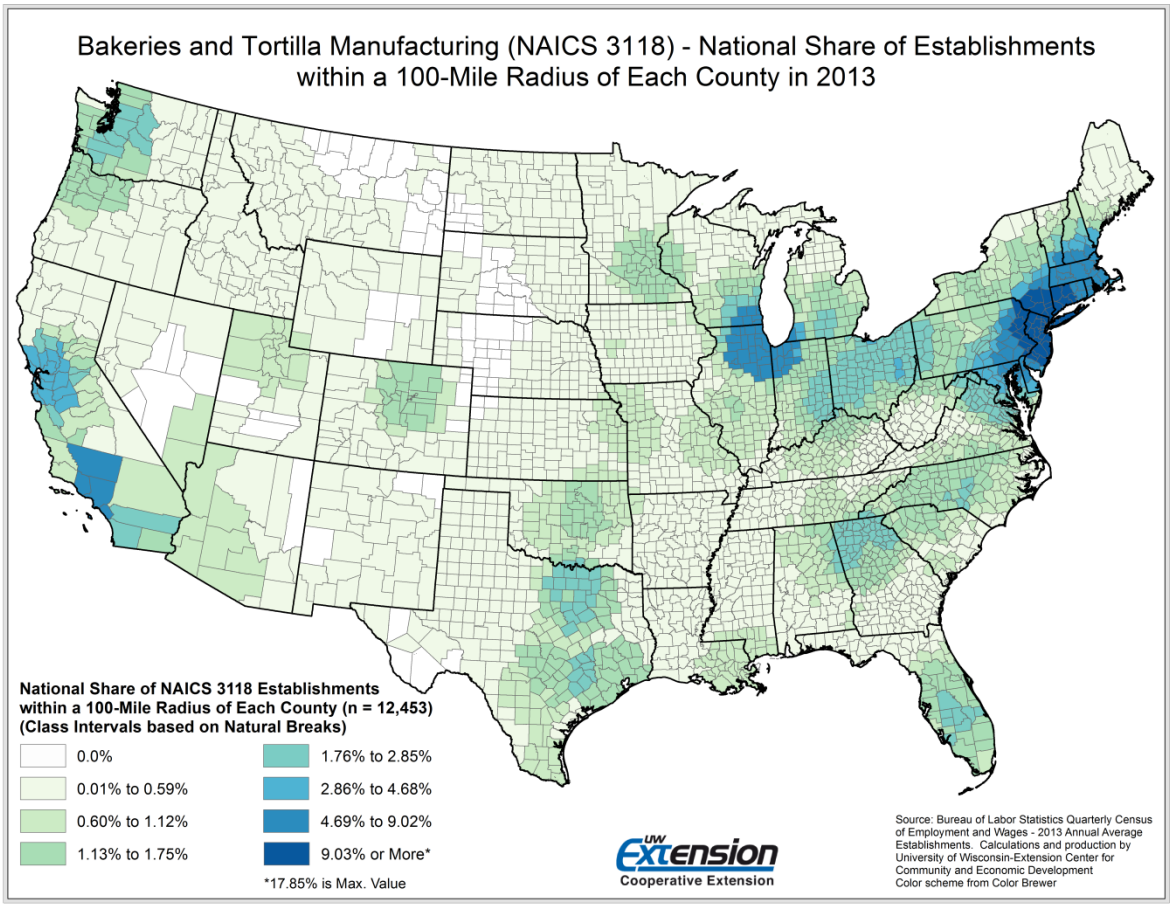

Sugar and Confectionery Product Manufacturing (NAICS 3113) - National Share of Establishments within a 100-Mile Radius of Each County in 2013
National Share of NAICS 3113 Establishments within a 100-Mile Radius of Each County (n = 1,973) (Class Intervals based on Natural Breaks)
0.0%
0.01% to 0.61%
0.62% to 1.37%
1.38% to 2.43%
2.44% to 3.80%
3.81% to 5.52%
5.53% to 7.91%
7.92% or More*
*11.1% is Max. Value
Cooperative Extension
Source: Bureau of Labor Statistics Quarterly Census of Employment and Wages - 2013 Annual Average Establishments. Calculations and production by University of Wisconsin-Extension Center for Community and Economic Development
Color scheme from Color Brewer

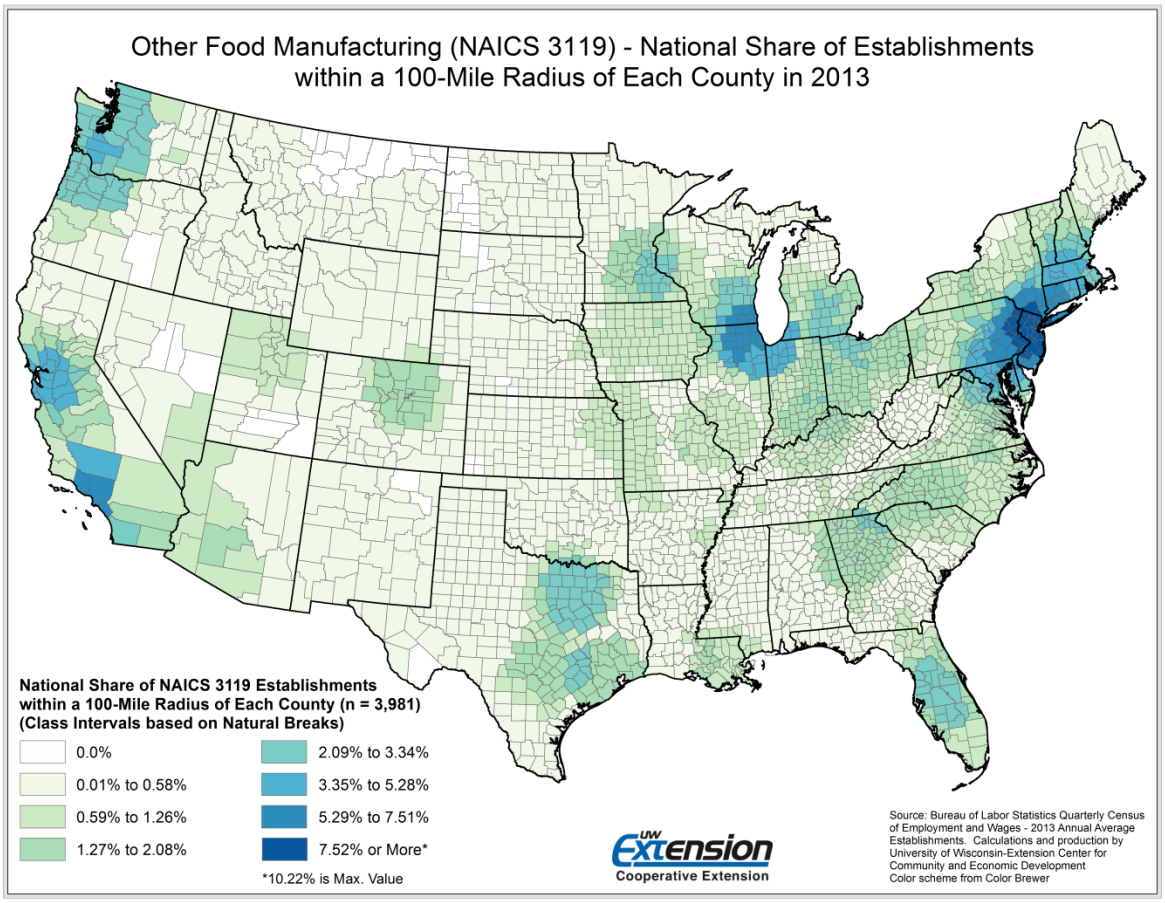

Fruit and Vegetable Preserving and Specialty Food Manufacturing (NAICS 3114) - National Share of Establishments within a 100-Mile Radius of Each County in 2013
National Share of NAICS 3114 Establishments within a 100-Mile Radius of Each County (n = 1,969) (Class Intervals based on Natural Breaks)
0.0%
0.01% to 0.56%
0.57% to 1.22%
1.23% to 1.98%
1.99% to 2.95%
2.96% to 4.27%
4.28% to 5.79%
5.80% or More*
*7.41% is Max. Value
Cooperative Extension
Source: Bureau of Labor Statistics Quarterly Census of Employment and Wages - 2013 Annual Average Establishments. Calculations and production by University of Wisconsin-Extension Center for Community and Economic Development
Color scheme from Color Brewer

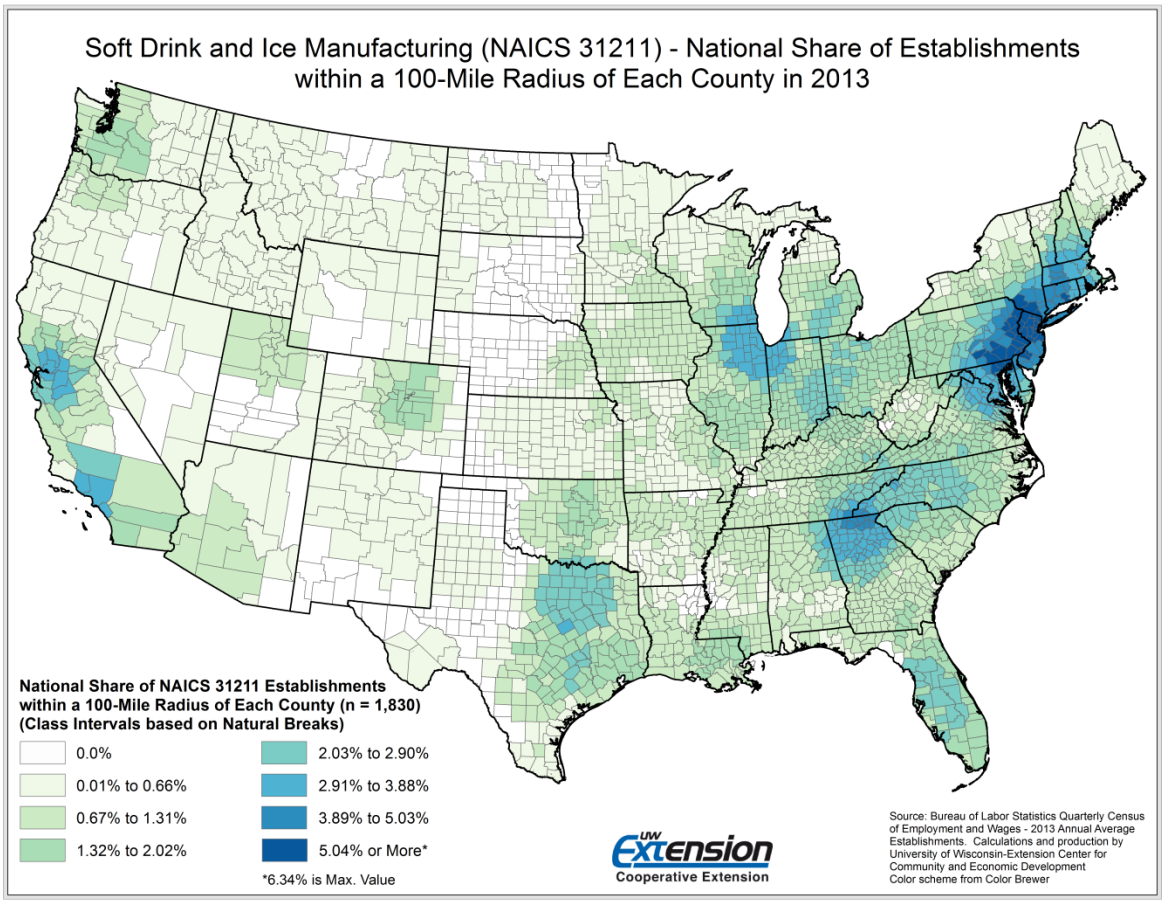

Dairy Product Manufacturing (NAICS 3115) - National Share of Establishments within a 100-Mile Radius of Each County in 2013
National Share of NAICS 3115 Establishments within a 100-Mile Radius of Each County (n = 1,934) (Class Intervals based on Natural Breaks)
0.0%
0.01% to 0.67%
0.68% to 1.55%
1.56% to 2.79%
2.80% to 4.34%
4.35% to 5.95%
5.96% to 7.55%
7.56% or More*
*9.72% is Max. Value
UW Extension Cooperative Extension
Source: Bureau of Labor Statistics Quarterly Census of Employment and Wages - 2013 Annual Average Establishments. Calculations and production by University of Wisconsin-Extension Center for Community and Economic Development
Color scheme from Color Brewer

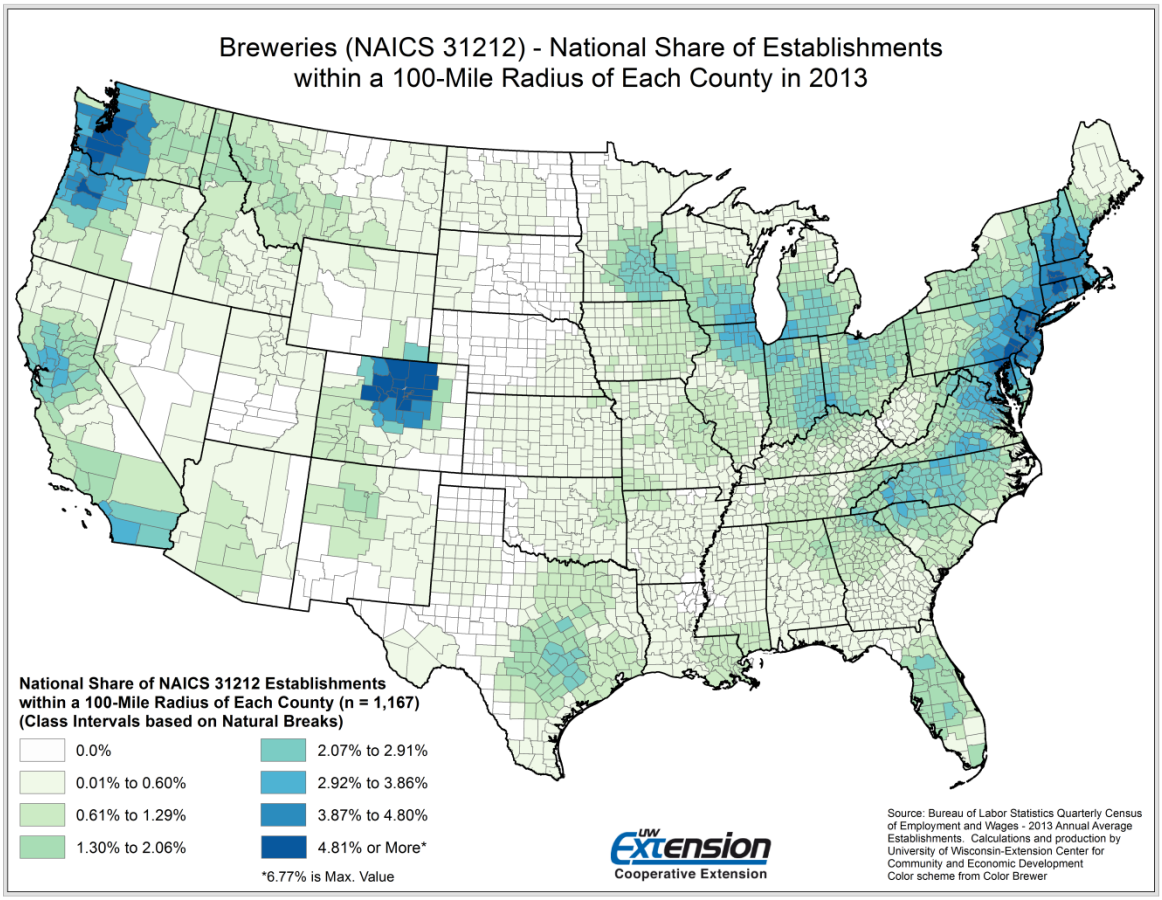

Animal Slaughtering and Processing (NAICS 3116) - National Share of Establishments within a 100-Mile Radius of Each County in 2013
National Share of NAICS 3116 Establishments within a 100-Mile Radius of Each County (n = 4,002) (Class Intervals based on Natural Breaks)
0.0%
0.01% to 0.62%
0.63% to 1.17%
1.18% to 1.72%
1.73% to 2.27%
2.28% to 3.17%
3.18% to 4.37%
4.38% or More*
*5.92% is Max. Value
UW Extension Cooperative Extension
Source: Bureau of Labor Statistics Quarterly Census of Employment and Wages - 2013 Annual Average Establishments. Calculations and production by University of Wisconsin-Extension Center for Community and Economic Development
Color scheme from Color Brewer

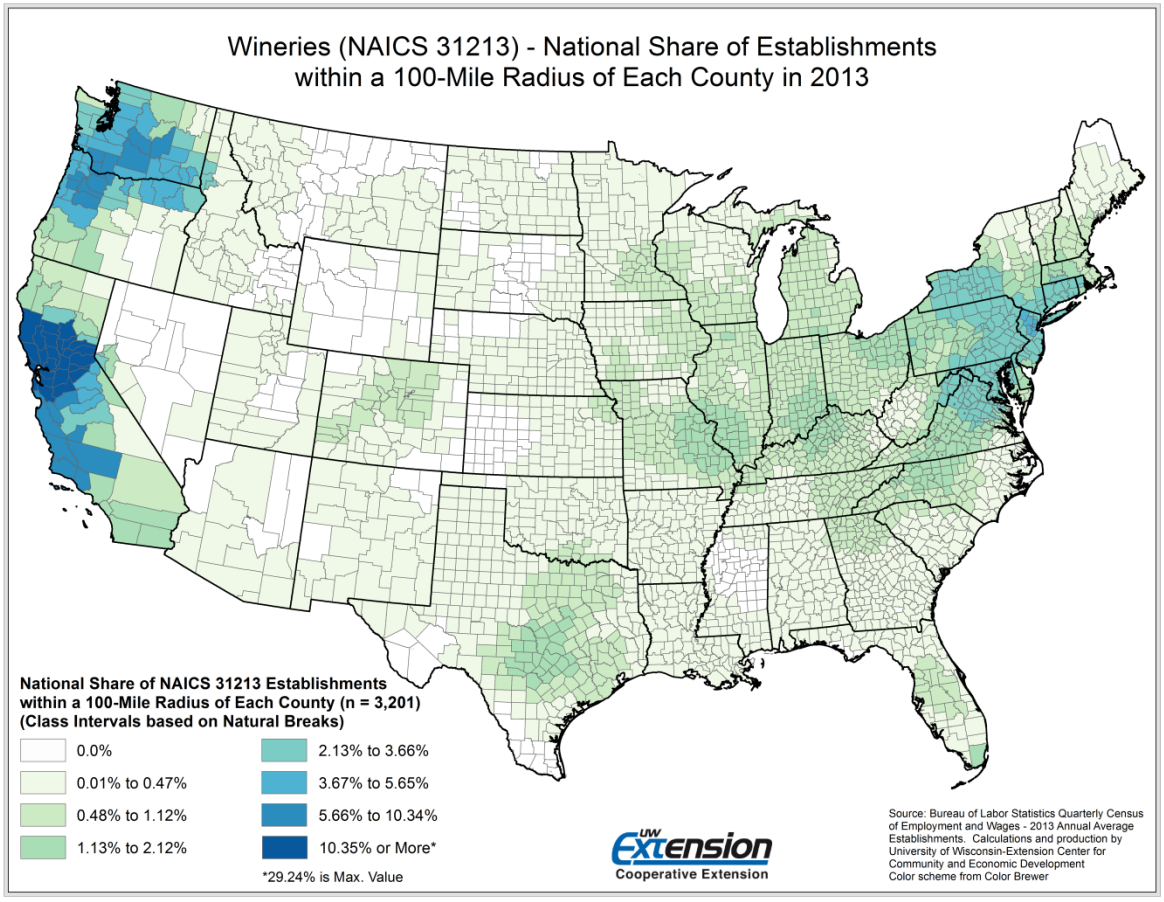

Seafood Product Preparation and Packaging (NAICS 3117) - National Share of Establishments within a 100-Mile Radius of Each County in 2013
National Share of NAICS 3117 Establishments within a 100-Mile Radius of Each County (n = 826) (Class Intervals based on Natural Breaks)
0.0%
0.01% to 0.61%
0.62% to 1.82%
1.83% to 3.39%
3.40% to 4.96%
4.97% to 6.66%
6.67% to 8.60%
8.61% or More*
*11.50% is Max. Value
Cooperative Extension
Source: Bureau of Labor Statistics Quarterly Census of Employment and Wages - 2013 Annual Average Establishments. Calculations and production by University of Wisconsin-Extension Center for Community and Economic Development
Color scheme from Color Brewer

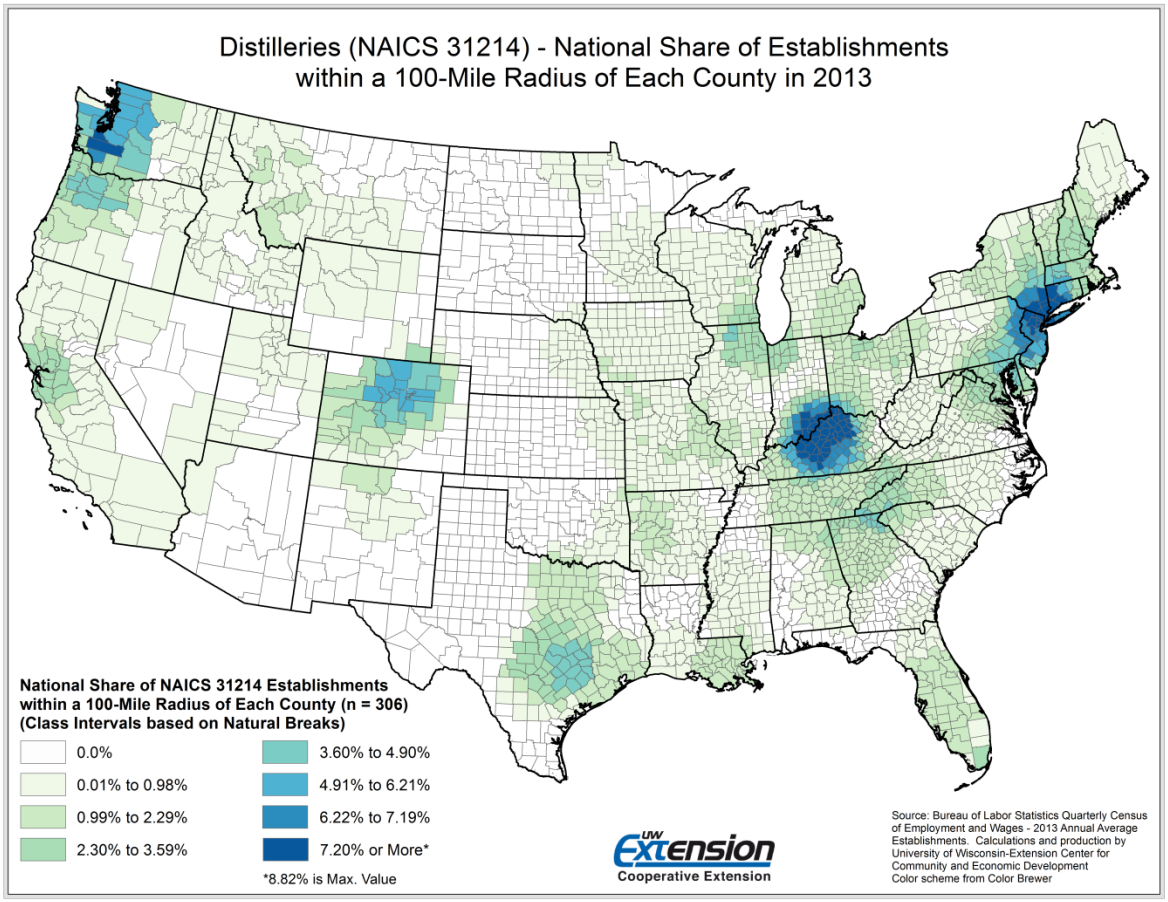

Bakeries and Tortilla Manufacturing (NAICS 3118) - National Share of Establishments within a 100-Mile Radius of Each County in 2013
National Share of NAICS 3118 Establishments within a 100-Mile Radius of Each County (n = 12,453) (Class Intervals based on Natural Breaks)
0.0%
0.01% to 0.59%
0.60% to 1.12%
1.13% to 1.75%
1.76% to 2.85%
2.86% to 4.68%
4.69% to 9.02%
9.03% or More*
*17.85% is Max. Value
Cooperative Extension
Source: Bureau of Labor Statistics Quarterly Census of Employment and Wages - 2013 Annual Average Establishments. Calculations and production by University of Wisconsin-Extension Center for Community and Economic Development
Color scheme from Color Brewer


Other Food Manufacturing (NAICS 3119) - National Share of Establishments within a 100-Mile Radius of Each County in 2013
National Share of NAICS 3119 Establishments within a 100-Mile Radius of Each County (n = 3,981) (Class Intervals based on Natural Breaks)
0.0%
0.01% to 0.58%
0.59% to 1.26%
1.27% to 2.08%
2.09% to 3.34%
3.35% to 5.28%
5.29% to 7.51%
7.52% or More*
*10.22% is Max. Value
UW Extension Cooperative Extension
Source: Bureau of Labor Statistics Quarterly Census of Employment and Wages - 2013 Annual Average Establishments. Calculations and production by University of Wisconsin-Extension Center for Community and Economic Development
Color scheme from Color Brewer


Soft Drink and Ice Manufacturing (NAICS 31211) - National Share of Establishments within a 100-Mile Radius of Each County in 2013
National Share of NAICS 31211 Establishments within a 100-Mile Radius of Each County (n = 1,830) (Class Intervals based on Natural Breaks)
0.0%
0.01% to 0.66%
0.67% to 1.31%
1.32% to 2.02%
2.03% to 2.90%
2.91% to 3.88%
3.89% to 5.03%
5.04% or More*
*6.34% is Max. Value
UW Extension Cooperative Extension
Source: Bureau of Labor Statistics Quarterly Census of Employment and Wages - 2013 Annual Average Establishments. Calculations and production by University of Wisconsin-Extension Center for Community and Economic Development
Color scheme from Color Brewer


Breweries (NAICS 31212) - National Share of Establishments
within a 100-Mile Radius of Each County in 2013
National Share of NAICS 31212 Establishments
within a 100-Mile Radius of Each County (n = 1,167)
(Class Intervals based on Natural Breaks)
0.0%
0.01% to 0.60%
0.61% to 1.29%
1.30% to 2.06%
2.07% to 2.91%
2.92% to 3.86%
3.87% to 4.80%
4.81% or More*
*6.77% is Max. Value
UW Extension
Cooperative Extension
Source: Bureau of Labor Statistics Quarterly Census of Employment and Wages - 2013 Annual Average Establishments. Calculations and production by University of Wisconsin-Extension Center for Community and Economic Development
Color scheme from Color Brewer


Wineries (NAICS 31213) - National Share of Establishments
within a 100-Mile Radius of Each County in 2013
National Share of NAICS 31213 Establishments
within a 100-Mile Radius of Each County (n = 3,201)
(Class Intervals based on Natural Breaks)
0.0%
0.01% to 0.47%
0.48% to 1.12%
1.13% to 2.12%
2.13% to 3.66%
3.67% to 5.65%
5.66% to 10.34%
10.35% or More*
*29.24% is Max. Value
UW Extension
Cooperative Extension
Source: Bureau of Labor Statistics Quarterly Census of Employment and Wages - 2013 Annual Average Establishments. Calculations and production by University of Wisconsin-Extension Center for Community and Economic Development
Color scheme from Color Brewer


Distilleries (NAICS 31214) - National Share of Establishments
within a 100-Mile Radius of Each County in 2013
National Share of NAICS 31214 Establishments
within a 100-Mile Radius of Each County (n = 306)
(Class Intervals based on Natural Breaks)
0.0%
0.01% to 0.98%
0.99% to 2.29%
2.30% to 3.59%
3.60% to 4.90%
4.91% to 6.21%
6.22% to 7.19%
7.20% or More*
*8.82% is Max. Value
UW Extension
Cooperative Extension
Source: Bureau of Labor Statistics Quarterly Census of Employment and Wages - 2013 Annual Average Establishments. Calculations and production by University of Wisconsin-Extension Center for Community and Economic Development
Color scheme from Color Brewer

Section 2 - Agricultural Production

In addition to food and beverage manufacturing, agricultural production is the other core industry within the AFB cluster. In 2012, just over 24,000 farms in the fourteen county AFB study area produced $3.4 billion in sales and accounted for 30,000 employees. The region's agricultural production sector largely produces crop and animal products to be used either as inputs to other value-added food products or sold to intermediate distributers for eventual consumer purchase at retail outlets. However, farms also produce a relatively small, but growing amount of food that is sold directly to consumers. To better understand this sizeable industry, the following overview of the region's agricultural producers includes perspectives on employment trends, scale of production, and other characteristics that could inform the development of the AFB cluster.

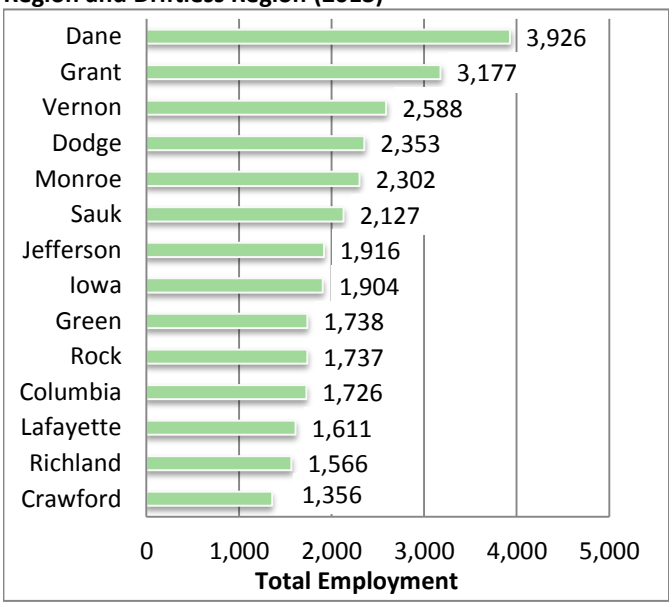
Agricultural producers include both crop production and animal production. Enterprises in the crop production subsector (NAICS 111) include "farms, orchards, groves, greenhouses, and nurseries that grow crops, plants, vines, or trees and their seeds. Specific categories of crop production are grouped by likeness of production activity, including biological and physiological characteristics; economic requirements; growing seasons; crop rotations; input specialization; labor requirements, and capital demands." [12]

As described by the Census Bureau, establishments in the animal production and aquaculture subsector (NAICS 112) "raise or fatten animals for the sale of animals or animal products; and/or raise aquatic plants and animals in controlled or selected aquatic environments for the sale of aquatic plants, animals, or their products. The subsector includes establishments, such as ranches, farms, and feedlots primarily engaged in keeping, grazing, breeding, or feeding animals. These animals are kept for the products they produce or for eventual sale. The animals are generally raised in assorted environments, varying from total confinement to feeding on an open range pasture."

Employment

In 2013, farms accounted for 17,400 employees in the Madison Region and 12,600 employees in the Driftless Region. The combined farm employment in these two regions is responsible for a third of all farm employees in the State of Wisconsin. While every county in the study area has more than 1,300 farm employees, Dane County and Grant County have the greatest employment levels (Figure 2.1). The total number of farm employees in Dane County may surprise those who often associate the area with employment in government, education, health care or knowledge-based industry sectors.

Figure 2.1 – Farm Employment by County in the Madison Region and Driftless Region (2013)



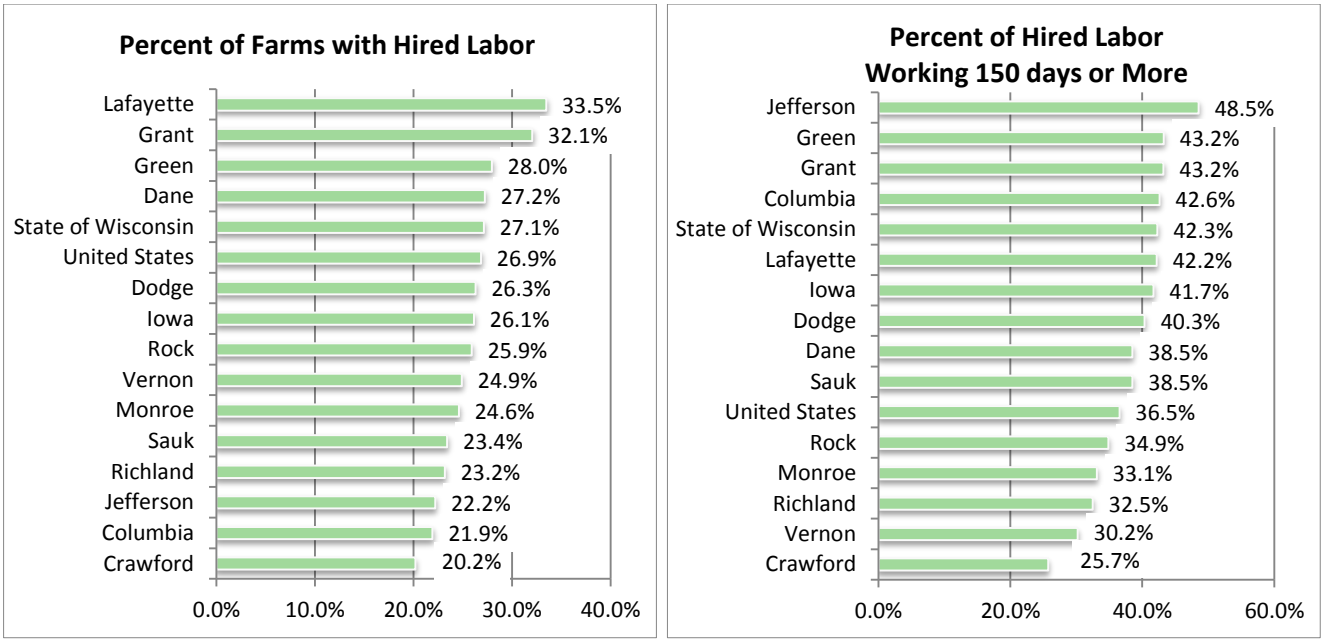
Source: Bureau of Economic Analysis

[12] Industry descriptions are based on NAICS definitions from the U.S. Census Bureau

When comparing farm employees to employment in other industry sectors, it is important to recognize some distinct differences in how farm employment is reported and recorded. In this AFB cluster abstract, employees reported in non-farm industries are mostly restricted to wage and salary employment. More specifically, employment figures for other sectors do not include business proprietors or owners. In contrast, farm employment figures used here encompass "workers engaged in the direct production of agricultural commodities, *whether as a sole proprietor, partner, or hired laborer.*"[13] That is, farm employment figures include both wage and salary employees *and* farm owners.

A farm's need for hired labor depends on a variety of characteristics such as size of the operation, types of products produced, and the number of operators involved. Overall, a relatively low share of farms in the United States reported having hired labor in 2012 (27 percent of all farms). In the AFB study area, the percent of farms with hired labor varied between 33.5 percent in Lafayette County to just 20.2 percent in Crawford County (Figure 2.2). By nature of the industry, a large share of farm employment also tends to be seasonal or part-time. In the United States just over one-third (36.5 percent) of hired laborers work 150 days or more at the same operation per year. In the AFB study area, the greatest share of hired laborers working 150 days or more at the same farm is found in Jefferson County (48.5 percent). Again, the lowest share occurs in Crawford County (25.7 percent). The regional distribution of hired laborers working 150 days or more partially reflects the relative presence or absence of large farms (particularly farms with animal operations) within study area counties.

Figure 2.2 – Farms with Hired Labor (2012)



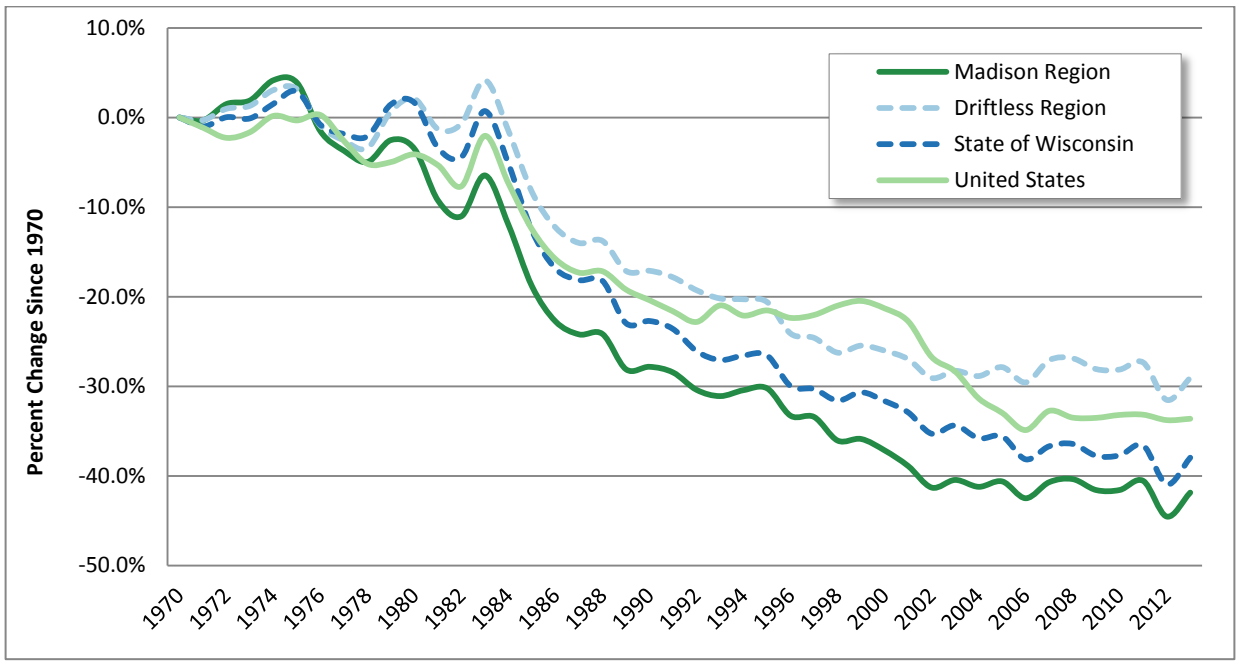
Source: USDA 2012 Census of Agriculture and Author's Calculations

As noted in Section 1, national employment levels in food manufacturing have remained somewhat consistent across the past 20 years. However, it is not surprising that farm employment has declined over prior decades. Improved chemicals, new machinery, and the adoption of innovative technologies have greatly improved agricultural yields. Consequently, increases in agricultural productivity through the use of non-labor inputs

[13] Definition from the Bureau of Economic Analysis

results in a need for fewer farm employees. Locally, farm employment in the Madison Region has declined by approximately 40 percent since 1970, largely mirroring the State of Wisconsin's employment trend (Figure 2.3). Similarly, farm employment in the Driftless Region dropped by almost 30 percent between 1970 and 2013. Despite these long-term declines, farm employment levels in the Madison Region and the Driftless Region have stabilized somewhat in the past decade.

Figure 2.3 – Percent Change in Farm Employment 1970 to 2013

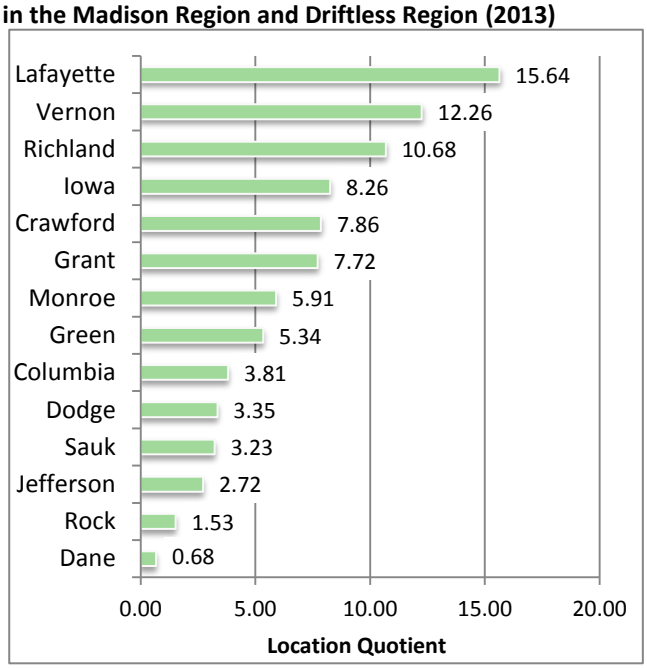


Source: Bureau of Economic Analysis and Author's Calculations

Location Quotients

Location quotients provide another means of analyzing farm employment in the region. As noted in Section 1, a location quotient (LQ) is calculated by comparing farm employment's share of total local employment to the industry's share of overall national employment. Again, the critical value for a location quotient is 1.0. An LQ of 1.0 means an area has the *same* proportion of farm employment as that of the nation. An LQ *greater* than 1.0 denotes that an area's share of farm employment is above the national share. Conversely, an LQ *less* than 1.0 indicates an area's farm employment is below the national percentage. Due to accuracy issues with employment data, location quotients between 0.75 and 1.25 are generally considered not to be significantly different from 1.0.

Figure 2.4 - Farm Employment Location Quotients by County in the Madison Region and Driftless Region (2013)

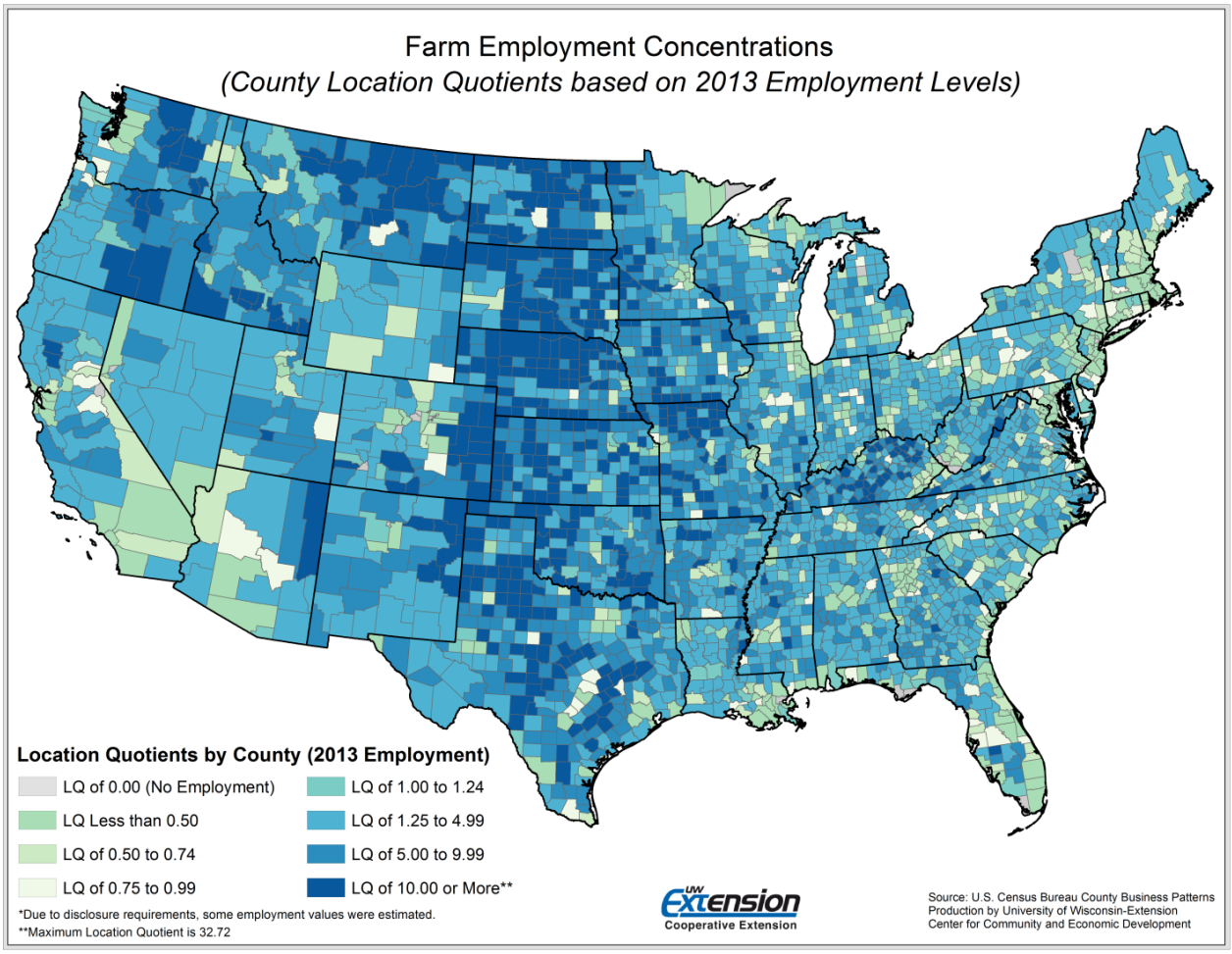


Source: Bureau of Economic Analysis and Author's Calculations

With the exception of Dane County, every county in the AFB study area has a location quotient above 1.0 (Figure 2.4). A farm employment location quotient of just 0.68 in Dane County may seem counterintuitive given its large number of farm employees. However, the figure reflects the fact that Dane County is also the largest employment center in the region and farm employment simply comprises a lower share of total employment than in other study area counties. The location quotients in Figure 2.4 are important as they show the relative concentration of agriculture in the region. The figures also reiterate the export-based nature of agricultural production in the region, which brings external dollars into local communities.

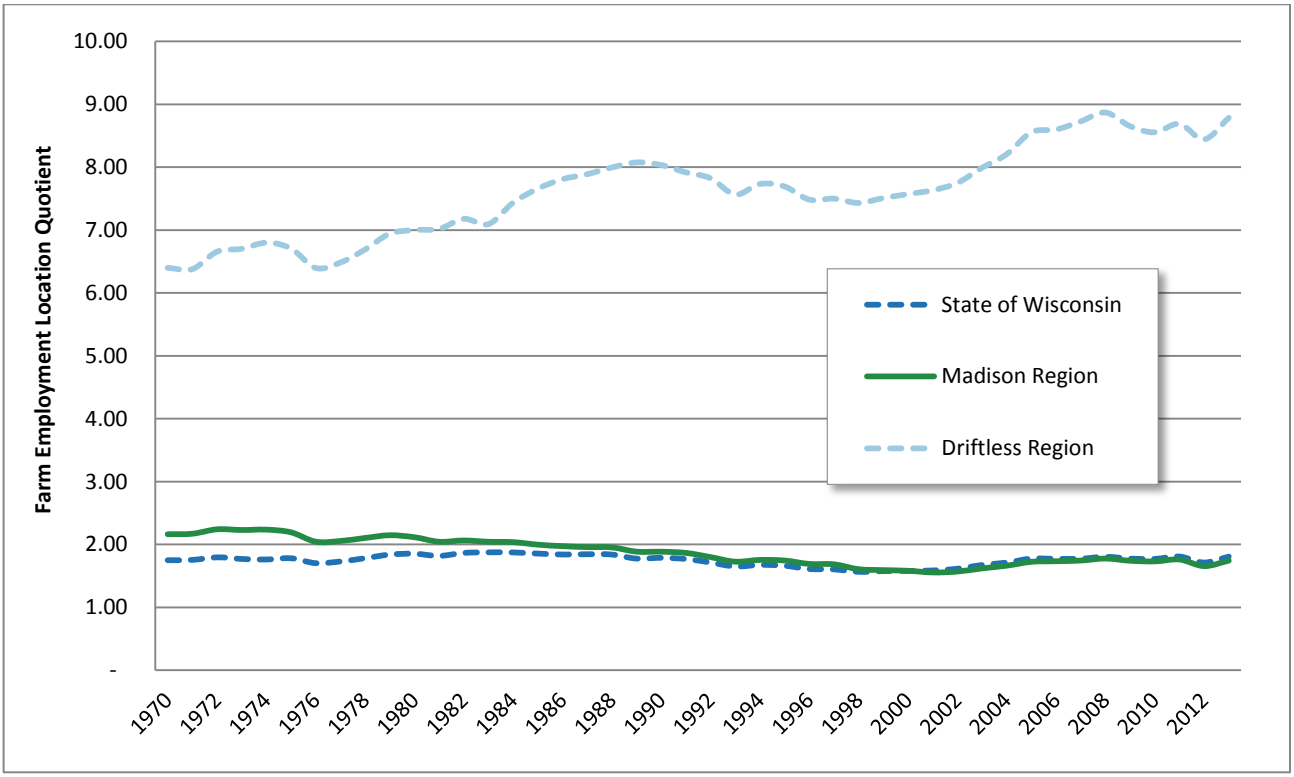
Farm employment location quotients are particularly large in Driftless Region counties. Lafayette, Vernon, Richland, Crawford, Grant and Monroe counties all have LQs of at least 5.9 and show the intensity of agricultural production employment in Southwest Wisconsin. Certainly other counties across the nation have large location quotients as well, particularly across the Great Plains states (Figure 2.5). However, comparing the map of farm employment location quotients to the map of food manufacturing location quotients in Section 1 (Figure 1.4) does suggest one potential advantage for the AFB study area. Compared to many areas with high farm employment location quotients, the AFB study area has a concentration of high location quotients in *both* farm employment and food manufacturing. That is, producers and processors are potentially within close geographic proximity of each other that could generate greater opportunities for networks and efficiencies.

Figure 2.5 - National Distribution of Farm Employment Location Quotients by County (2013)



Farm employment location quotients measured across the past four decades also provide additional context on employment change. Overall, the farm employment location quotient for the Madison Region has declined somewhat since 1970. Nonetheless, the region's location quotient has risen recently from 1.58 in 2000 to 1.74 in 2013. Within the Driftless Region, the farm employment location quotient increased from 6.40 in 1970 to 8.78 in 2013. The increasing LQ in the Driftless Region is partly a function of farm employment declining at a lesser rate in the region relative to the national rate of decline. The increasing location quotient also reflects non-farm employment in the Driftless Region growing at a slower rate than non-farm employment nationally. Regardless, the location quotient trend in the Driftless Region shows the area's potentially increasing importance on farm employment relative to the state and national economy.

Figure 2.6 – Farm Employment Location Quotient Trend 1970 to 2013



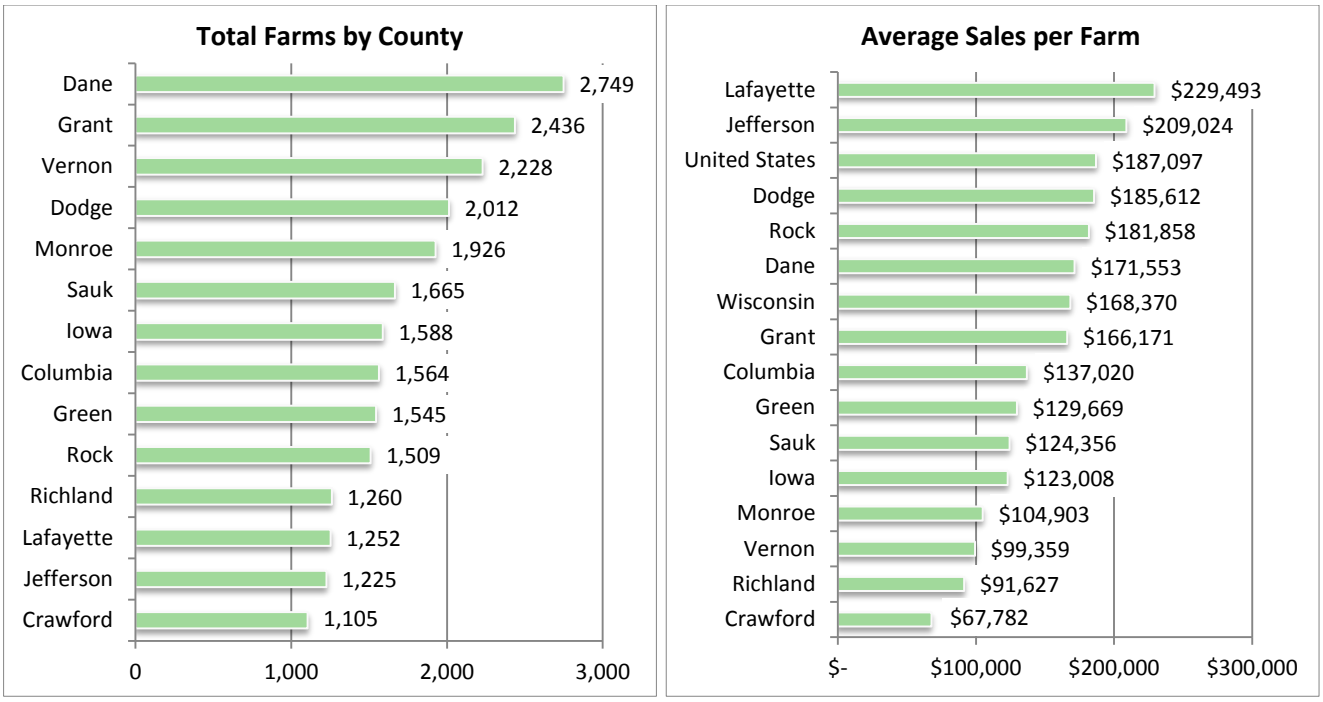
Source: Bureau of Economic Analysis and Author's Calculations

Farms and Value of Agricultural Products Sold

According to figures from the 2012 Census of Agriculture, the Madison Region is home to almost 13,900 farms. Furthermore, the Driftless Region contains approximately 10,200 farms. Reflecting the farm employment figures in Figure 2.1, the six counties with the greatest number of farms are also those with the largest number of farm employees (Figure 2.7). Not surprisingly, these counties are also among the largest counties in the AFB study area in terms of their total land area. Nonetheless, every county in the Madison Region and Driftless Region had at least 1,100 total farms in 2012.

When considering the large number of farms in the study area, it is important to understand the USDA's definition of a farm. A farm is currently defined as any place from which $1,000 or more of agricultural goods (crops or livestock) were sold or normally would have been sold during the year under consideration. USDA's National Agricultural Statistics Service (NASS) also includes government payments as sales. In other words, a farm is defined as any place with any combination of sales, potential sales, and government payments totaling at least $1,000. The phrase "normally would" aims to ensure the inclusion of farms that do, or could, contribute to agricultural production, even if they did not have $1,000 in sales. These farms are included as any given operation could experience an adverse event, such as a drought, flood or disease that destroys the farm's production.[14] *The inclusion of all operations is particularly important as Southern Wisconsin experienced a severe drought in 2012 which undoubtedly affects the figures reported in this abstract.*

Figure 2.7 - Total Number of Farms and Average Sales per Farm in 2012



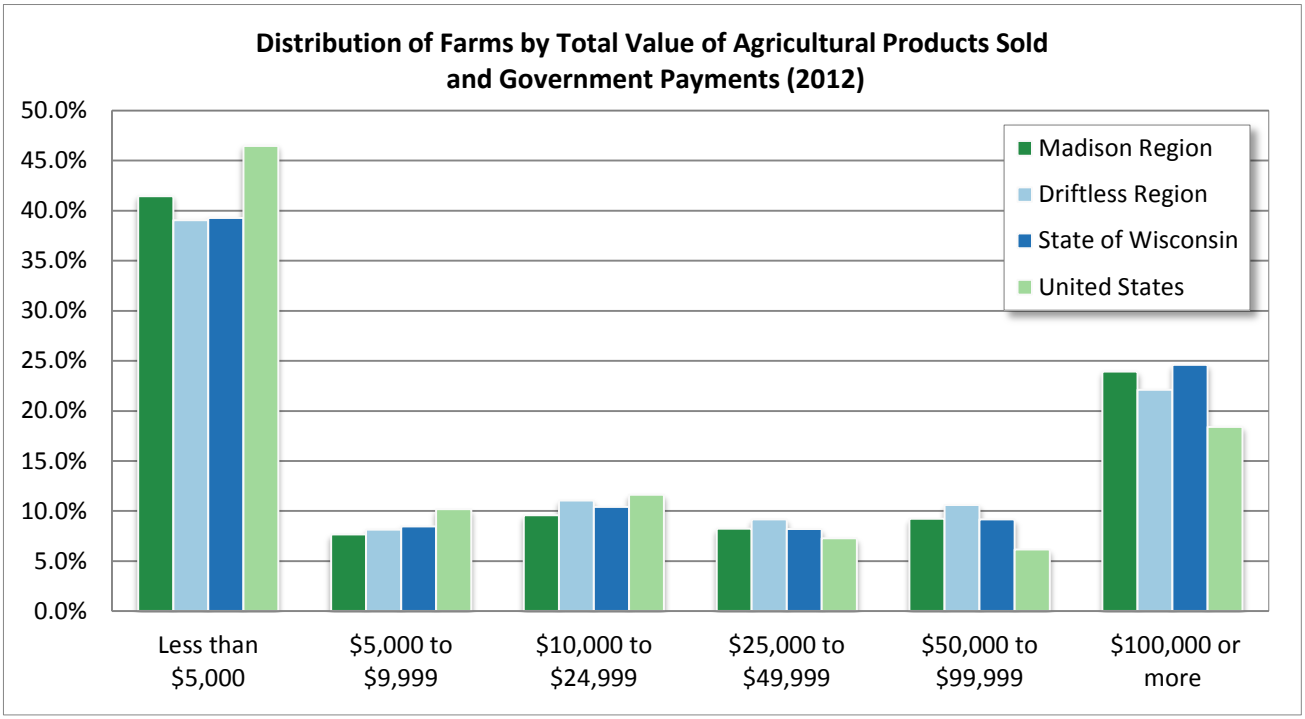
Source: USDA 2012 Census of Agriculture and Author's Calculations

[14] Some commodities also require a long production cycle before sales are realized.

Given the USDA's inclusive definition of a farm, it is not surprising that a large share of farms have relatively low total values of agricultural products sold. Within the Madison Region, 41.4 percent of farms reported less than $5,000 in sales of agricultural products (Figure 2.8). A slightly smaller percentage of farms in the Driftless Region (39.0 percent) reported values below $5,000. In contrast, both the Madison Region and the Driftless Region have higher shares of farms with agricultural sales above $25,000 than the national share.

Despite the large share of farms with agricultural sales under $100,000 dollars, average sales per farm are over $100,000 in all but three AFB study area counties (Figure 2.7). These seemingly contradictory figures are explained by a disproportionately large share of total agricultural sales produced by farms having sales of $100,000 or more. In 2012, 24 percent of farms in the Madison Region had sales of $100,000 or more. *However, these farms also accounted for 92 percent of all agricultural sales value in the Madison Region. In fact, farms with sales of $500,000 or more account 67 percent of all sales.* Similarly, the 22.1 percent of farms in the Driftless Region with sales of $100,000 or more accounted for 89 percent of total sales.

Figure 2.8 – Distribution of Farms by Total Value of Agricultural Products Sold and Government Payments



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

Between 2007 and 2012, the number of farms declined across the Madison Region, the Driftless Region, the State of Wisconsin, and the United States (Table 2.1). These declines occurred across almost all sizes of farms. The exceptions being increases in the number of farms of 500 or more acres in the Driftless Region (4.9 percent) and the State of Wisconsin (0.5 percent). Compared to the national rate, overall farm numbers decreased at higher rates across Wisconsin (-11.1 percent), the Madison Region (-8.6 percent), and the Driftless Region (-12.8 percent). These higher rates of decline partially reflect a mild winter and a severe drought that occurred across Southern Wisconsin in 2012. *Again, the drought conditions during 2012 will impact many of the farm production figures and characteristics in this abstract. The drought conditions also preclude a detailed analysis of changes occurring between 2012 and prior Census of Agriculture years.*

Consequently, this analysis of agricultural production should be viewed as a snapshot. Those interested in longer term changes to farm production characteristics in Wisconsin should refer to the *Status of Wisconsin Agriculture* reports produced annually by UW-Madison's College of Agriculture and Life Sciences, and the University of Wisconsin-Extension. These reports are available at: www.aae.wisc.edu/pubs/status/

Table 2.1 – Change in the Number of Farms – 2007 and 2012

Size of Farm by Acres	Madison Region			Driftless Region			State of Wisconsin			United States		
	2007	*2012*	*Change*	*2007*	*2012*	*Change*	*2007*	*2012*	*Change*	*2007*	*2012*	*Change*
All Farms	15,155	13,857	-8.6%	11,707	10,207	-12.8%	78,463	69,754	-11.1%	2,204,792	2,109,303	-4.3%
1 to 9 acres	1,272	1,185	-6.8%	627	521	-16.9%	4,861	4,603	-5.3%	232,849	223,634	-4.0%
10 to 49 acres	4,307	4,049	-6.0%	2,750	2,284	-16.9%	19,895	17,825	-10.4%	620,283	589,549	-5.0%
50 to 179 acres	5,238	4,615	-11.9%	4,738	4,113	-13.2%	29,765	25,502	-14.3%	660,530	634,047	-4.0%
180 to 499 acres	3,101	2,800	-9.7%	2,834	2,494	-12.0%	17,837	15,688	-12.0%	368,368	346,038	-6.1%
500 acres or more	1,237	1,208	-2.3%	758	795	4.9%	6,105	6,136	0.5%	322,762	316,035	-2.1%

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

In the Madison Region, the loss in farms between 2007 and 2012 translated to a decline of 102,000 acres in farmland (a change of -3.5 percent). The total land in farms declined by 69,600 acres in the Driftless Region (-3.2 percent). The greatest percentage losses occurred in Richland and Crawford counties, while acreage in Lafayette County and Rock County actually increased (Table 2.2). Again, it is unknown what levels of decline can be attributed to drought conditions relative to other factors.

Table 2.2 – Land in Farms (Change between 2007 and 2012)

Area	Acreage in 2012	Acreage in 2007	Numeric Change	Percent Change
Columbia County	307,973	316,193	-8,220	-2.6%
Dane County	504,420	535,756	-31,336	-5.8%
Dodge County	402,041	412,949	-10,908	-2.6%
Green County	302,295	306,859	-4,564	-1.5%
Iowa County	350,813	364,970	-14,157	-3.9%
Jefferson County	227,901	244,238	-16,337	-6.7%
Rock County	353,793	344,361	9,432	2.7%
Sauk County	332,649	358,919	-26,270	-7.3%
Madison Region Total	**2,781,885**	**2,884,245**	**-102,360**	**-3.5%**
Crawford County	216,584	238,225	-21,641	-9.1%
Grant County	587,587	610,914	-23,327	-3.8%
Lafayette County	368,501	342,617	25,884	7.6%
Monroe County	337,895	351,306	-13,411	-3.8%
Richland County	227,833	253,776	-25,943	-10.2%
Vernon County	345,892	357,090	-11,198	-3.1%
Driftless Region Total	**2,084,292**	**2,153,928**	**-69,636**	**-3.2%**

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

Farms by Industry Classification and Commodity Production

Farm diversity in the Madison Region and the Driftless Region is an advantage for the AFB cluster. While some large agricultural producing regions of the United States are rooted in a handful of commodities, farms in the AFB study area produce a wide variety of crop and animal products. Production also occurs across an assortment of scales. To better understand the scale and scope of agricultural products produced in the study area, the following analysis provides a brief overview of the region's farms categorized by industrial classification and by commodity type.

An individual farm may produce a variety of agricultural products. However, many farms will have a primary commodity type that generates the majority of sales. Grouping farms by their primary type of production provides one means of understanding farm diversity in the study area. Specifically, the Census of Agriculture classifies agricultural production establishments according to the North American Industrial Classification System (NAICS).[15] Agricultural production NAICS categories include:[16]

- "*Oilseed and grain farming (NAICS 1111)* - Comprises establishments primarily engaged in (1) growing oilseed and/or grain crops and/or (2) producing oilseed and grain seeds. These crops have an annual life cycle and are typically grown in open fields. This category includes corn silage and grain silage;
- *Vegetable and melon farming (NAICS 11121)* - Comprises establishments primarily engaged in one or more of the following: (1) growing vegetables and/or melon crops, (2) producing vegetable and melon seeds, and (3) growing vegetable and/or melon bedding plants;
- *Fruit and tree nut farming (NAICS 1113)* - Comprises establishments primarily engaged in growing fruit and/or tree nut crops. These crops are generally not grown from seeds and have a perennial life cycle;
- *Greenhouse, nursery, and floriculture production (NAICS 1114)* - Comprises establishments primarily engaged in growing crops of any kind under cover and/or growing nursery stock and flowers. ''Under cover'' is generally defined as greenhouses, cold frames, cloth houses, and lath houses. Crops grown are removed at various stages of maturity and have annual and perennial life cycles. The category includes short rotation woody crops and Christmas trees that have a growing and harvesting cycle of 10 years or less;
- *Other crop farming (NAICS 1119)* - Comprises establishments primarily engaged in (1) growing crops such as tobacco, cotton, sugarcane, hay, sugarbeets, peanuts, agave, herbs and spices, and hay and grass seeds, or *(2) growing a combination of the valid crops with no one crop or family of crops accounting for one-half of the establishment's agricultural production (value of crops for market);*
- *Beef cattle ranching and farming (NAICS 112111)* - Comprises establishments primarily engaged in raising cattle (including cattle for dairy herd replacements). Pastureland-only farms, those with only 100 or more acres of pastureland, were classified as "All other animal production farming (11299);
- *Cattle feedlots (NAICS 112112)* - Establishments primarily engaged in feeding cattle for fattening;

[15] As mentioned in Section 1, NAICS is the North American Industrial Classification System. As noted by the U.S. Census Bureau, "NAICS is the standard used by Federal statistical agencies in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy." For more information see: http://www.census.gov/eos/www/naics/.

[16] These descriptions are cited from the *2012 Census of Agriculture: Appendix B. General Explanation and Census of Agriculture Report Form. USDA, National Agricultural Statistics Service.*

- *Dairy cattle and milk production (NAICS 11212)* - This industry comprises establishments primarily engaged in milking dairy cattle;
- *Poultry and egg production (NAICS 1123)* - This industry group comprises establishments primarily engaged in breeding, hatching, and raising poultry for meat or egg production;
- *Sheep and goat farming (NAICS 1124)* - This industry group comprises establishments primarily engaged in raising sheep, lambs, and goats, or feeding lambs for fattening;
- *Animal aquaculture (NAICS 1125)* - Comprises establishments primarily engaged in the farm raising of finfish, shellfish, or any other kind of animal aquaculture. These establishments use some form of intervention in the rearing process to enhance production, such as holding in captivity, regular stocking, feeding, and protecting from predators;
- *Other animal production (NAICS 1129)* - Comprises establishments primarily engaged in raising animals and insects (except cattle, hogs and pigs, poultry, sheep and goats, and aquaculture) for sale or product production. These establishments are primarily engaged in one of the following: bees, horses and other equine, rabbits and other fur-bearing animals, etc., and producing products such as honey and other bee products. *Establishments primarily engaged in raising a combination of animals with no one animal or family of animals accounting for one-half of the establishment's agricultural production are included in this industry group. Farms with only 100 acres or more of pastureland are classified here as well."*

In comparing the distribution of farms by NAICS categories, farms in the Madison Region and Driftless Region are much more likely to be classified as oilseed and grain farms than the national distribution (Table 2.3). Large shares of farms are also classified as other crop farming (NAICS 1119) which partially reflects farms where less than half of their sales comes from one crop. Not surprisingly, farms in the Madison Region and the Driftless Region are also distinguished by the high share classified under dairy cattle and milk production (NAICS 11212). When compared to the Madison Region and the State of Wisconsin, a high share of farms in the Driftless Region also are classified as beef cattle ranching and farming (NAICS 112111).

Table 2.3 – Farms by NAICS Classification

NAICS Description and Classification	Madison Region	Driftless Region	State of Wisconsin	United States
Total farms	13,857	10,207	69,754	2,109,303
Oilseed and grain farming (1111)	32.4%	24.6%	28.3%	17.5%
Vegetable and melon farming (1112)	1.9%	1.2%	1.9%	2.0%
Fruit and tree nut farming (1113)	1.2%	1.8%	1.8%	4.4%
Greenhouse, nursery, and floriculture production (1114)	2.1%	1.0%	2.5%	2.5%
Other crop farming (1119)	24.2%	23.6%	22.5%	23.6%
Beef cattle ranching and farming (112111)	12.0%	21.0%	14.7%	29.4%
Cattle feedlots (112112)	1.6%	1.7%	1.3%	0.7%
Dairy cattle and milk production (11212)	11.0%	15.9%	14.9%	2.2%
Hog and pig farming (1122)	1.0%	0.5%	0.7%	1.0%
Poultry and egg production (1123)	2.7%	1.4%	2.3%	2.5%
Sheep and goat farming (1124)	2.4%	2.3%	2.2%	3.5%
Animal aquaculture & other animal production (1125,1129)	7.5%	4.9%	6.9%	10.8%

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

Agricultural enterprises also can be classified according to the individual commodities farms produce. Every farm recorded in the Census of Agriculture reports whether or not the establishment produces any given type of crop or animal production; not just by the primary type of commodity it produces. The following tables summarize the production of selected commodities in the AFB study area. The tables include the number of farms producing a specific agricultural product; the total value of sales for the product; and average sales per farm. Again, this information should be viewed as a snapshot of conditions in 2012. As with total average sales per farm reported in Figure 2.7, average sales for a given agricultural commodity also may be biased by the sizes of farm operations in an area.

Given the high share of farms classified as oilseed and grain farming operations in Table 2.2, the large number of study area farms producing corn, wheat and soybeans is expected (Table 2.4). Over 10,000 farms in the AFB study area produced corn in 2012. These farms combined for a total sales value of $844 million. Not surprisingly, the highest average sales per farm were found in Rock County ($159,974 per farm). Four other study area counties (Columbia, Dane, Dodge and Lafayette) also had average sales over $100,000 per farm. While all study area counties had average corn sales per farm below the national average, the national value is skewed somewhat by extremely large operations in Corn Belt states.

In addition to corn, over 1,700 farms in the study area produced $37.3 million in wheat sales. Furthermore, 6,120 farms had soybean sales of $321.3 million. As with corn, most counties had average sales per farm below the national average for these commodities. Again, the national averages are influenced by large scale producers in the Midwest and Great Plains states.

Table 2.4 – Corn, Wheat and Soybeans in 2012 - Farms and Sales

Commodity	Corn			Wheat			Soybeans		
	Number of Farms	*Total Value of Sales ($1000s)*	*Average Sales per Farm*	*Number of Farms*	*Total Value of Sales ($1000s)*	*Average Sales per Farm*	*Number of Farms*	*Total Value of Sales ($1000s)*	*Average Sales per Farm*
Columbia	731	$88,010	$120,397	172	$4,230	$24,593	410	$19,562	$47,712
Dane	1,069	$113,307	$105,993	290	$7,198	$24,821	759	$41,078	$54,121
Dodge	1,025	$106,335	$103,741	376	$7,865	$20,918	756	$39,496	$52,243
Green	616	$41,541	$67,437	152	$3,532	$23,237	399	$20,298	$50,872
Iowa	571	$31,591	$55,326	62	$1,394	$22,484	313	$15,245	$48,706
Jefferson	569	$52,643	$92,518	198	$3,024	$15,273	497	$29,026	$58,402
Rock	619	$99,024	$159,974	157	$4,521	$28,796	530	$45,383	$85,628
Sauk	730	$43,924	$60,170	105	$2,194	$20,895	455	$16,052	$35,279
Crawford	416	$21,730	$52,236	16	$402	$25,125	183	$7,447	$40,694
Grant	1,150	$86,664	$75,360	57	$1,222	$21,439	633	$30,846	$48,730
Lafayette	566	$64,542	$114,032	42	$956	$22,762	339	$26,888	$79,316
Monroe	850	$31,700	$37,294	16	$205	$12,813	324	$9,273	$28,620
Richland	415	$20,442	$49,258	19	$221	$11,632	186	$6,409	$34,457
Vernon	990	$42,647	$43,078	59	$415	$7,034	336	$14,325	$42,634
Wisconsin	28,802	$2,345,697	$81,442	5,127	$124,468	$24,277	17,106	$879,153	$51,394
United States	361,744	$67,250,120	$185,905	147,022	$15,761,545	$107,205	301,343	$38,745,118	$128,575

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

Over 800 farms produced vegetables, melons, potatoes or sweet potatoes in 2012 (Table 2.5). While sales values are suppressed for Crawford County and Iowa County, the 12 counties with figures reported in Table 2.5 generated $33.7 million in total sales. The types of vegetables grown may vary by year, but farms in the region produced a wide variety of products in 2012 (Appendix B). A smaller number of farms produce either fruits and tree nuts (206 farms) or berries (291 farms). However, every county in the AFB study area had at least four farms engaged in growing these products.

Relative to the national average, fruit and tree nut and berry operations tend to have much smaller sales per farm. However, berry operations in Monroe County had average sales well above the national value. The average sales figure in Monroe County reflects the large number of cranberry producers in the area. Furthermore, average sales per farm for fruit and tree nut farms in Richland County were much higher than other study area counties. The higher values in Richland County likely reflect larger apple growing operations in the area.

Table 2.5 – Vegetables, Fruits and Tree Nuts, and Berries in 2012 - Farms and Sales

Commodity	Vegetables, melons, potatoes, and sweet potatoes			Fruits and tree nuts			Berries		
	Number of Farms	*Total Value of Sales ($1000s)*	*Average Sales per Farm*	*Number of Farms*	*Total Value of Sales ($1000s)*	*Average Sales per Farm*	*Number of Farms*	*Total Value of Sales ($1000s)*	*Average Sales per Farm*
Columbia	98	$2,609	$26,622	13	$142	$10,923	23	$85	$3,696
Dane	143	$4,138	$28,937	33	$822	$24,909	45	$225	$5,000
Dodge	135	$8,101	$60,007	10	$230	$23,000	10	(D)	(D)
Green	20	$1,999	$99,950	7	$77	$11,000	5	(D)	(D)
Iowa	22	(D)	(D)	7	$82	$11,714	6	$23	$3,833
Jefferson	33	$2,880	$87,273	11	(D)	(D)	4	(D)	(D)
Rock	62	$5,110	$82,419	12	$134	$11,167	10	$129	$12,900
Sauk	43	$1,974	$45,907	6	(D)	(D)	18	(D)	(D)
Crawford	17	(D)	(D)	21	(D)	(D)	10	$50	$5,000
Grant	28	$311	$11,107	9	$126	$14,000	8	$54	$6,750
Lafayette	13	$268	$20,615	5	$42	$8,400	7	(D)	(D)
Monroe	49	$754	$15,388	14	$270	$19,286	78	$44,565	$571,346
Richland	27	$548	$20,296	9	$923	$102,556	8	$9	$1,125
Vernon	146	$5,056	$34,630	49	$563	$11,490	59	(D)	(D)
Wisconsin	2,880	$555,432	$192,858	713	$20,981	$29,426	903	$198,290	$219,590
United States	72,267	$16,851,235	$233,180	86,675	$22,427,436	$258,753	24,553	$3,442,264	$140,197

Source: USDA 2012 Census of Agriculture and Author's Calculations (D) Withheld to avoid disclosing data for individual farms.

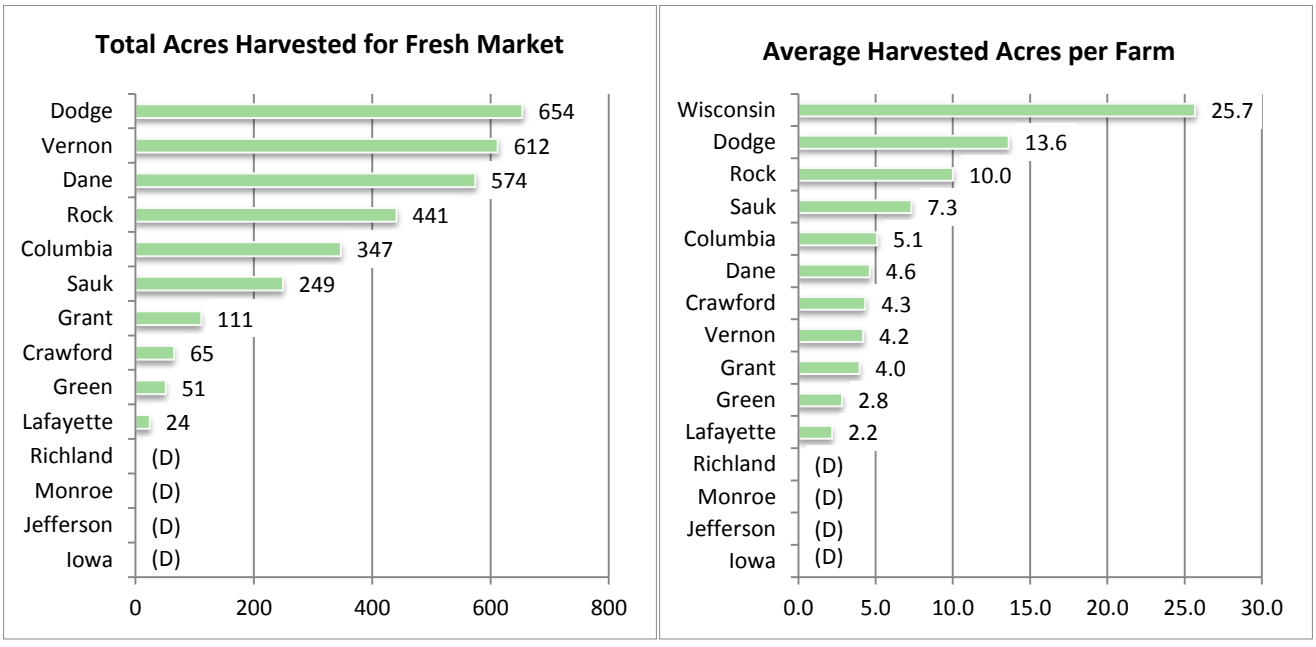
When considering vegetable farm figures in Table 2.5, it is important to note that there is a distinct difference between vegetables produced for the fresh market and those produced for processing. Vegetables produced for the fresh market tend to require higher levels of quality and appearance. Consequently, fresh market vegetables typically involve additional production costs and also command higher prices. A portion of these higher production costs are attributed to greater labor costs as many vegetables for the fresh market are harvested using manual labor. In comparison, many vegetables grown for processing do not require the same aesthetic qualities, allowing them to be harvested using mechanical means and transported in bulk to processors. As vegetables for processing have lower costs, they are often grown under contracts that reduce production costs. The need for lower costs may also require vegetables for processing to be grown at larger scales.

Accordingly, several of the counties with high vegetable sales totals have a large number of acres devoted to vegetables harvested for processing. In 2012, over 8,400 acres of vegetables for processing were harvested in Dodge County. Several other study area counties also had notable acreages devoted to vegetables grown for processing including: Columbia (1,806 acres), Dane (1,509 acres), Green (969 acres), Rock (4,732 acres) and Sauk (1,835 acres). Most of the vegetables grown for processing are peas, sweet corn, lima beans and snap beans. *These farms contribute to Wisconsin's position as one of the top states growing vegetables for processing purposes.* More information on vegetables harvested for processing (as well as those intended for the fresh market) is available in Appendix B.

When compared to operations growing vegetables for processing, study area farms producing vegetables for the fresh market tend to be small in scale. Dodge County had the greatest number acres of vegetables harvested for the fresh market, as well as the largest average acres harvested per farm (Figure 2.9). Nonetheless, Dodge County's average vegetable acres harvested for the fresh market was well below Wisconsin's overall average. Furthermore, the average fresh market acres harvested in study area counties are well below the values found in those states producing a large amount of fresh market vegetables. As an example, California accounted for 32 percent of the United States' fresh market vegetable sales value in 2012. *California farms growing fresh market vegetables harvested an average of 142 acres.* Consequently, the scale of fresh market operations in the AFB study area is significantly different.

While the scale of fresh market vegetable production in study area counties is smaller, the difference also suggests a high value of products grown. For instance, Vernon County farms producing fresh market vegetables harvested an average of just 4.2 acres and reported no acres harvested for processing. Nonetheless, Vernon County still produced average vegetable sales per farm well above many other study area counties. Some of these figures may be skewed by the 2012 drought, but the Driftless Region remains home to many small farms producing high quality, high value produce. Cluster development opportunities and challenges related to the scale of vegetable production are considered later in this abstract.

Figure 2.9 - Total Acres of Vegetables Harvested for Fresh Market and Average Harvested Acres per Farm (2012)



Source: USDA 2012 Census of Agriculture and Author's Calculations (D) Withheld to avoid disclosing data for individual farms.

In 2012, almost 8,800 study area farms raised cattle and calves, with a total sales value of $522 million (excluding Crawford County). Over 2,100 of these farms were found in either Grant County or Vernon County (Table 2.6). As with other comparisons in these tables, average sales per farm in the study area were lower than the national average (with the exception of Lafayette County). While a smaller number of farms produced milk from cows (3,420 farms), these farms reported significant total sales of $1.31 billion (excluding Crawford County). Average milk sales per farm varied from $173,249 in Vernon County to $700,217 in Dane County.

Table 2.6 – Cattle and Calves and Milk from Cows in 2012 - Farms and Sales

Commodity	Cattle and Calves			Milk from Cows		
	Number of Farms	*Total Value of Sales ($1000s)*	*Average Sales per Farm*	*Number of Farms*	*Total Value of Sales ($1000s)*	*Average Sales per Farm*
Columbia	423	$27,396	$64,766	130	$61,878	$475,985
Dane	745	$59,977	$80,506	293	$205,193	$700,317
Dodge	647	$40,924	$63,252	305	$149,157	$489,039
Green	557	$26,070	$46,804	276	$98,822	$358,051
Iowa	652	$53,153	$81,523	216	$77,590	$359,213
Jefferson	300	$25,557	$85,190	110	$57,828	$525,709
Rock	366	$27,595	$75,396	101	$70,638	$699,386
Sauk	604	$29,566	$48,950	222	$93,119	$419,455
Crawford	473	(D)	(D)	121	(D)	(D)
Grant	1,180	$89,209	$75,601	449	$164,759	$366,947
Lafayette	627	$66,603	$106,225	262	$113,240	$432,214
Monroe	764	$21,355	$27,952	352	$87,090	$247,415
Richland	500	$24,143	$48,286	150	$53,909	$359,393
Vernon	1,041	$30,306	$29,112	433	$75,017	$173,249
Wisconsin	25,614	$1,416,881	$55,317	11,295	$4,952,039	$438,428
United States	740,978	$76,380,153	$103,080	50,556	$35,512,120	$702,431

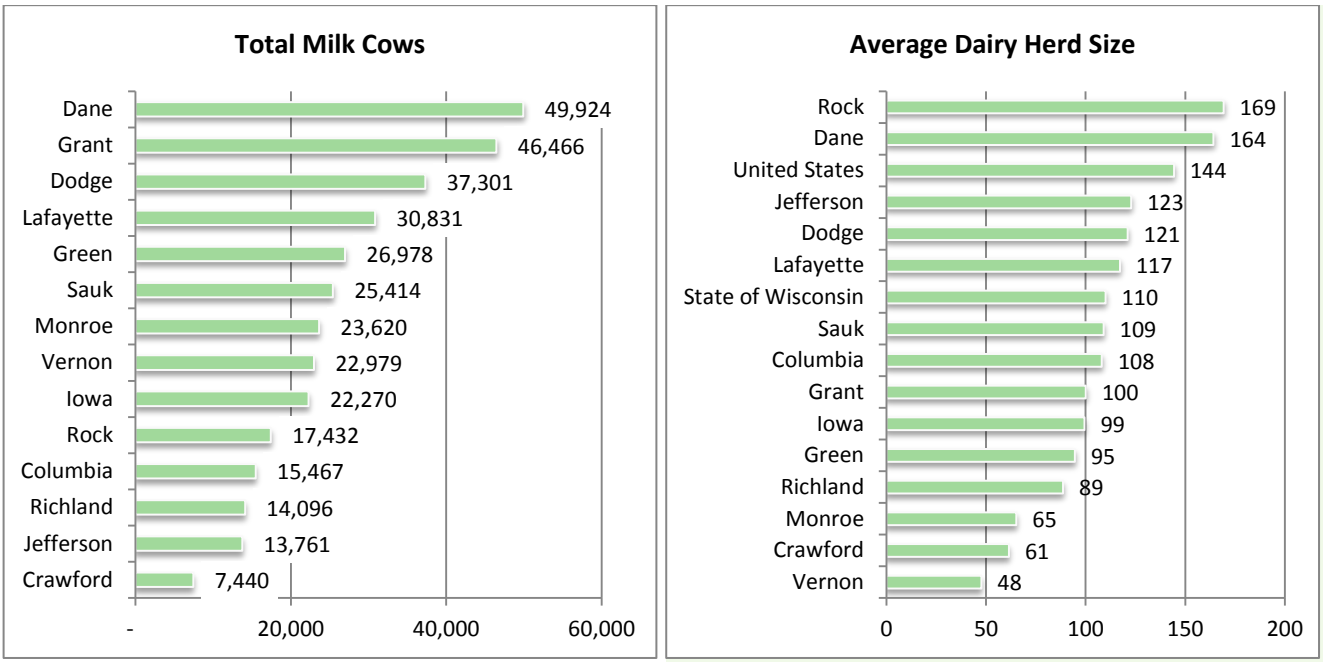
Source: USDA 2012 Census of Agriculture and Author's Calculations (D) Withheld to avoid disclosing data for individual farms.

The sales per farm values in Table 2.6 largely reflect average dairy herd sizes throughout study area counties. That is, those counties with the largest average sales per farm (Dane, Rock, Jefferson, Dodge, Lafayette, Sauk and Columbia) also have the largest average dairy herd sizes (Figure 2.10). However, average herd sizes do not reflect the diversity of farms with large and small dairy herds (Figure 2.11). In general, counties in the Madison Region tend to have a greater share of dairy farms with larger herds than Driftless Region counties. Some of this difference may reflect organic producers concentrated in the Driftless Region. For instance, Organic Valley has over 500 member farms, with two-thirds of them located in the southwestern part of the Wisconsin that encompasses the Driftless Region. These organic dairy producers who partner with Organic Valley have an average herd size of 65, smaller than the overall state average of 110 dairy cows (Jesse and Mitchell 2014).

From a cluster development perspective, the diversity of large and small dairy farms in Figure 2.11 should be viewed as a potential advantage. As noted by Jesse and Mitchell (2014) "large farmers contribute significantly to an expanding milk supply for processors, encouraging investment and innovation in that sector. In turn, this strengthens markets for smaller dairies. Small farmers help maintain the state's dairy infrastructure, which is

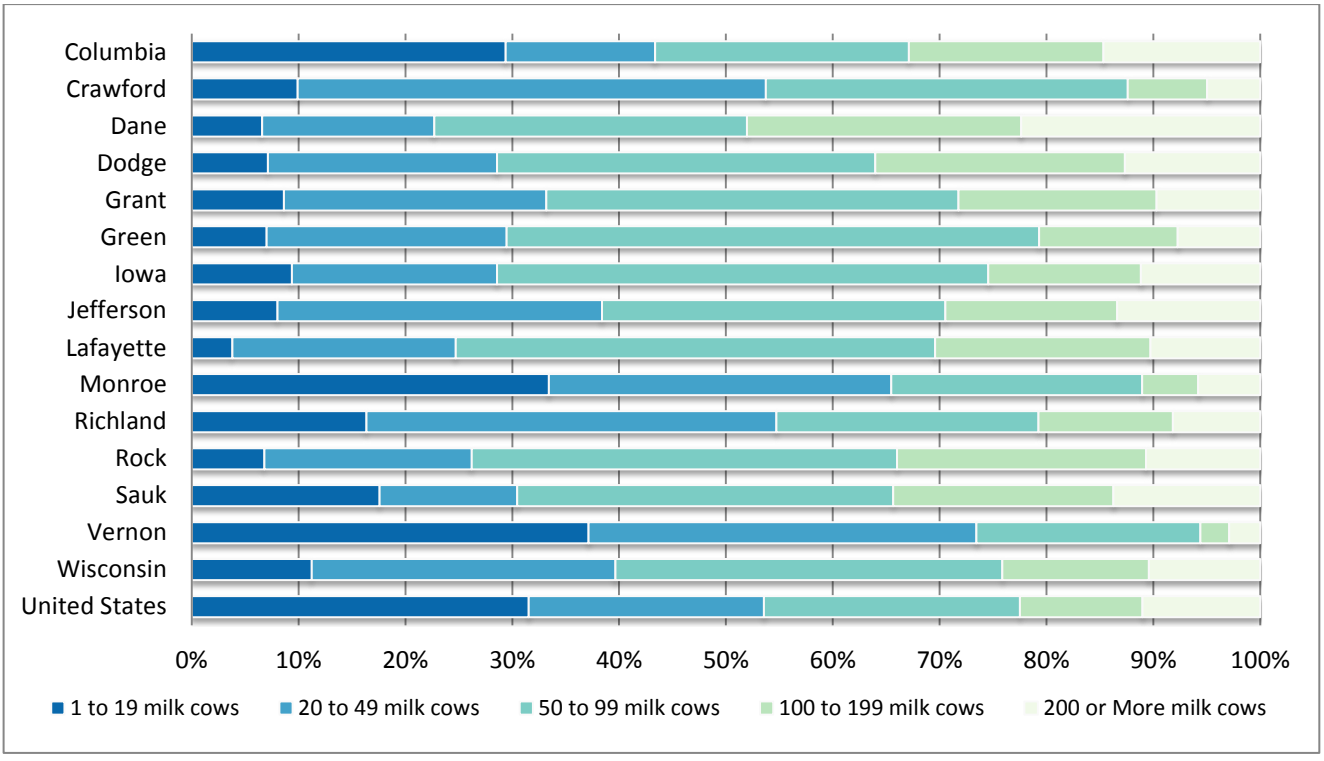
based on both number of customers and volume of milk. Large numbers of smaller dairy farms help sustain their local rural communities, benefiting both themselves and the owners and employees of larger dairies. Finally, smaller operations pair well with the smaller artisan cheese plants that have played a big role in advancing the Wisconsin brand."

Figure 2.10 - Total Milk Cows and Average Dairy Herd Size (2012)



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

Figure 2.11 — Percentage of Farms of Dairy Farms by Herd Size (2012)



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

In addition to cattle and calves, and milk cows, study area farmers also raise a number of other animals and animal products (Table 2.7). In 2012, more than 1,800 poultry and egg producers generated at least $70 million in sales.[17] By far the greatest amount was generated by farms in Jefferson County which is home to sizeable operations at Daybreak Foods. In addition, almost 800 pork producers were located in the study area, accounting for over a third of Wisconsin's hog and pig farms. Finally, 1,076 farms producing sheep and goat products were found in the Madison Region and Driftless Region. Average sales per farm in many counties also exceeded the national average for these products.

Table 2.7 – Poultry and Eggs; Hogs and Pigs; and Sheep, Goats, Wool, Mohair, and Milk in 2012 - Farms and Sales

Commodity	Poultry and Eggs			Hogs and Pigs			Sheep, goats, wool, mohair, and milk		
	Number of Farms	*Total Value of Sales ($1000s)*	*Average Sales per Farm*	*Number of Farms*	*Total Value of Sales ($1000s)*	*Average Sales per Farm*	*Number of Farms*	*Total Value of Sales ($1000s)*	*Average Sales per Farm*
Columbia	110	$3,199	$29,082	44	$1,438	$32,682	83	$653	$7,867
Dane	185	$2,253	$12,178	86	$7,590	$88,256	93	$503	$5,409
Dodge	139	$3,432	$24,691	62	$7,306	$117,839	72	$615	$8,542
Green	134	$163	$1,216	42	$930	$22,143	81	$1,460	$18,025
Iowa	79	(D)	(D)	40	$681	$17,025	67	$1,087	$16,224
Jefferson	109	$55,360	$507,890	54	(D)	(D)	50	(D)	(D)
Rock	112	(D)	(D)	51	(D)	(D)	90	$691	$7,678
Sauk	163	$2,177	$13,356	52	$9,933	$191,019	67	$704	$10,507
Crawford	49	$32	$653	16	(D)	(D)	30	$209	$6,967
Grant	121	$1,354	$11,190	75	$15,821	$210,947	109	$3,314	$30,404
Lafayette	69	$771	$11,174	55	$3,425	$62,273	64	$2,645	$41,328
Monroe	217	$541	$2,493	84	$280	$3,333	87	$692	$7,954
Richland	63	$25	$397	36	(D)	(D)	43	$402	$9,349
Vernon	260	(D)	(D)	97	$608	$6,268	140	$1,145	$8,179
Wisconsin	5,350	$465,717	$87,050	2,210	$90,589	$40,990	2,737	$29,673	$10,841
United States	137,541	$42,751,468	$310,827	55,882	$22,492,611	$402,502	114,746	$939,662	$8,189

Source: USDA 2012 Census of Agriculture and Author's Calculations (D) Withheld to avoid disclosing data for individual farms.

[17] Sales do not include values from Iowa, Rock and Vernon counties.

Other Selected Farm Characteristics

Farms in the Madison Region and the Driftless Region clearly are responsible for a large number of employees and produce a diversity of agricultural goods. These farms also generate a sizeable economic impact. However, farms in the AFB study area have a number of other characteristics that could potentially create opportunities to distinguish the AFB study area somewhat from many other agricultural areas. Specific characteristics explored below include organic production, direct sales, and other selected operational characteristics.

Organic Production

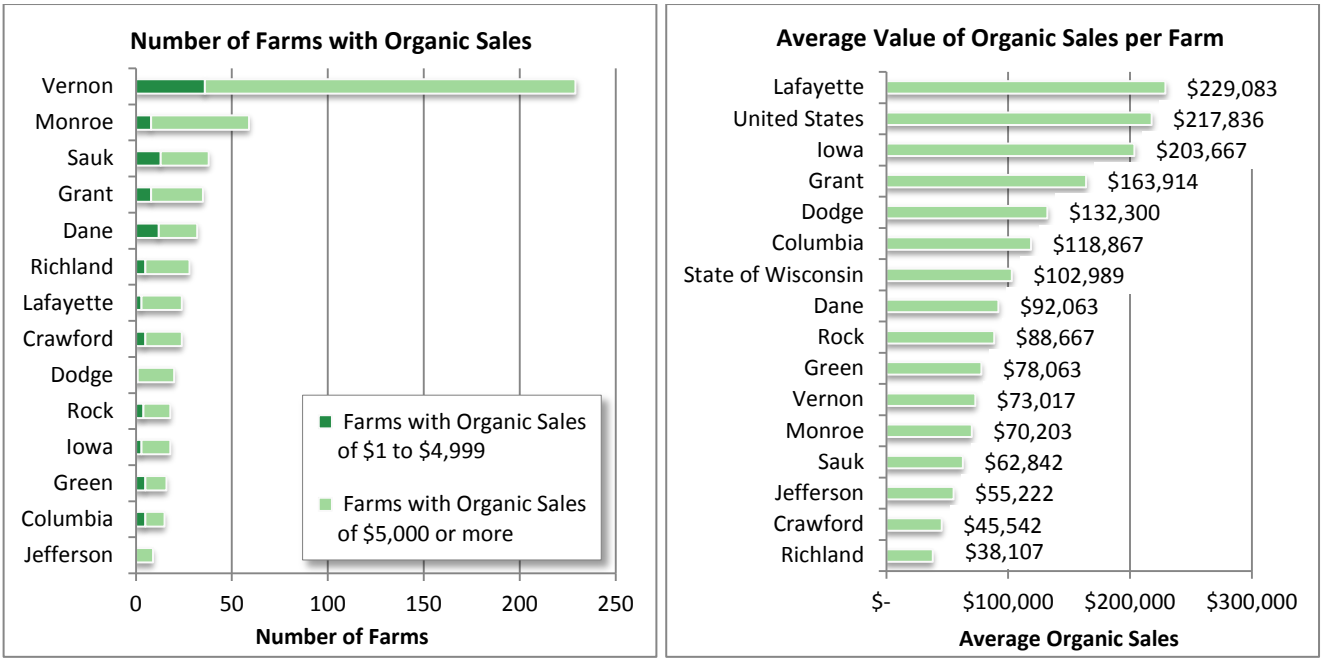
According to the USDA's Agricultural Market Service, "organic is a labeling term that indicates that the food or other agricultural product has been produced through approved methods that integrate cultural, biological, and mechanical practices that foster cycling of resources, promote ecological balance, and conserve biodiversity. Synthetic fertilizers, sewage sludge, irradiation, and genetic engineering may not be used." While organic products accounted for less than one percent of the national value of all agricultural product sales in 2012, the demand for organic food products has grown significantly over the past decade. Growth is expected to continue as organic products are increasingly available to consumers. Once the domain of natural food stores, organic products are available in nearly 3 out of 4 conventional grocery stores (USDA Economic Research Service).[18]

Both the State of Wisconsin and the AFB study area are prominent in organic agricultural production. In 2012, the State of Wisconsin ranked fourth among all states in the value of organic product sales. Farms in the AFB study area contributed over $51 million dollars to the state's organic product sales, or 42 percent of Wisconsin's total organic production value. Importantly, the total value of organic products produced in the AFB study area grew by 31 percent between 2007 and 2012. Similarly, the value of organic products in Wisconsin grew by 36 percent during the same period.

In 2012, 565 farms in the AFB study area had organic sales. The majority of organic farms are located in the Driftless Region, with Vernon County alone accounting for 41 percent of the study area's organic farms (Figure 2.12). While average organic sales per farm were the greatest in Lafayette County, Vernon County farms also generated about a third of total organic sales in the AFB study area. Four out of every five organic farms in the region had sales of $5,000 or more. (Farms with $5,000 or more in organic sales in a given year are significant as they must be certified by the National Organic Program). The study area's overall concentrations 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 (Figure 2.13)

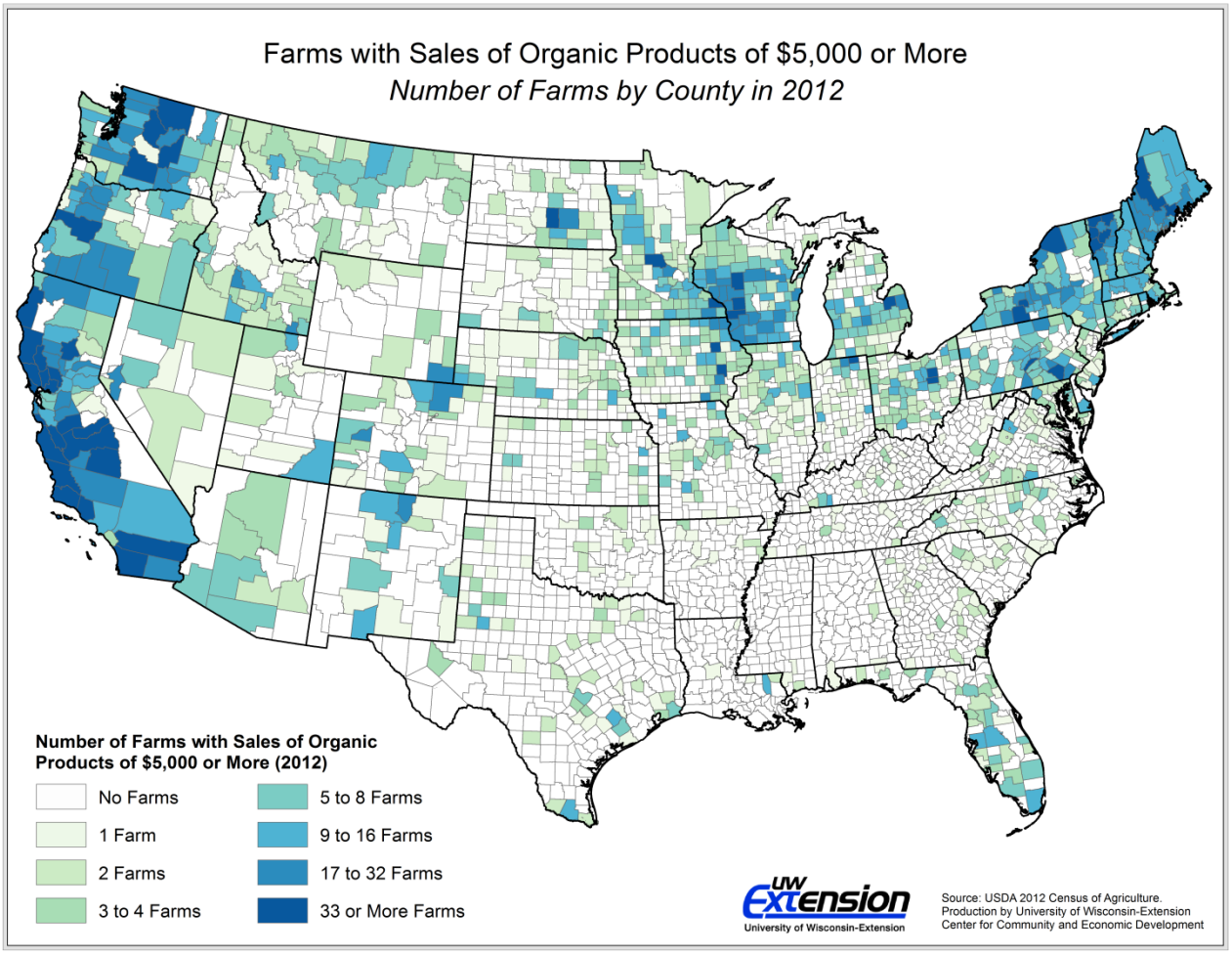
[18] More information on organic food trends is available in Section 3.

Figure 2.12 – Farms with Organic Sales and Average Value of Organic Sales per Farm



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

Figure 2.13 – Farms with Organic Product Sales of $5,000 or More (2012)



Direct Sales and Other Selected Practices

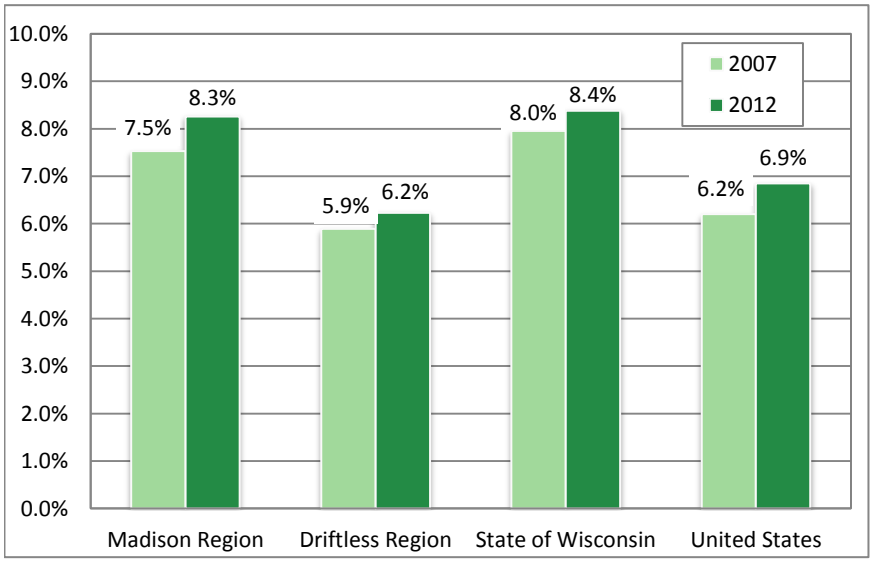
Interest in food produced locally has grown over the past decade. Economic and community development practitioners tout many potential benefits of food that is produced, marketed or consumed locally. While the exact economic, environmental and health impacts are still being explored, most research agrees that production and consumption of local food is hard to measure. The difficulty in measuring local food activity partially stems from an inconsistent definition of local food. While some definitions are based on a distance or radius around an area (e.g. 100-mile or 400-mile radius), this abstract considers local foods from a marketing channel perspective. That is, local foods are those sold through direct-to-consumer channels and intermediated sales[19] (Hand and Martinez 2010; Martinez et al 2010; Low and Vogel 2011).

The Census of Agriculture provides some indicators of local food production and marketing. One measure is the number of farms with direct-to-consumer sales. These farms produce and sell agricultural products directly to individuals for human consumption from venues such as farmers' markets, community supported agriculture (CSA) programs, and roadside stands.[20] However, sales of agricultural products by vertically integrated operations through their own processing and marketing operations are excluded from these figures.

In 2012, 8.3 percent of Madison Region farms reported direct sales to consumers (Figure 2.14). The share of farms with direct sales was almost identical to the state share and 1.4 percent greater than the national share. The share of farms with direct sales also increased from 7.5 percent in 2007. A smaller share of farms reported direct sales in the Driftless Region. The difference between the Madison Region and the Driftless Region may be partially driven by geography. Nationally, a large share of farms with local food sales are located in metropolitan counties, suggesting that proximity to urban markets is strongly related to farms engaging in direct sales (Low and Vogel 2011). As farms in the Driftless Region are somewhat removed from urban centers, this distance potentially could influence direct sales activities among some farms in the region.

Those farms in the Driftless Region that do have direct sales tend to have higher average sales values (Figure 2.15). Furthermore, average direct sales per farm in the region also increased notably between 2007 and 2012. Consequently, direct sales operations in the Driftless Region may be operating at increasingly larger scales.

Figure 2.14 – Percent of Farms with Direct Sales to Consumers (2007 and 2012)



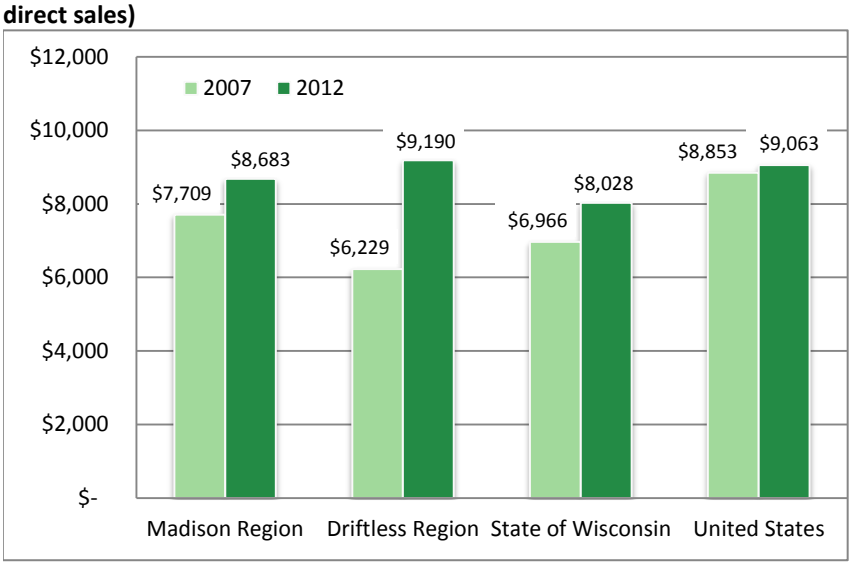
Source: USDA 2012 Census of Agriculture and Author's Calculations

[19] Intermediated sales are direct-to-grocer or direct-to-restaurant.

[20] Direct sales figures exclude non-edible products such as nursery crops, cut flowers, and wool.

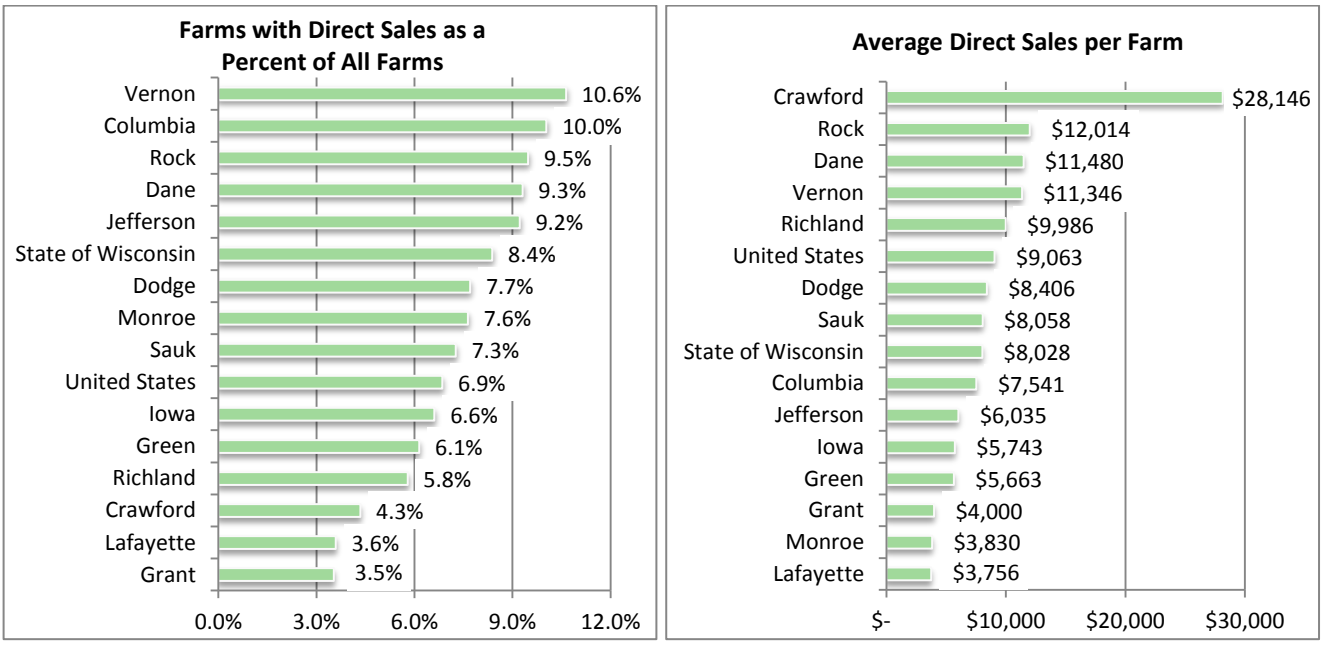
While the Driftless Region has a smaller overall share of farms with direct-to-consumer sales, Vernon County has the highest share of any study area county. Crawford, Vernon and Richland counties also have average direct sales per farm figures above the national average (Figure 2.16). In contrast, some counties in the Madison Region also have low shares of farms with direct sales. Consequently, aggregating direct sales figures at a regional level may miss some of these important variations.

Figure 2.15 – Average Direct Sales per Farm 2007 and 2012 (for farms with direct sales)



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

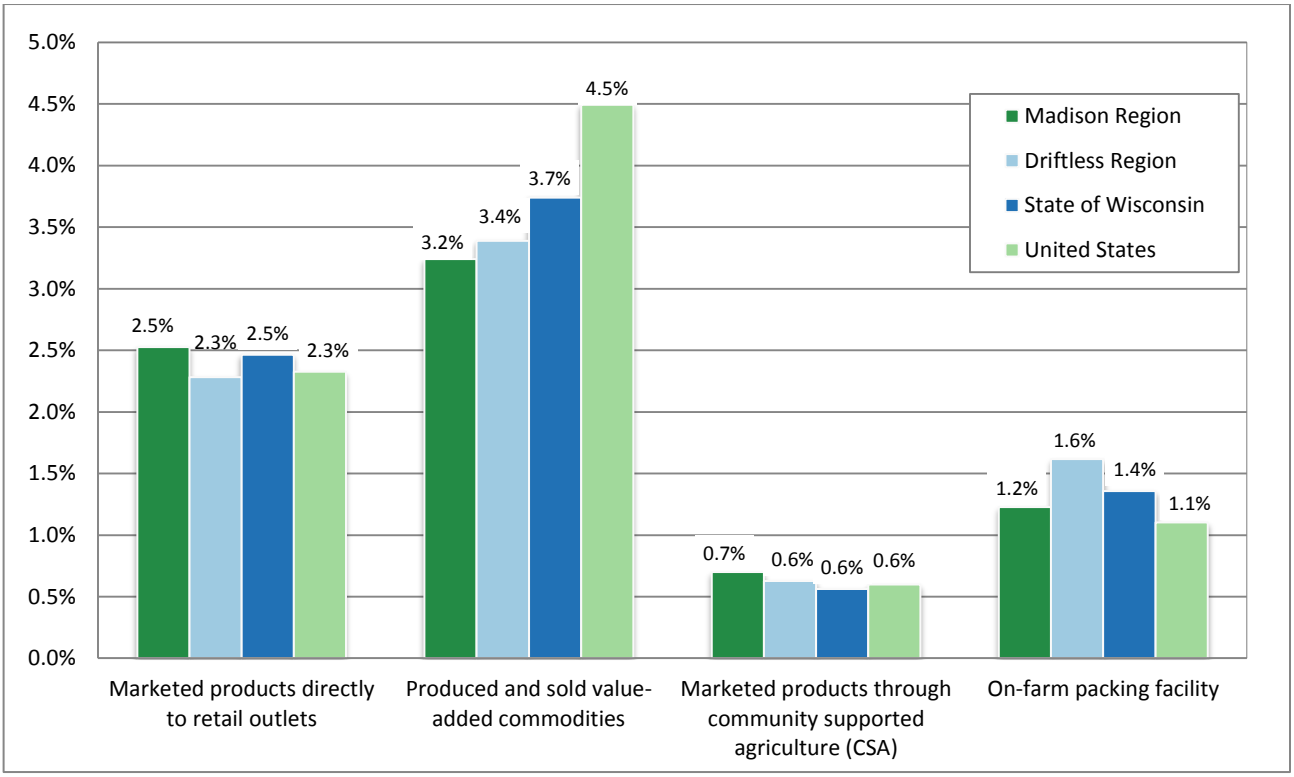
Figure 2.16 – Farms with Direct Sales – Percent of All Farms and Average Direct Sales per Farm (2012)



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

While direct-to-consumer sales are increasing in the Region, they still comprise less than one percent of food production values nationally. However, direct-to-consumer sales are but one the channels for bringing local foods to market. Other means include selling directly to regional distributors, retailers, restaurants or government institutions (such as farm-to-school programs). When including these other local foods sales channels, the total national amount of sales increases fourfold (Low and Vogel 2011). Sales of local foods through intermediate channels cannot be measured in similar manner locally, but farms participating in marketing products directly to retailers or having on-farm packing facilities provide some insight into local intermediate sales activity (Figure 2.17).

Figure 2.17 – Share of Farms Participating in Selected Practices (2012)



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

Finally, it is important to realize that the market is still emerging when considering local foods as an economic development strategy. *Even when direct-to-consumer and intermediate sales of local foods are combined, they account for approximately 2.0 percent of gross farm sales nationwide (Low and Vogel 2011).* Because of these scale issues, the connection between regional economic growth and local food production is still somewhat uncertain (Brown et al 2014; Deller et al 2014). This uncertainty is in no way a criticism of local foods as economic opportunity. *In particular, economic benefits may certainly be realized by individual producers selling local foods.* However, the scale of local food sales will likely need to be increased before more noticeable regional effects are experienced.

Conclusion

This overview of agricultural production in the AFB study area shows a region that is diverse in its farms and products. The variety of goods produced in the region, combined with close proximity of food and beverage manufacturing capacity, is one of the cluster's strengths. Certainly, the region's concentration of dairy production and organics are also distinct opportunities to differentiate the Madison Region and Driftless Region from many other agricultural areas. Local foods and fresh market vegetables are also emerging opportunities that could potentially expand with efforts to increase their scales of production. Some of these opportunities are further considered in Section 3.

Appendix B – Vegetable Production Characteristics by County (2012)

Columbia County (Madison Region)

Vegetable Type	Total Harvested			Harvested for Processing			Harvested for Fresh Market		
	Total Farms	*Total Acres*	*Acres per Farm*	*Total Farms*	*Total Acres*	*Acres per Farm*	*Total Farms*	*Total Acres*	*Acres per Farm*
Vegetables harvested for sale	98	2,152	22.0	30	1,806	60	68	347	5.1
Asparagus, bearing age	8	33	4.1	-	-	-	8	33	4.1
Beans, green lima	-	-	-	-	-	-	-	-	-
Beans, snap (bush and pole)	28	730	26.1	15	720	48	13	10	0.8
Beets	5	1	0.2	-	-	-	5	1	0.2
Broccoli	6	2	0.3	-	-	-	6	2	0.3
Brussels sprouts	9	1	0.1	-	-	-	9	1	0.1
Cabbage, Chinese	4	(Z)	N/A	-	-	-	4	N/A	N/A
Cabbage, head	7	6	0.9	-	-	-	7	6	0.9
Cantaloupes and muskmelons	13	16	1.2	-	-	-	13	16	1.2
Carrots	5	1	0.2	-	-	-	5	1	0.2
Cucumbers and pickles	22	9	0.4	-	-	-	22	9	0.4
Eggplant	1	(D)	(D)	-	-	-	1	(D)	N/A
Garlic	1	(D)	(D)	-	-	-	1	(D)	N/A
Herbs, fresh cut	-	-	-	-	-	-	-	-	-
Kale	1	(D)	-	-	-	-	1	(D)	-
Lettuce, all	4	1	0.3	-	-	-	4	1	0.3
Lettuce, head	2	(D)	-	-	-	-	2	(D)	-
Lettuce, leaf	2	(D)	(D)	-	-	-	2	(D)	-
Onions, dry	14	5	0.4	-	-	-	14	5	0.4
Onions, green	2	(D)	(D)	-	-	-	2	(D)	-
Parsley	2	(D)	(D)	-	-	-	2	(D)	-
Peas, Chinese (sugar and snow)	7	(D)	(D)	6	(D)	-	1	(D)	-
Peas, green (excluding southern)	20	(D)	(D)	12	(D)	-	8	1	0.1
Peppers, bell (excluding pimientos)	25	17	0.7	-	-	-	25	17	0.7
Peppers other than bell	14	10	0.7	-	-	-	14	10	0.7
Potatoes	19	10	0.5	-	-	-	19	10	0.5
Pumpkins	35	47	1.3	-	-	-	35	47	1.3
Radishes	5	2	0.4	-	-	-	5	2	0.4
Rhubarb	1	(D)	(D)	-	-	-	1	(D)	N/A
Spinach	6	1	0.2	-	-	-	6	1	0.2
Squash, all	34	61	1.8	-	-	-	34	61	1.8
Squash, summer	15	13	0.9	-	-	-	15	13	0.9
Squash, winter	28	48	1.7	-	-	-	28	48	1.7
Sweet corn	36	671	18.6	13	595	46	23	77	3.3
Sweet potatoes	-	-	-	-	-	-	-	-	-
Tomatoes in the open	32	18	0.6	-	-	-	32	18	0.6
Turnip greens	2	(D)	(D)	-	-	-	2	(D)	(D)
Turnips	3	2	0.7	-	-	-	3	2	0.7
Watermelons	13	8	0.6	-	-	-	13	8	0.6
Other vegetables	7	5	0.7	-	-	-	7	5	0.7

Source: USDA 2012 Census of Agriculture and Author's Calculations (D) Withheld to avoid disclosing data for individual farms.

Dane County (Madison Region)

Vegetable Type	Total Harvested			Harvested for Processing			Harvested for Fresh Market		
	Total Farms	*Total Acres*	*Acres per Farm*	*Total Farms*	*Total Acres*	*Acres per Farm*	*Total Farms*	*Total Acres*	*Acres per Farm*
Vegetables harvested for sale	145	2,083	14.4	21	1,509	71.9	124	574	4.6
Asparagus, bearing age	15	14	0.9	-	-	-	15	14	0.9
Beans, green lima	1	(D)	(D)	1	(D)	(D)	-	-	-
Beans, snap (bush and pole)	46	334	7.3	4	320	80.0	42	14	0.3
Beets	18	6	0.3	-	-	-	18	6	0.3
Broccoli	8	6	0.8	-	-	-	8	6	0.8
Brussels sprouts	8	2	0.3	-	-	-	8	2	0.3
Cabbage, Chinese	2	(D)	(D)	-	-	-	2	(D)	(D)
Cabbage, head	5	1	0.2	-	-	-	5	1	0.2
Cantaloupes and muskmelons	9	3	0.3	-	-	-	9	3	0.3
Carrots	19	6	0.3	-	-	-	19	6	0.3
Cauliflower	3	2	0.7	-	-	-	3	2	0.7
Celery	2	(D)	(D)	-	-	-	2	(D)	(D)
Cucumbers and pickles	15	8	0.5	-	-	-	15	8	0.5
Daikon	-	-	-	-	-	-	-	-	-
Eggplant	10	2	0.2	-	-	-	10	2	0.2
Garlic	15	7	0.5	-	-	-	15	7	0.5
Herbs, fresh cut	3	2	0.7	-	-	-	3	2	0.7
Honeydew melons	-	-	-	-	-	-	-	-	-
Horseradish	1	(D)	(D)	-	-	-	1	(D)	(D)
Kale	5	3	0.6	-	-	-	5	3	0.6
Lettuce, all	19	9	0.5	-	-	-	19	9	0.5
Lettuce, head	8	(D)	(D)	-	-	-	8	(D)	(D)
Lettuce, leaf	12	4	0.3	-	-	-	12	4	0.3
Lettuce, romaine	1	(D)	(D)	-	-	-	1	(D)	(D)
Mustard greens	-	-	-	-	-	-	-	-	-
Okra	3	(D)	(D)	-	-	-	3	(D)	(D)
Onions, dry	9	5	0.6	-	-	-	9	5	0.6
Onions, green	8	1	0.1	-	-	-	8	1	0.1
Parsley	-	-	-	-	-	-	-	-	-
Peas, Chinese (sugar and snow)	1	(D)	(D)	-	-	-	1	(D)	(D)
Peas, green (excluding southern)	21	820	39.0	19	(D)	(D)	2	(D)	(D)
Peppers, bell (excluding pimientos)	42	24	0.6	-	-	-	42	24	0.6
Peppers other than bell	33	9	0.3	-	-	-	33	9	0.3
Potatoes	42	34	0.8	-	-	-	42	34	0.8
Pumpkins	52	167	3.2	-	-	-	52	167	3.2
Radishes	6	4	0.7	-	-	-	6	4	0.7
Rhubarb	7	1	0.1	-	-	-	7	1	0.1
Spinach	3	(D)	(D)	-	-	-	3	(D)	(D)
Squash, all	20	27	1.4	-	-	-	20	27	1.4
Squash, summer	8	7	0.9	-	-	-	8	7	0.9
Squash, winter	14	21	1.5	-	-	-	14	21	1.5
Sweet corn	38	469	12.3	7	(D)	(D)	31	(D)	(D)
Sweet potatoes	1	(D)	(D)	-	-	-	1	(D)	(D)
Tomatoes in the open	57	32	0.6	-	-	-	57	32	0.6
Turnips	2	(D)	(D)	-	-	-	2	(D)	(D)
Watermelons	4	2	0.5	-	-	-	4	2	0.5
Other vegetables	17	23	1.4	-	-	-	17	23	1.4

Source: USDA 2012 Census of Agriculture and Author's Calculations (D) Withheld to avoid disclosing data for individual farms.

Dodge County (Madison Region)

Vegetable Type	Total Harvested			Harvested for Processing			Harvested for Fresh Market		
	Total Farms	*Total Acres*	*Acres per Farm*	*Total Farms*	*Total Acres*	*Acres per Farm*	*Total Farms*	*Total Acres*	*Acres per Farm*
Vegetables harvested for sale	135	9,069	67.2	89	8,414	94.5	48	654	13.6
Asparagus, bearing age	4	2	0.5	-	-	-	4	2	0.5
Beans, green lima	23	1079	46.9	21	(D)	(D)	2	(D)	(D)
Beans, snap (bush and pole)	24	393	16.4	9	(D)	(D)	15	(D)	(D)
Beets	5	1	0.2	-	-	-	5	1	0.2
Broccoli	5	2	0.4	-	-	-	5	2	0.4
Brussels sprouts	2	(D)	(D)	-	-	-	2	(D)	(D)
Cabbage, Chinese	2	(D)	(D)	-	-	-	2	(D)	(D)
Cabbage, head	5	8	1.6	-	-	-	5	8	1.6
Cantaloupes and muskmelons	5	9	1.8	-	-	-	5	9	1.8
Carrots	3	(D)	(D)	1	(D)	(D)	3	1	0.3
Cauliflower	1	(D)	(D)	-	-	-	1	(D)	(D)!
Collards	4	4	1.0	-	-	-	4	4	1.0
Cucumbers and pickles	6	2	0.3	-	-	-	6	2	0.3
Eggplant	2	(D)	(D)	-	-	-	2	(D)	(D)
Garlic	3	(Z)	(D)	-	-	-	3	(D)	(D)
Herbs, fresh cut	2	(D)	(D)	-	-	-	2	(D)	(D)
Honeydew melons	2	(D)	(D)	-	-	-	2	(D)	(D)
Horseradish	2	(D)	(D)	-	-	-	2	(D)	(D)
Kale	2	(D)	(D)	-	-	-	2	(D)	(D)
Lettuce, all	2	(D)	(D)	-	-	-	2	(D)	(D)
Lettuce, head	2	(D)	(D)	-	-	-	2	(D)	(D)
Lettuce, leaf	2	(D)	(D)	-	-	-	2	(D)	(D)
Lettuce, romaine	2	(D)	(D)	-	-	-	2	(D)	(D)
Mustard greens	2	(D)	(D)	-	-	-	2	(D)	(D)
Onions, dry	6	(D)	(D)	-	-	-	6	(D)	(D)
Onions, green	2	(D)	(D)	-	-	-	2	(D)	(D)
Parsley	2	(D)	(D)	-	-	-	2	(D)	(D)
Peas, Chinese (sugar and snow)	4	2	0.5	-	-	-	4	2	0.5
Peas, green (excluding southern)	60	3929	65.5	56	3,928	70.1	4	1	0.3
Peppers, bell (excluding pimientos)	15	7	0.5	-	-	-	15	7	0.5
Peppers other than bell	9	3	0.3	-	-	-	9	3	0.3
Potatoes	8	6	0.8	-	-	-	8	6	0.8
Pumpkins	26	50	1.9	-	-	-	26	50	1.9
Radishes	5	3	0.6	-	-	-	5	3	0.6
Rhubarb	2	(D)	(D)	-	-	-	2	(D)	(D)
Spinach	5	6	1.2	-	-	-	5	6	1.2
Squash, all	19	42	2.2	-	-	-	19	42	2.2
Squash, summer	9	9	1.0	-	-	-	9	9	1.0
Squash, winter	17	33	1.9	-	-	-	17	33	1.9
Sweet corn	56	3,188	56.9	40	2,917	72.9	17	270	15.9
Sweet potatoes	2	(D)	(D)	-	-	-	2	(D)	(D)
Tomatoes in the open	22	14	0.6	-	-	-	22	14	0.6
Turnip greens	4	8	2.0	-	-	-	4	8	2.0
Turnips	4	2	0.5	-	-	-	4	2	0.5
Watermelons	6	(D)	(D)	-	-	-	6	(D)	(D)
Other vegetables	8	8	1.0	-	-	-	8	8	1.0

Source: USDA 2012 Census of Agriculture and Author's Calculations (D) Withheld to avoid disclosing data for individual farms.

Green County (Madison Region)

Vegetable Type	Total Harvested			Harvested for Processing			Harvested for Fresh Market		
	Total Farms	*Total Acres*	*Acres per Farm*	*Total Farms*	*Total Acres*	*Acres per Farm*	*Total Farms*	*Total Acres*	*Acres per Farm*
Vegetables harvested for sale	21	1,020	48.6	3	969	323.0	18	51	2.8
Asparagus, bearing age	4	2	0.5	-	-	-	4	2	0.5
Beans, green lima	1	(D)	(D)	1	(D)	(D)	-	-	-
Beans, snap (bush and pole)	8	2	0.3	-	-	-	8	2	0.3
Beets	3	1	0.3	-	-	-	3	1	0.3
Broccoli	3	1	0.3	-	-	-	3	1	0.3
Brussels sprouts	1	(D)	(D)	-	-	-	1	(D)	(D)
Cabbage, head	1	(D)	(D)	-	-	-	1	(D)	(D)
Cantaloupes and muskmelons	-	-	-	-	-	-	-	-	-
Carrots	1	(D)	(D)	-	-	-	1	(D)	(D)
Cucumbers and pickles	1	(D)	(D)	-	-	-	1	(D)	(D)
Garlic	4	(D)	(D)	-	-	-	4	(D)	(D)
Herbs, fresh cut	3	1	0.3	-	-	-	3	1	0.3
Kale	1	(D)	(D)	-	-	-	1	(D)	(D)
Lettuce, all	3	(D)	(D)	-	-	-	3	(D)	(D)
Lettuce, head	2	(D)	(D)	-	-	-	2	(D)	(D)
Lettuce, leaf	-	-	-	-	-	-	-	-	-
Lettuce, romaine	1	(D)	(D)	-	-	-	1	(D)	(D)
Onions, dry	4	2	0.5	-	-	-	4	2	0.5
Onions, green	-	-	-	-	-	-	-	-	-
Peas, green (excluding southern)	2	(D)	(D)	2	(D)	(D)	-	-	-
Peppers, bell (excluding pimientos)	9	3	0.3	-	-	-	9	3	0.3
Peppers other than bell	9	3	0.3	-	-	-	9	3	0.3
Potatoes	8	7	0.9	-	-	-	8	7	0.9
Pumpkins	7	6	0.9	-	-	-	7	6	0.9
Radishes	1	(D)	(D)	-	-	-	1	(D)	(D)
Spinach	-	-	-	-	-	-	-	-	-
Squash, all	3	1	0.3	-	-	-	3	1	0.3
Squash, summer	2	(D)	(D)	-	-	-	2	(D)	(D)
Squash, winter	2	(D)	(D)	-	-	-	2	(D)	(D)
Sweet corn	8	600	75.0	3	594	198.0	5	6	1.2
Tomatoes in the open	14	7	0.5	-	-	-	14	7	0.5
Watermelons	-	-	-	-	-	-	-	-	-
Other vegetables	2	(D)	(D)	-	-	-	2	(D)	

Source: USDA 2012 Census of Agriculture and Author's Calculations (D) Withheld to avoid disclosing data for individual farms.

Iowa County (Madison Region)

Vegetable Type	Total Harvested			Harvested for Processing			Harvested for Fresh Market		
	Total Farms	*Total Acres*	*Acres per Farm*	*Total Farms*	*Total Acres*	*Acres per Farm*	*Total Farms*	*Total Acres*	*Acres per Farm*
Vegetables harvested for sale	22	(D)	(D)	-	-	-	22	(D)	(D)
Asparagus, bearing age	6	2	0.3	-	-	-	6	2	0.3
Beans, snap (bush and pole)	8	8	1.0	-	-	-	8	8	1.0
Beets	1	(D)	(D)	-	-	-	1	(D)	(D)
Broccoli	-	-	-	-	-	-	-	-	-
Brussels sprouts	1	(D)	(D)	-	-	-	1	(D)	(D)
Cabbage, Chinese	-	-	-	-	-	-	-	-	-
Cabbage, head	4	(D)	(D)	-	-	-	4	(D)	(D)
Cantaloupes and muskmelons	5	6	1.2	-	-	-	5	6	1.2
Carrots	4	(D)	(D)	-	-	-	4	(D)	(D)
Cauliflower	4	(D)	(D)	-	-	-	4	(D)	(D)
Cucumbers and pickles	8	6	0.8	-	-	-	8	6	0.8
Garlic	-	-	-	-	-	-	-	-	-
Herbs, fresh cut	-	-	-	-	-	-	-	-	-
Kale	4	(D)	(D)	-	-	-	4	(D)	(D)
Lettuce, all	5	1	0.2	-	-	-	5	1	0.2
Lettuce, head	4	(D)	(D)	-	-	-	4	(D)	(D)
Lettuce, leaf	5	1	0.2	-	-	-	5	1	0.2
Onions, dry	-	-	-	-	-	-	-	-	-
Onions, green	-	-	-	-	-	-	-	-	-
Peas, Chinese (sugar and snow)	1	(D)	(D)	-	-	-	1	(D)	(D)
Peas, green (excluding southern)	-	-	-	-	-	-	-	-	-
Peppers, bell (excluding pimientos)	11	7	0.6	-	-	-	11	7	0.6
Peppers other than bell	8	2	0.3	-	-	-	8	2	0.3
Potatoes	15	(D)	(D)	-	-	-	15	(D)	(D)
Pumpkins	11	34	3.1	-	-	-	11	34	3.1
Rhubarb	1	(D)	(D)	-	-	-	1	(D)	(D)
Spinach	-	-	-	-	-	-	-	-	-
Squash, all	7	17	2.4	-	-	-	7	17	2.4
Squash, summer	5	(D)	(D)	-	-	-	5	(D)	(D)
Squash, winter	5	(D)	(D)	-	-	-	5	(D)	(D)
Sweet corn	6	53	8.8	-	-	-	6	53	8.8
Sweet potatoes	-	-	-	-	-	-	-	-	-
Tomatoes in the open	13	19	1.5	-	-	-	13	19	1.5
Watermelons	1	(D)	(D)	-	-	-	1	(D)	(D)
Other vegetables	7	(D)	(D)	-	-	-	7	(D)	(D)

Source: USDA 2012 Census of Agriculture and Author's Calculations (D) Withheld to avoid disclosing data for individual farms.

Jefferson County (Madison Region)

Vegetable Type	Total Harvested			Harvested for Processing			Harvested for Fresh Market		
	Total Farms	*Total Acres*	*Acres per Farm*	*Total Farms*	*Total Acres*	*Acres per Farm*	*Total Farms*	*Total Acres*	*Acres per Farm*
Vegetables harvested for sale	31	1,343	43.3	2	(D)	(D)	30	(D)	(D)
Asparagus, bearing age	2	(D)	(D)	-	-	-	2	(D)	(D)
Beans, snap (bush and pole)	7	3	0.4	-	-	-	7	3	0.4
Beets	5	(D)	(D)	1	(D)	(D)	4	(D)	(D)
Broccoli	6	1	0.2	-	-	-	6	1	0.2
Brussels sprouts	3	(D)	(D)	1	(D)	(D)	2	(D)	(D)
Cabbage, Chinese	2	(D)	(D)	-	-	-	2	(D)	(D)
Cabbage, head	2	(D)	(D)	-	-	-	2	(D)	(D)
Cantaloupes and muskmelons	6	1	0.2	-	-	-	6	1	0.2
Carrots	6	(D)	(D)	1	(D)	(D)	5	3	0.6
Cauliflower	3	(D)	(D)	-	-	-	3	(D)	(D)
Collards	1	(D)	(D)	-	-	-	1	(D)	(D)
Cucumbers and pickles	5	1	0.2	-	-	-	5	1	0.2
Daikon	2	(D)	(D)	-	-	-	2	(D)	(D)
Eggplant	1	(D)	(D)	-	-	-	1	(D)	(D)
Garlic	2	(D)	(D)	-	-	-	2	(D)	(D)
Herbs, fresh cut	2	(D)	(D)	-	-	-	2	(D)	(D)
Kale	3	(D)	(D)	1	(D)	(D)	2	(D)	(D)
Lettuce, all	2	(D)	(D)	-	-	-	2	(D)	(D)
Lettuce, leaf	2	(D)	(D)	-	-	-	2	(D)	(D)
Onions, dry	2	(D)	(D)	-	-	-	2	(D)	(D)
Onions, green	1	(D)	(D)	-	-	-	1	(D)	(D)
Parsley	1	(D)	(D)	-	-	-	1	(D)	(D)
Peas, Chinese (sugar and snow)	2	(D)	(D)	1	(D)	(D)	1	(D)	(D)
Peas, green (excluding southern)	-	-	-	-	-	-	-	-	-
Peppers, bell (excluding pimientos)	7	4	0.6	-	-	-	7	4	0.6
Peppers other than bell	4	1	0.3	-	-	-	4	1	0.3
Potatoes	14	(D)	(D)	-	-	-	14	(D)	(D)
Pumpkins	17	19	1.1	-	-	-	17	19	1.1
Radishes	-	-	-	-	-	-	-	-	-
Rhubarb	2	(D)	(D)	-	-	-	2	(D)	(D)
Spinach	2	(D)	(D)	-	-	-	2	(D)	(D)
Squash, all	13	7	0.5	-	-	-	13	7	0.5
Squash, summer	5	1	0.2	-	-	-	5	1	0.2
Squash, winter	12	6	0.5	-	-	-	12	6	0.5
Sweet corn	12	159	13.3	1	(D)	(D)	11	(D)	(D)
Sweet potatoes	2	(D)	(D)	-	-	-	2	(D)	(D)
Tomatoes in the open	18	19	1.1	-	-	-	18	19	1.1
Turnips	1	(D)	(D)	-	-	-	1	(D)	(D)
Watermelons	1	(D)	(D)	-	-	-	1	(D)	(D)
Other vegetables	2	(D)	(D)	-	-	-	2	(D)	(D)

Source: USDA 2012 Census of Agriculture and Author's Calculations (D) Withheld to avoid disclosing data for individual farms.

Rock County (Madison Region)

Vegetable Type	Total Harvested			Harvested for Processing			Harvested for Fresh Market		
	Total Farms	*Total Acres*	*Acres per Farm*	*Total Farms*	*Total Acres*	*Acres per Farm*	*Total Farms*	*Total Acres*	*Acres per Farm*
Vegetables harvested for sale	62	5,173	83.4	18	4,732	262.9	44	441	10.0
Asparagus, bearing age	8	10	1.3	-	-	-	8	10	1.3
Beans, green lima	3	(D)	(D)	3	(D)	(D)	-	-	-
Beans, snap (bush and pole)	18	5	0.3	-	-	-	18	5	0.3
Beets	4	1	0.3	-	-	-	4	1	0.3
Broccoli	4	2	0.5	-	-	-	4	2	0.5
Brussels sprouts	2	(D)	(D)	-	-	-	2	(D)	(D)
Cabbage, Chinese	3	2	0.7	-	-	-	3	2	0.7
Cabbage, head	4	3	0.8	-	-	-	4	3	0.8
Cantaloupes and muskmelons	6	5	0.8	-	-	-	6	5	0.8
Carrots	4	(D)	(D)	-	-	-	4	(D)	(D)
Cauliflower	3	1	0.3	-	-	-	3	1	0.3
Celery	3	1	0.3	-	-	-	3	1	0.3
Collards	3	1	0.3	-	-	-	3	1	0.3
Cucumbers and pickles	6	2	0.3	-	-	-	6	2	0.3
Eggplant	3	1	0.3	-	-	-	3	1	0.3
Escarole and endive	3	1	0.3	-	-	-	3	1	0.3
Garlic	5	4	0.8	-	-	-	5	4	0.8
Herbs, fresh cut	2	(D)	(D)	-	-	-	2	(D)	(D)
Honeydew melons	4	5	1.3	-	-	-	4	5	1.3
Kale	3	1	0.3	-	-	-	3	1	0.3
Lettuce, all	5	5	1.0	-	-	-	5	5	1.0
Lettuce, head	2	(D)	(D)	-	-	-	2	(D)	(D)
Lettuce, leaf	5	3	0.6	-	-	-	5	3	0.6
Lettuce, romaine	3	(D)	(D)	-	-	-	3	(D)	(D)
Mustard greens	5	1	0.2	-	-	-	5	1	0.2
Okra	2	(D)	(D)	-	-	-	2	(D)	(D)
Onions, dry	5	2	0.4	-	-	-	5	2	0.4
Onions, green	3	1	0.3	-	-	-	3	1	0.3
Parsley	3	1	0.3	-	-	-	3	1	0.3
Peas, Chinese (sugar and snow)	4	(D)	(D)	1	(D)	(D)	3	2	0.7
Peas, green (excluding southern)	16	1,216	76.0	13	1,216	93.5	3	(D)	(D)
Peppers, bell (excluding pimientos)	17	4	0.2	-	-	-	17	4	0.2
Peppers other than bell	12	2	0.2	-	-	-	12	2	0.2
Potatoes	17	8	0.5	-	-	-	17	8	0.5
Pumpkins	20	(D)	(D)	-	-	-	20	(D)	(D)
Radishes	3	1	0.3	-	-	-	3	1	0.3
Rhubarb	4	1	0.3	-	-	-	4	1	0.3
Spinach	4	1	0.3	-	-	-	4	1	0.3
Squash, all	18	19	1.1	-	-	-	18	19	1.1
Squash, summer	8	5	0.6	-	-	-	8	5	0.6
Squash, winter	15	14	0.9	-	-	-	15	14	0.9
Sweet corn	29	3,038	104.8	9	2,783	309.2	20	255	12.8
Sweet potatoes	7	1	0.1	-	-	-	7	1	0.1
Tomatoes in the open	24	13	0.5	-	-	-	24	13	0.5
Turnip greens	2	(D)	(D)	-	-	-	2	(D)	(D)
Turnips	3	1	0.3	-	-	-	3	1	0.3
Watermelons	10	9	0.9	-	-	-	10	9	0.9
Other vegetables	9	22	2.4	-	-	-	9	22	2.4

Source: USDA 2012 Census of Agriculture and Author's Calculations (D) Withheld to avoid disclosing data for individual farms.

Sauk County (Madison Region)

Vegetable Type	Total Harvested			Harvested for Processing			Harvested for Fresh Market		
	Total Farms	*Total Acres*	*Acres per Farm*	*Total Farms*	*Total Acres*	*Acres per Farm*	*Total Farms*	*Total Acres*	*Acres per Farm*
Vegetables harvested for sale	43	2,084	48.5	11	1,835	166.8	34	249	7.3
Asparagus, bearing age	2	(D)	(D)	-	-	-	2	(D)	(D)
Beans, snap (bush and pole)	23	1,712	74.4	8	1,709	213.6	15	3	0.2
Beets	7	1	0.1	-	-	-	7	1	0.1
Broccoli	2	(D)	(D)	-	-	-	2	(D)	(D)
Cabbage, head	3	1	0.3	-	-	-	3	1	0.3
Cantaloupes and muskmelons	3	(D)	(D)	-	-	-	3	(D)	(D)
Carrots	5	1	0.2	-	-	-	5	1	0.2
Cauliflower	1	(D)	(D)	-	-	-	1	(D)	(D)
Celery	2	(D)	(D)	-	-	-	2	(D)	(D)
Cucumbers and pickles	4	1	0.3	-	-	-	4	1	0.3
Eggplant	4	(D)	(D)	-	-	-	4	(D)	(D)
Garlic	1	(D)	(D)	-	-	-	1	(D)	(D)
Herbs, fresh cut	4	2	0.5	-	-	-	4	2	0.5
Honeydew melons	1	(D)	(D)	-	-	-	1	(D)	(D)
Kale	1	(D)	(D)	-	-	-	1	(D)	(D)
Lettuce, all	4	2	0.5	-	-	-	4	2	0.5
Lettuce, head	3	(D)	(D)	-	-	-	3	(D)	(D)
Lettuce, leaf	-	-	-	-	-	-	-	-	-
Lettuce, romaine	1	(D)	(D)	-	-	-	1	(D)	(D)
Okra	1	(D)	(D)	-	-	-	1	(D)	(D)
Onions, dry	6	1	0.2	-	-	-	6	1	0.2
Onions, green	1	(D)	(D)	-	-	-	1	(D)	(D)
Peas, green (excluding southern)	4	(D)	(D)	1	(D)	(D)	4	(D)	(D)
Peppers, bell (excluding pimientos)	18	3	0.2	-	-	-	18	3	0.2
Peppers other than bell	13	2	0.2	-	-	-	13	2	0.2
Potatoes	11	2	0.2	-	-	-	11	2	0.2
Pumpkins	20	63	3.2	-	-	-	20	63	3.2
Radishes	2	(D)	(D)	-	-	-	2	(D)	(D)
Rhubarb	4	(D)	(D)	-	-	-	4	(D)	(D)
Squash, all	12	39	3.3	-	-	-	12	39	3.3
Squash, summer	6	2	0.3	-	-	-	6	2	0.3
Squash, winter	9	37	4.1	-	-	-	9	37	4.1
Sweet corn	13	182	14.0	2	(D)	(D)	12	(D)	(D)
Sweet potatoes	3	1	0.3	-	-	-	3	1	0.3
Tomatoes in the open	19	6	0.3	-	-	-	19	6	0.3
Turnips	1	(D)	(D)	-	-	-	1	(D)	(D)
Watermelons	2	(D)	(D)	-	-	-	2	(D)	(D)
Other vegetables	7	5	0.7	-	-	-	7	5	0.7

Source: USDA 2012 Census of Agriculture and Author's Calculations (D) Withheld to avoid disclosing data for individual farms.

Crawford County (Driftless Region)

Vegetable Type	Total Harvested			Harvested for Processing			Harvested for Fresh Market		
	Total Farms	*Total Acres*	*Acres per Farm*	*Total Farms*	*Total Acres*	*Acres per Farm*	*Total Farms*	*Total Acres*	*Acres per Farm*
Vegetables harvested for sale	15	65	4.3	-	-	-	15	65	4.3
Asparagus, bearing age	3	(D)	(D)	-	-	-	3	(D)	(D)
Beans, snap (bush and pole)	2	(D)	(D)	-	-	-	2	(D)	(D)
Beets	1	(D)	(D)	-	-	-	1	(D)	(D)
Broccoli	2	(D)	(D)	-	-	-	2	(D)	(D)
Brussels sprouts	1	(D)	(D)	-	-	-	1	(D)	(D)
Cabbage, Chinese	1	(D)	(D)	-	-	-	1	(D)	(D)
Cabbage, head	1	(D)	(D)	-	-	-	1	(D)	(D)
Cantaloupes and muskmelons	1	(D)	(D)	-	-	-	1	(D)	(D)
Carrots	2	(D)	(D)	-	-	-	2	(D)	(D)
Cauliflower	1	(D)	(D)	-	-	-	1	(D)	(D)
Celery	1	(D)	(D)	-	-	-	1	(D)	(D)
Collards	1	(D)	(D)	-	-	-	1	(D)	(D)
Cucumbers and pickles	1	(D)	(D)	-	-	-	1	(D)	(D)
Eggplant	3	(D)	(D)	-	-	-	3	(D)	(D)
Escarole and endive	1	(D)	(D)	-	-	-	1	(D)	(D)
Garlic	3	1	0.3	-	-	-	3	1	0.3
Herbs, fresh cut	2	(D)	(D)	-	-	-	2	(D)	(D)
Kale	2	(D)	(D)	-	-	-	2	(D)	(D)
Lettuce, all	1	(D)	(D)	-	-	-	1	(D)	(D)
Lettuce, head	1	(D)	(D)	-	-	-	1	(D)	(D)
Lettuce, leaf	1	(D)	(D)	-	-	-	1	(D)	(D)
Lettuce, romaine	1	(D)	(D)	-	-	-	1	(D)	(D)
Okra	1	(D)	(D)	-	-	-	1	(D)	(D)
Onions, dry	2	(D)	(D)	-	-	-	2	(D)	(D)
Onions, green	1	(D)	(D)	-	-	-	1	(D)	(D)
Parsley	1	(D)	(D)	-	-	-	1	(D)	(D)
Peas, Chinese (sugar and snow)	1	(D)	(D)	-	-	-	1	(D)	(D)
Peas, green (excluding southern)	-	-	-	-	-	-	-	-	-
Peppers, bell (excluding pimientos)	3	1	0.3	-	-	-	3	1	0.3
Peppers other than bell	3	(D)	(D)	-	-	-	3	(D)	(D)
Potatoes	4	3	0.8	-	-	-	4	3	0.8
Pumpkins	9	20	2.2	-	-	-	9	20	2.2
Radishes	3	(D)	(D)	-	-	-	3	(D)	(D)
Spinach	1	(D)	(D)	-	-	-	1	(D)	(D)
Squash, all	7	12	1.7	-	-	-	7	12	1.7
Squash, summer	2	(D)	(D)	-	-	-	2	(D)	(D)
Squash, winter	6	(D)	(D)	-	-	-	6	(D)	(D)
Sweet corn	4	10	2.5	-	-	-	4	10	2.5
Sweet potatoes	1	(D)	(D)	-	-	-	1	(D)	(D)
Tomatoes in the open	3	1	0.3	-	-	-	3	1	0.3
Turnips	1	(D)	(D)	-	-	-	1	(D)	(D)
Watermelons	3	(D)	(D)	-	-	-	3	(D)	(D)
Other vegetables	1	(D)	(D)	-	-	-	1	(D)	(D)

Source: USDA 2012 Census of Agriculture and Author's Calculations (D) Withheld to avoid disclosing data for individual farms.

Grant County (Driftless Region)

Vegetable Type	Total Harvested			Harvested for Processing			Harvested for Fresh Market		
	Total Farms	*Total Acres*	*Acres per Farm*	*Total Farms*	*Total Acres*	*Acres per Farm*	*Total Farms*	*Total Acres*	*Acres per Farm*
Vegetables harvested for sale	28	111	4.0	-	-	-	28	111	4.0
Asparagus, bearing age	3	2	0.7	-	-	-	3	2	0.7
Beans, snap (bush and pole)	3	(D)	(D)	-	-	-	3	(D)	(D)
Beets	4	2	0.5	-	-	-	4	2	0.5
Broccoli	2	(D)	(D)	-	-	-	2	(D)	(D)
Brussels sprouts	-	-	-	-	-	-	-	-	-
Cabbage, head	2	(D)	(D)	-	-	-	2	(D)	(D)
Cantaloupes and muskmelons	3	3	1.0	-	-	-	3	3	1.0
Carrots	3	1	0.3	-	-	-	3	1	0.3
Cauliflower	1	(D)	(D)	-	-	-	1	(D)	(D)
Cucumbers and pickles	1	(D)	(D)	-	-	-	1	(D)	(D)
Eggplant	2	(D)	(D)	-	-	-	2	(D)	(D)
Garlic	4	4	1.0	-	-	-	4	4	1.0
Herbs, fresh cut	2	(D)	(D)	-	-	-	2	(D)	(D)
Horseradish	-	-	-	-	-	-	-	-	-
Lettuce, all	2	(D)	(D)	-	-	-	2	(D)	(D)
Lettuce, head	1	(D)	(D)	-	-	-	1	(D)	(D)
Lettuce, leaf	1	(D)	(D)	-	-	-	1	(D)	(D)
Lettuce, romaine	1	(D)	(D)	-	-	-	1	(D)	(D)
Okra	1	(D)	(D)	-	-	-	1	(D)	(D)
Onions, dry	3	2	0.7	-	-	-	3	2	0.7
Peas, green (excluding southern)	3	1	0.3	-	-	-	3	1	0.3
Peppers, bell (excluding pimientos)	6	2	0.3	-	-	-	6	2	0.3
Peppers other than bell	4	1	0.3	-	-	-	4	1	0.3
Potatoes	9	10	1.1	-	-	-	9	10	1.1
Pumpkins	10	25	2.5	-	-	-	10	25	2.5
Radishes	1	(D)	(D)	-	-	-	1	(D)	(D)
Rhubarb	1	(D)	(D)	-	-	-	1	(D)	(D)
Spinach	1	(D)	(D)	-	-	-	1	(D)	(D)
Squash, all	4	3	0.8	-	-	-	4	3	0.8
Squash, summer	1	(D)	(D)	-	-	-	1	(D)	(D)
Squash, winter	3	(D)	(D)	-	-	-	3	(D)	(D)
Sweet corn	12	35	2.9	-	-	-	12	35	2.9
Tomatoes in the open	11	7	0.6	-	-	-	11	7	0.6
Turnips	-	-	-	-	-	-	-	-	-
Watermelons	2	(D)	(D)	-	-	-	2	(D)	(D)
Other vegetables	2	(D)	(D)	-	-	-	2	(D)	(D)

Source: USDA 2012 Census of Agriculture and Author's Calculations (D) Withheld to avoid disclosing data for individual farms.

Lafayette County (Driftless Region)

Vegetable Type	Total Harvested			Harvested for Processing			Harvested for Fresh Market		
	Total Farms	*Total Acres*	*Acres per Farm*	*Total Farms*	*Total Acres*	*Acres per Farm*	*Total Farms*	*Total Acres*	*Acres per Farm*
Vegetables harvested for sale	11	24	2.2	-	-	-	11	24	2.2
Asparagus, bearing age	2	(D)	(D)	-	-	-	2	(D)	(D)
Beans, snap (bush and pole)	4	1	0.3	-	-	-	4	1	0.3
Broccoli	2	(D)	(D)	-	-	-	2	(D)	(D)
Cabbage, head	3	(D)	(D)	-	-	-	3	(D)	(D)
Cantaloupes and muskmelons	2	(D)	(D)	-	-	-	2	(D)	(D)
Carrots	3	1	0.3	-	-	-	3	1	0.3
Cucumbers and pickles	4	2	0.5	-	-	-	4	2	0.5
Garlic	2	(D)	(D)	-	-	-	2	(D)	(D)
Lettuce, all	1	(D)	(D)	-	-	-	1	(D)	(D)
Lettuce, head	1	(D)	(D)	-	-	-	1	(D)	(D)
Onions, dry	1	(D)	(D)	-	-	-	1	(D)	(D)
Onions, green	1	(D)	(D)	-	-	-	1	(D)	(D)
Peas, green (excluding southern)	1	(D)	(D)	-	-	-	1	(D)	(D)
Peppers, bell (excluding pimientos)	6	1	0.2	-	-	-	6	1	0.2
Peppers other than bell	4	1	0.3	-	-	-	4	1	0.3
Potatoes	6	4	0.7	-	-	-	6	4	0.7
Pumpkins	5	1	0.2	-	-	-	5	1	0.2
Rhubarb	1	(D)	(D)	-	-	-	1	(D)	(D)
Spinach	1	(D)	(D)	-	-	-	1	(D)	(D)
Squash, all	1	(D)	(D)	-	-	-	1	(D)	(D)
Squash, summer	1	(D)	(D)	-	-	-	1	(D)	(D)
Squash, winter	1	(D)	(D)	-	-	-	1	(D)	(D)
Sweet corn	5	2	0.4	-	-	-	5	2	0.4
Tomatoes in the open	6	1	0.2	-	-	-	6	1	0.2
Watermelons	2	(D)	(D)	-	-	-	2	(D)	(D)
Other vegetables	1	(D)	(D)	-	-	-	1	(D)	(D)

Source: USDA 2012 Census of Agriculture and Author's Calculations (D) Withheld to avoid disclosing data for individual farms.

Monroe County (Driftless Region)

Vegetable Type	Total Harvested			Harvested for Processing			Harvested for Fresh Market		
	Total Farms	*Total Acres*	*Acres per Farm*	*Total Farms*	*Total Acres*	*Acres per Farm*	*Total Farms*	*Total Acres*	*Acres per Farm*
Vegetables harvested for sale	47	131	2.8	1	(D)	(D)	46	(D)	(D)
Asparagus, bearing age	3	2	0.7	-	-	-	3	2	0.7
Beans, green lima	1	(D)	(D)	-	-	-	1	(D)	(D)
Beans, snap (bush and pole)	7	2	0.3	-	-	-	7	2	0.3
Beets	3	7	2.3	-	-	-	3	7	2.3
Broccoli	-	-	(D)	-	-	-	-	-	-
Brussels sprouts	1	(D)	(D)	-	-	-	1	(D)	(D)
Cabbage, Chinese	1	(D)	(D)	-	-	-	1	(D)	(D)
Cabbage, head	2	(D)	(D)	-	-	-	2	(D)	(D)
Cantaloupes and muskmelons	2	(D)	(D)	-	-	-	2	(D)	(D)
Carrots	-	-	-	-	-	-	-	-	-
Cauliflower	-	-	-	-	-	-	-	-	-
Celery	-	-	-	-	-	-	-	-	-
Collards	1	(D)	(D)	-	-	-	1	(D)	(D)
Cucumbers and pickles	5	3	0.6	-	-	-	5	3	0.6
Eggplant	2	(D)	(D)	-	-	-	2	(D)	(D)
Garlic	4	1	0.3	-	-	-	4	1	0.3
Ginseng	1	(D)	(D)	1	(D)	(D)	-	-	-
Herbs, fresh cut	1	(D)	(D)	-	-	-	1	(D)	(D)
Honeydew melons	-	-	-	-	-	-	-	-	-
Horseradish	-	-	-	-	-	-	-	-	-
Kale	6	3	0.5	-	-	-	6	3	0.5
Lettuce, all	1	(D)	(D)	-	-	-	1	(D)	(D)
Lettuce, leaf	1	(D)	(D)	-	-	-	1	(D)	(D)
Mustard greens	1	(D)	(D)	-	-	-	1	(D)	(D)
Onions, dry	18	12	0.7	-	-	-	18	12	0.7
Onions, green	-	-	-	-	-	-	-	-	-
Parsley	2	(D)	(D)	-	-	-	2	(D)	(D)
Peas, Chinese (sugar and snow)	2	(D)	(D)	-	-	-	2	(D)	(D)
Peas, green (excluding southern)	3	2	0.7	-	-	-	3	2	0.7
Peppers, bell (excluding pimientos)	9	2	0.2	-	-	-	9	2	0.2
Peppers other than bell	1	(D)	(D)	-	-	-	1	(D)	(D)
Potatoes	9	4	0.4	-	-	-	9	4	0.4
Pumpkins	11	11	1.0	-	-	-	11	11	1.0
Radishes	5	1	0.2	-	-	-	5	1	0.2
Rhubarb	-	-	-	-	-	-	-	-	-
Spinach	1	(D)	(D)	-	-	-	1	(D)	(D)
Squash, all	17	14	0.8	-	-	-	17	14	0.8
Squash, summer	10	8	0.8	-	-	-	10	8	0.8
Squash, winter	11	6	0.5	-	-	-	11	6	0.5
Sweet corn	9	12	1.3	-	-	-	9	12	1.3
Tomatoes in the open	23	17	0.7	-	-	-	23	17	0.7
Turnips	-	-	-	-	-	-	-	-	-
Watermelons	2	(D)	(D)	-	-	-	2	(D)	(D)
Other vegetables	10	10	1.0	-	-	-	10	10	1.0

Source: USDA 2012 Census of Agriculture and Author's Calculations (D) Withheld to avoid disclosing data for individual farms.

Richland County (Driftless Region)

Vegetable Type	Total Harvested			Harvested for Processing			Harvested for Fresh Market		
	Total Farms	*Total Acres*	*Acres per Farm*	*Total Farms*	*Total Acres*	*Acres per Farm*	*Total Farms*	*Total Acres*	*Acres per Farm*
Vegetables harvested for sale	27	217	8.0	1	(D)	(D)	26	(D)	(D)
Asparagus, bearing age	5	2	0.4	-	-	-	5	2	0.4
Beans, snap (bush and pole)	9	(D)	(D)	1	(D)	(D)	8	5	0.6
Beets	2	(D)	(D)	-	-	-	2	(D)	(D)
Broccoli	3	(D)	(D)	-	-	-	3	(D)	(D)
Brussels sprouts	1	(D)	(D)	-	-	-	1	(D)	(D)
Cabbage, Chinese	1	(D)	(D)	-	-	-	1	(D)	(D)
Cabbage, head	2	(D)	(D)	-	-	-	2	(D)	(D)
Cantaloupes and muskmelons	-	-	-	-	-	-	-	-	-
Carrots	1	(D)	(D)	-	-	-	1	(D)	(D)
Cucumbers and pickles	11	6	0.5	-	-	-	11	6	0.5
Eggplant	1	(D)	(D)	-	-	-	1	(D)	(D)
Garlic	3	3	1.0	-	-	-	3	3	1.0
Herbs, fresh cut	2	(D)	(D)	-	-	-	2	(D)	(D)
Honeydew melons	2	(D)	(D)	-	-	-	2	(D)	(D)
Kale	7	8	1.1	-	-	-	7	8	1.1
Lettuce, all	2	(D)	(D)	-	-	-	2	(D)	(D)
Lettuce, head	2	(D)	(D)	-	-	-	2	(D)	(D)
Lettuce, leaf	-	-	-	-	-	-	-	-	-
Onions, dry	4	(D)	(D)	-	-	-	4	(D)	(D)
Onions, green	3	3	1.0	-	-	-	3	3	1.0
Peas, Chinese (sugar and snow)	-	-	-	-	-	-	-	-	-
Peas, green (excluding southern)	-	-	-	-	-	-	-	-	-
Peppers, bell (excluding pimientos)	9	4	0.4	-	-	-	9	4	0.4
Peppers other than bell	1	(D)	(D)	-	-	-	1	(D)	(D)
Potatoes	14	9	0.6	-	-	-	14	9	0.6
Pumpkins	2	(D)	(D)	-	-	-	2	(D)	(D)
Radishes	-	-	-	-	-	-	-	-	-
Rhubarb	1	(D)	(D)	-	-	-	1	(D)	(D)
Spinach	1	(D)	(D)	-	-	-	1	(D)	(D)
Squash, all	8	11	1.4	-	-	-	8	11	1.4
Squash, summer	-	-	-	-	-	-	-	-	-
Squash, winter	8	11	1.4	-	-	-	8	11	1.4
Sweet corn	6	5	0.8	-	-	-	6	5	0.8
Tomatoes in the open	9	7	0.8	-	-	-	9	7	0.8
Turnips	2	(D)	(D)	-	-	-	2	(D)	(D)
Watermelons	2	(D)	(D)	-	-	-	2	(D)	(D)
Other vegetables	2	(D)	(D)	-	-	-	2	(D)	(D)

Source: USDA 2012 Census of Agriculture and Author's Calculations (D) Withheld to avoid disclosing data for individual farms.

Vernon County (Driftless Region)

Vegetable Type	Total Harvested			Harvested for Processing			Harvested for Fresh Market		
	Total Farms	*Total Acres*	*Acres per Farm*	*Total Farms*	*Total Acres*	*Acres per Farm*	*Total Farms*	*Total Acres*	*Acres per Farm*
Vegetables harvested for sale	146	612	4.2	-	-	-	146	612	4.2
Asparagus, bearing age	9	17	1.9	-	-	-	9	17	1.9
Beans, snap (bush and pole)	20	9	0.5	-	-	-	20	9	0.5
Beets	18	20	1.1	-	-	-	18	20	1.1
Broccoli	5	5	1.0	-	-	-	5	5	1.0
Brussels sprouts	2	(D)	(D)	-	-	-	2	(D)	(D)
Cabbage, Chinese	3	(D)	(D)	-	-	-	3	(D)	(D)
Cabbage, head	42	68	1.6	-	-	-	42	68	1.6
Cantaloupes and muskmelons	6	4	0.7	-	-	-	6	4	0.7
Carrots	8	7	0.9	-	-	-	8	7	0.9
Cauliflower	3	(D)	(D)	-	-	-	3	(D)	(D)
Celery	1	(D)	(D)	-	-	-	1	(D)	(D)
Collards	8	11	1.4	-	-	-	8	11	1.4
Cucumbers and pickles	30	37	1.2	-	-	-	30	37	1.2
Daikon	1	(D)	(D)	-	-	-	1	(D)	(D)
Eggplant	13	6	0.5	-	-	-	13	6	0.5
Escarole and endive	1	(D)	(D)	-	-	-	1	(D)	(D)
Garlic	21	11	0.5	-	-	-	21	11	0.5
Ginseng	-	-	-	-	-	-	-	-	-
Herbs, fresh cut	5	(D)	(D)	-	-	-	5	(D)	(D)
Honeydew melons	1	(D)	(D)	-	-	-	1	(D)	(D)
Horseradish	1	(D)	(D)	-	-	-	1	(D)	(D)
Kale	23	30	1.3	-	-	-	23	30	1.3
Lettuce, all	8	4	0.5	-	-	-	8	4	0.5
Lettuce, head	4	2	0.5	-	-	-	4	2	0.5
Lettuce, leaf	5	(D)	(D)	-	-	-	5	(D)	(D)
Lettuce, romaine	1	(D)	(D)	-	-	-	1	(D)	(D)
Mustard greens	1	(D)	(D)	-	-	-	1	(D)	(D)
Okra	-	-	-	-	-	-	-	-	-
Onions, dry	33	38	1.2	-	-	-	33	38	1.2
Onions, green	8	4	0.5	-	-	-	8	4	0.5
Parsley	3	(D)	(D)	-	-	-	3	(D)	(D)
Peas, Chinese (sugar and snow)	5	2	0.4	-	-	-	5	2	0.4
Peas, green (excluding southern)	3	(D)	(D)	-	-	-	3	(D)	(D)
Peppers, bell (excluding pimientos)	31	21	0.7	-	-	-	31	21	0.7
Peppers other than bell	14	5	0.4	-	-	-	14	5	0.4
Potatoes	23	13	0.6	-	-	-	23	13	0.6
Pumpkins	32	34	1.1	-	-	-	32	34	1.1
Radishes	5	(D)	(D)	-	-	-	5	(D)	(D)
Rhubarb	9	3	0.3	-	-	-	9	3	0.3
Spinach	3	1	0.3	-	-	-	3	1	0.3
Squash, all	56	117	2.1	-	-	-	56	117	2.1
Squash, summer	9	5	0.6	-	-	-	9	5	0.6
Squash, winter	53	112	2.1	-	-	-	53	112	2.1
Sweet corn	23	30	1.3	-	-	-	23	30	1.3
Sweet potatoes	3	(D)	(D)	-	-	-	3	(D)	(D)
Tomatoes in the open	54	26	0.5	-	-	-	54	26	0.5
Turnip greens	1	(D)	(D)	-	-	-	1	(D)	(D)
Turnips	4	1	0.3	-	-	-	4	1	0.3
Watermelons	3	1	0.3	-	-	-	3	1	0.3
Other vegetables	14	47	3.4	-	-	-	14	47	3.4

Source: USDA 2012 Census of Agriculture and Author's Calculations (D) Withheld to avoid disclosing data for individual farms.

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 sweetners, 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 be 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.

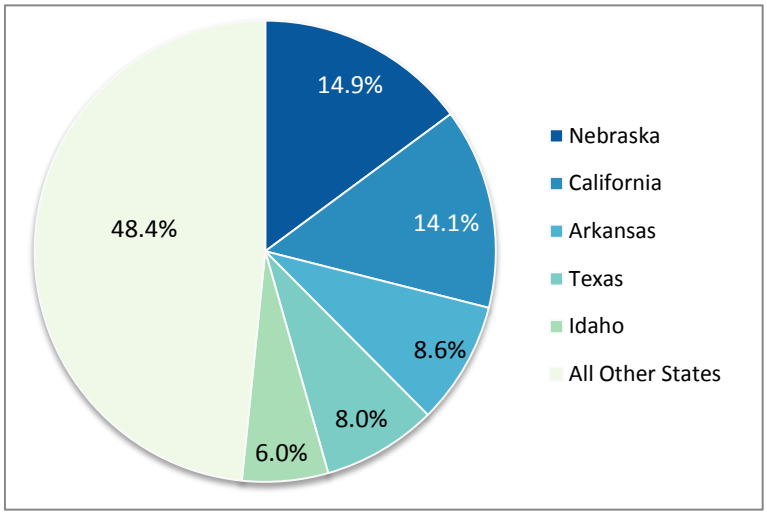
A Note on the AFB Cluster and Water

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.

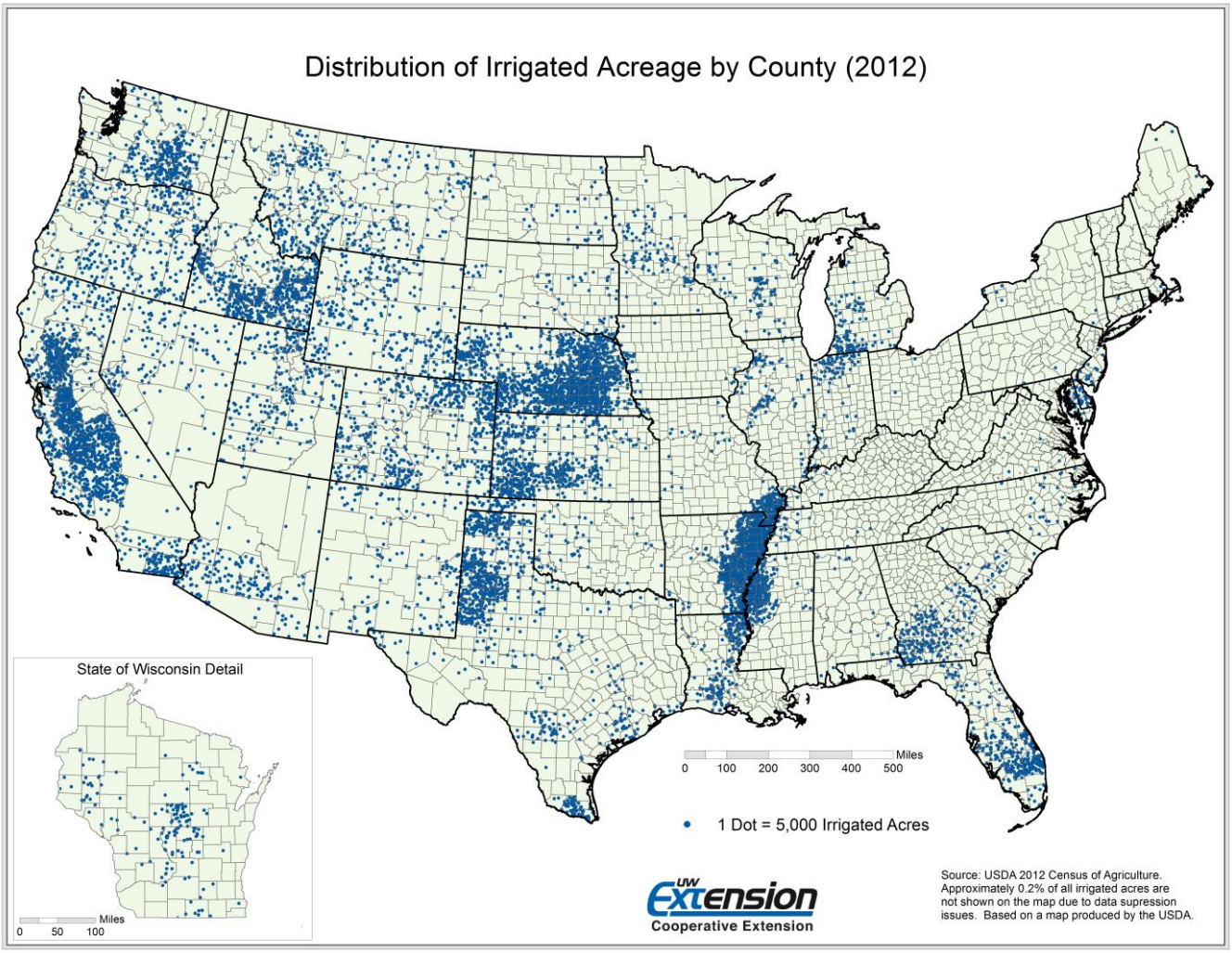
Figure 3.1 – Distribution of U.S. Irrigated Acres



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
UW-System	UW-Madison; UW-Platteville; UW-Whitewater; UW-Richland; UW-Rock County; UW-Baraboo/Sauk County; UW-Extension.
Private Colleges	Beloit College; Edgewood College,
Wisconsin Technical College System	Blackhawk Technical College; Madison College; Moraine Park Technical College; Southwest Wisconsin Technical College (SWTC).
Other Educational	Renk Agribusiness Institute; Community Groundworks at Troy Gardens.
State Agencies	Wisconsin Economic Development Corporation; Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP); Wisconsin Housing and Economic Development Authority; Wisconsin Department of Workforce Development.
Training	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.
Apprenticeship	Dairy Grazing Apprenticeship via Grassworks, Inc.
Workforce	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).
Dairy Trade Associations and Non-Profits	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 Purebread Dairy Cattle Association; WI Sheep Dairy Cooperative.
Cheese Trade Associations and Non-Profits	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.
Meat/Livestock Trade Associations and Non-Profits	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 Purebread Cattle Association, WI Sheep Breeders Cooperative, WI Turkey Federation, WI Veal Growers Association
Crops/Specialty Trade Associations and Non-Profits	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
Other Trade Associations and Non-Profits	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.

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

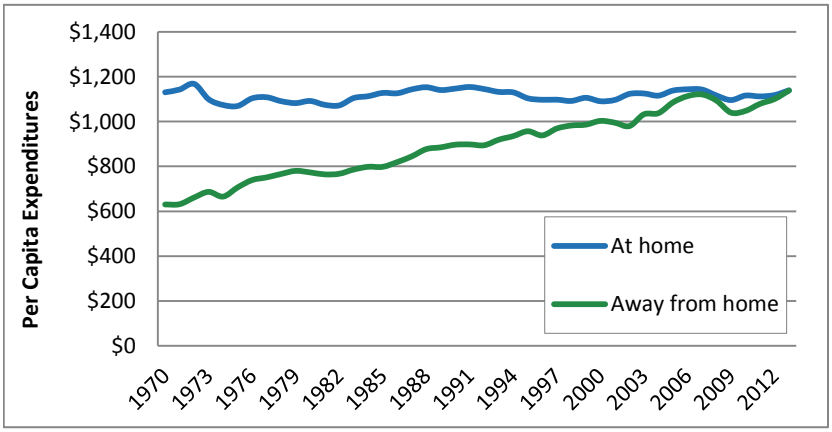
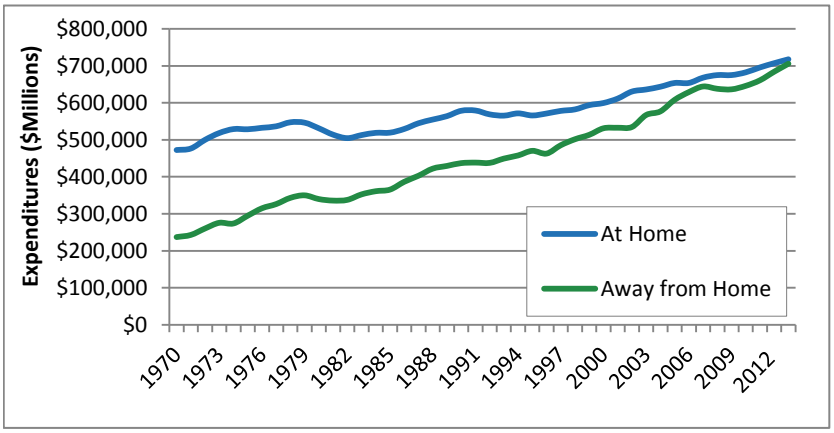


Figure 3.4 – Total U.S. Expenditures on Food at Home and Food Away from Home 1970 To 2013 (In Constant Dollars)



Source USDA Economic Research Service and Author's Calculations

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

[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 Trends[25]

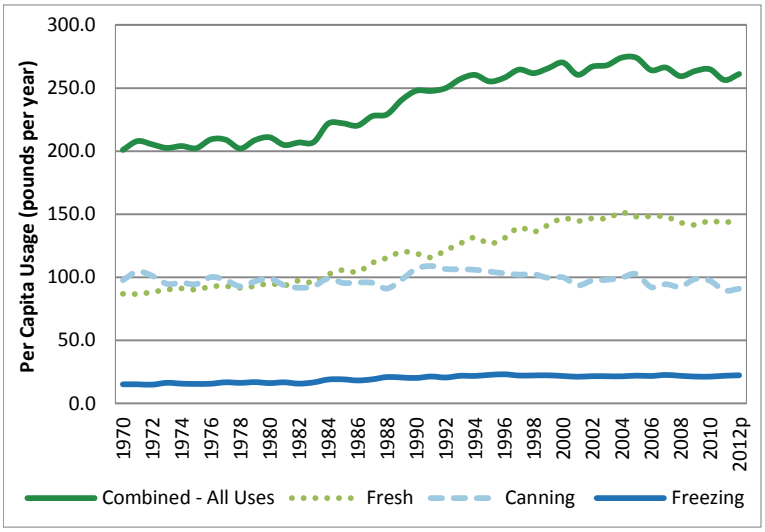
Over the past four decades, per capita consumption of fresh, frozen and canned vegetables has changed in the United States (Figure 3.5). After somewhat steady usage levels in the 1970s, per capita vegetable consumption grew by 30 percent between 1980 and 2004. Increased consumption of fresh vegetables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

[25]This 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.

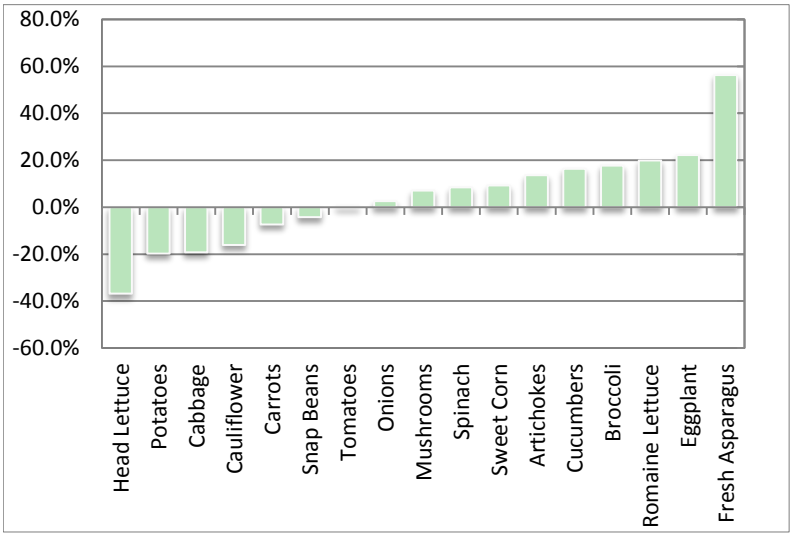
Despite the growth in fresh vegetable consumption between 1980 and 2004, per capita usage has experienced more recent declines. Some of these decreases may be tied to consumer sentiment and declining household incomes during the Great Recession. However, a rebounding economy and a growing awareness from 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.

Figure 3.5 – Per Capita Vegetable Consumption 1970 to 2012



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 region[26]

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/

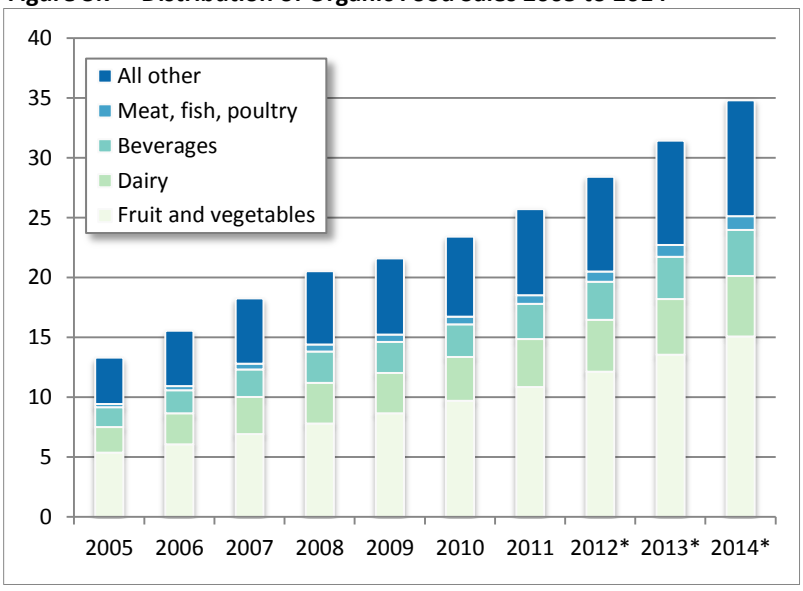
Organics

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).

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

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

[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).

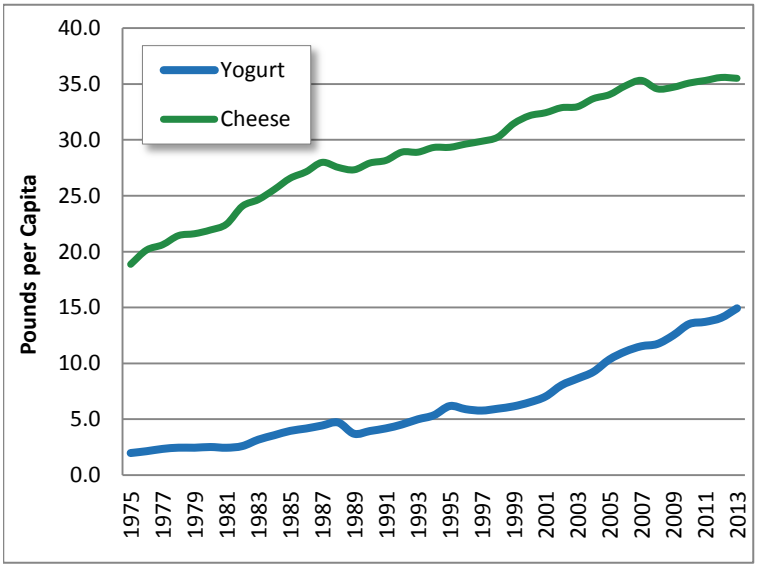
As suggested earlier, the California drought also presents potential opportunities for local organic dairy producers. Increasing costs for irrigation and associated competition for maintaining high value commodities (such as almonds) could reduce some organic vegetable production in California. Furthermore, 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 (Martiznez 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:

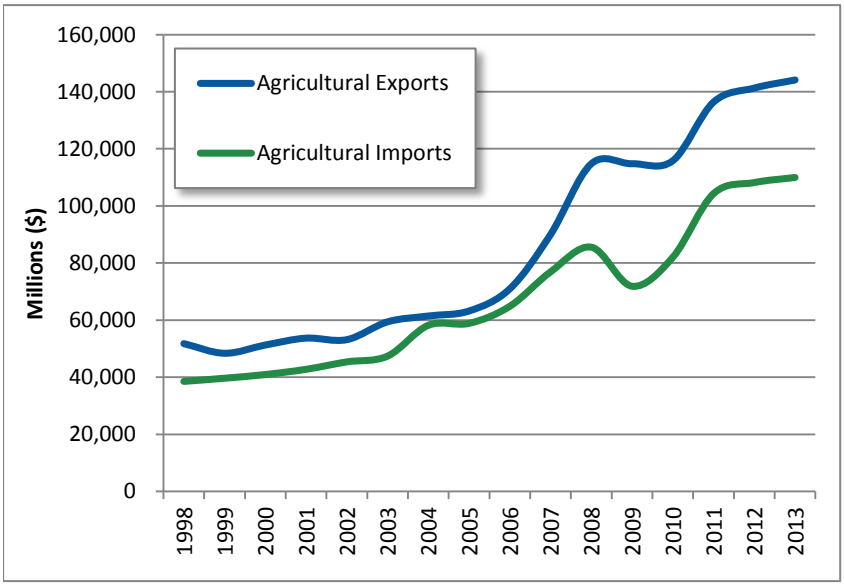
1. Small – "Annual production of 6 million barrels or less";
2. Independent – "Less than 25 percent of the craft brewery is owned or controlled by an alcoholic beverage industry member that is not a craft brewer"; and
3. Traditional – "A brewer that has a majority of its total beverage alcohol volume 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).

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



Source: USDA Economic Research Service

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.

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

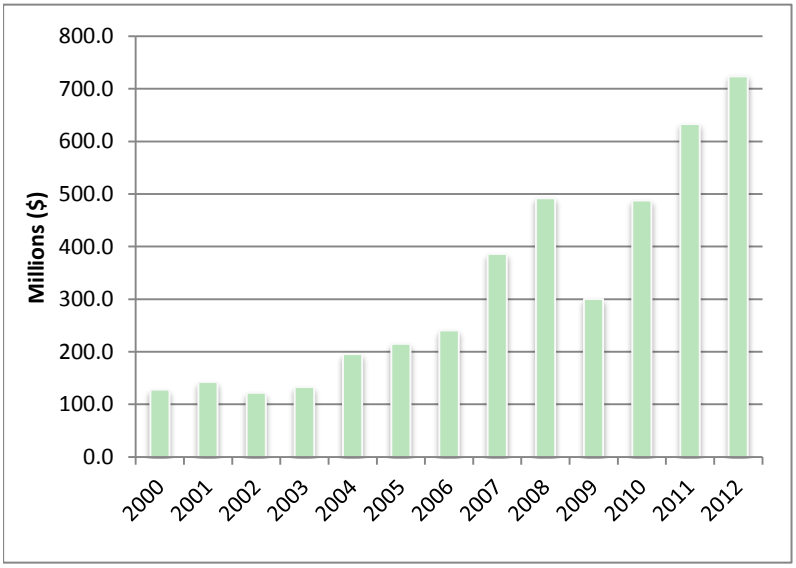
Product	2008	2009	2010	2011	2012
Beef and veal	54.0	51.1	68.1	106.4	104.1
Pork	33.7	27.6	30.9	38.9	38.0
Hides and skins	34.9	24.3	38.1	52.2	52.4
Dairy products	492.3	300.4	487.8	632.9	724.1
Chicken meat	16.6	14.5	13.8	15.5	20.1
Vegetables, fresh	57.0	50.8	49.9	57.6	59.3
Vegetables, processed	92.3	81.8	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

Transporation 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

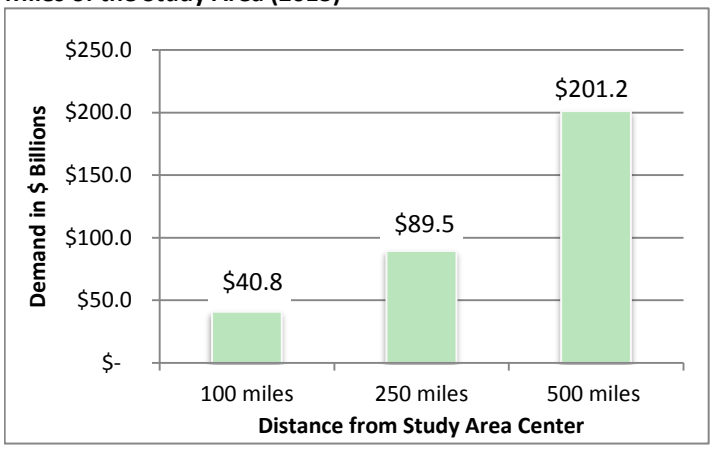
S= suppressed 2 Ton-miles estimates are based on estimated distances traveled along a modeled transportation network.
Sources: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics and U.S. Department of Commerce, U.S. Census Bureau, 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.

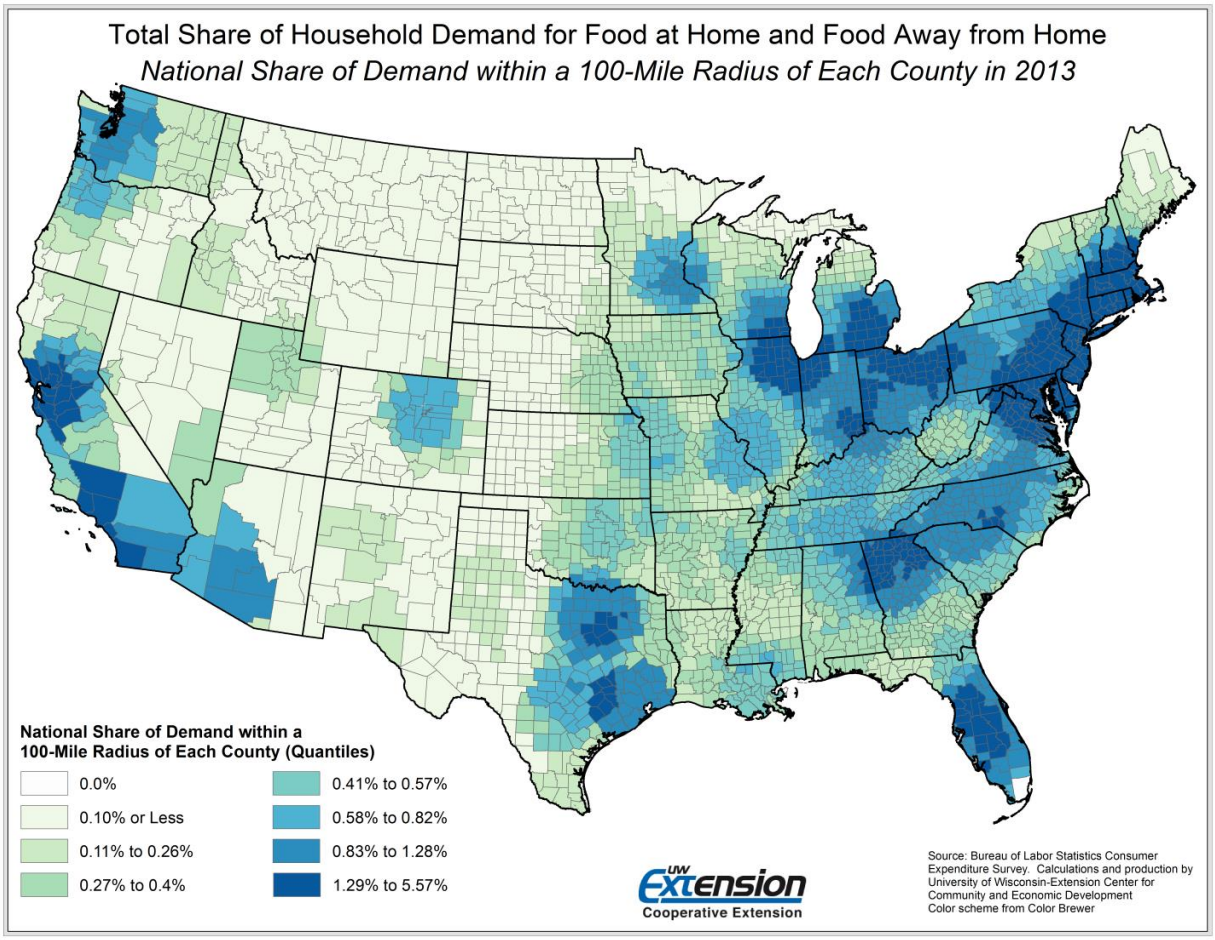
Significant household demand exists within typical trucking distances of the Madison Region and Driftless Region. Approximately $40.8 billion in household demand for food is located within 100 miles of the 14 county study area (Figure 3.11). Within 250 miles, demand increases to $89.5 billion (9.0 percent 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)



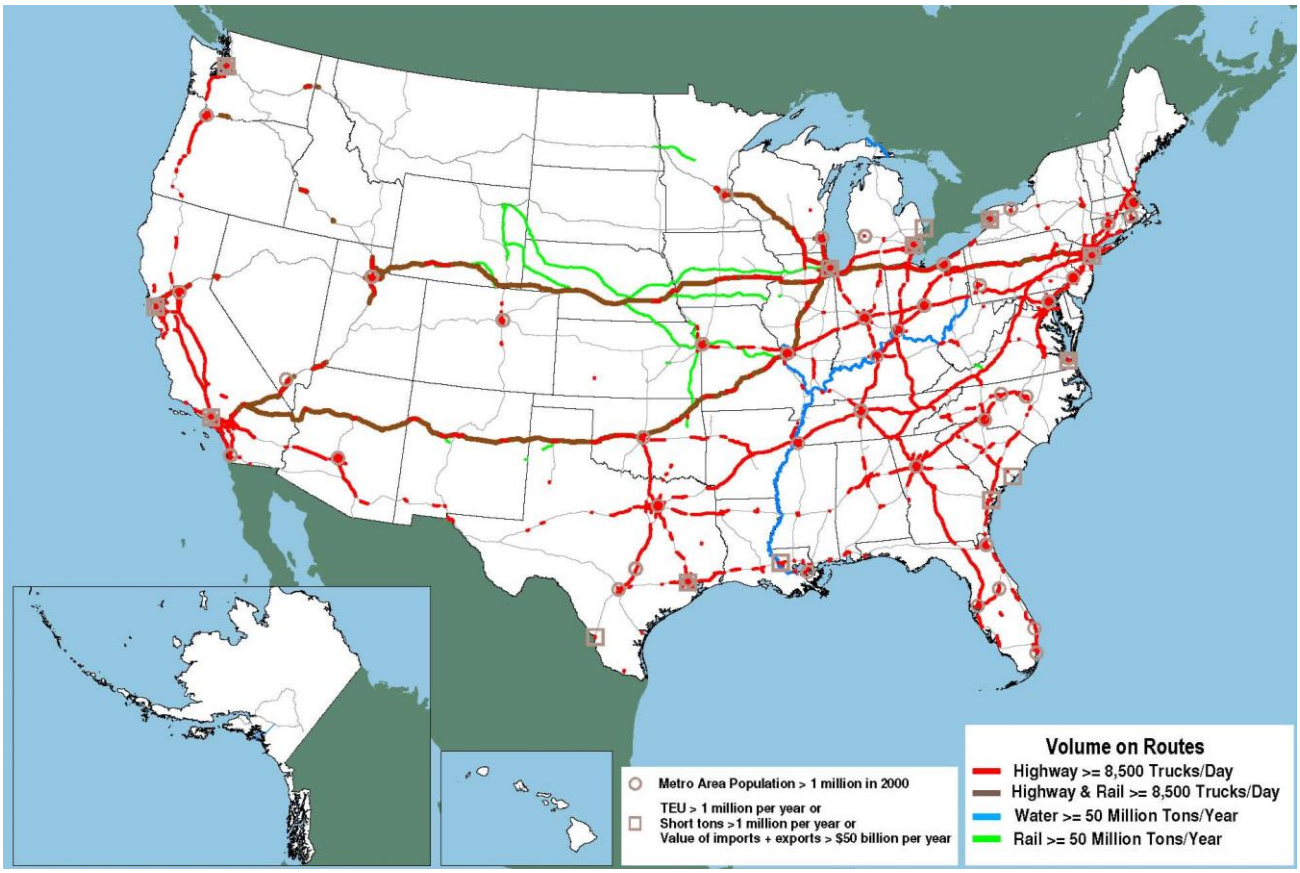
Source: U.S. Bureau of Labor Statistics Consumer Expenditure Survey, U.S. Census Bureau and Author's Calculations.

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.

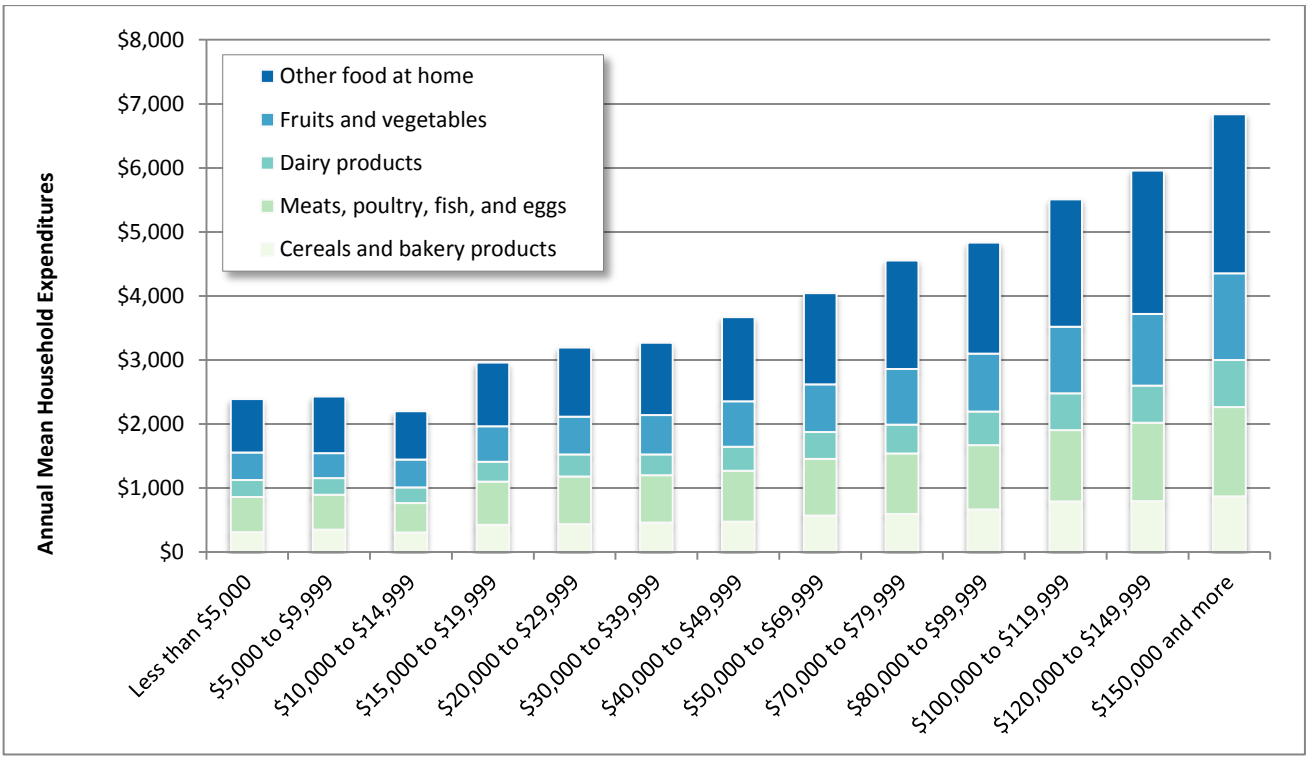
While rail is responsible for a smaller share of food and beverage product movement, rail is an important connection between the region and more distant markets. Rail is also an important link to international markets in North America, as well as ports serving overseas demand. Both short-line and Class 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.

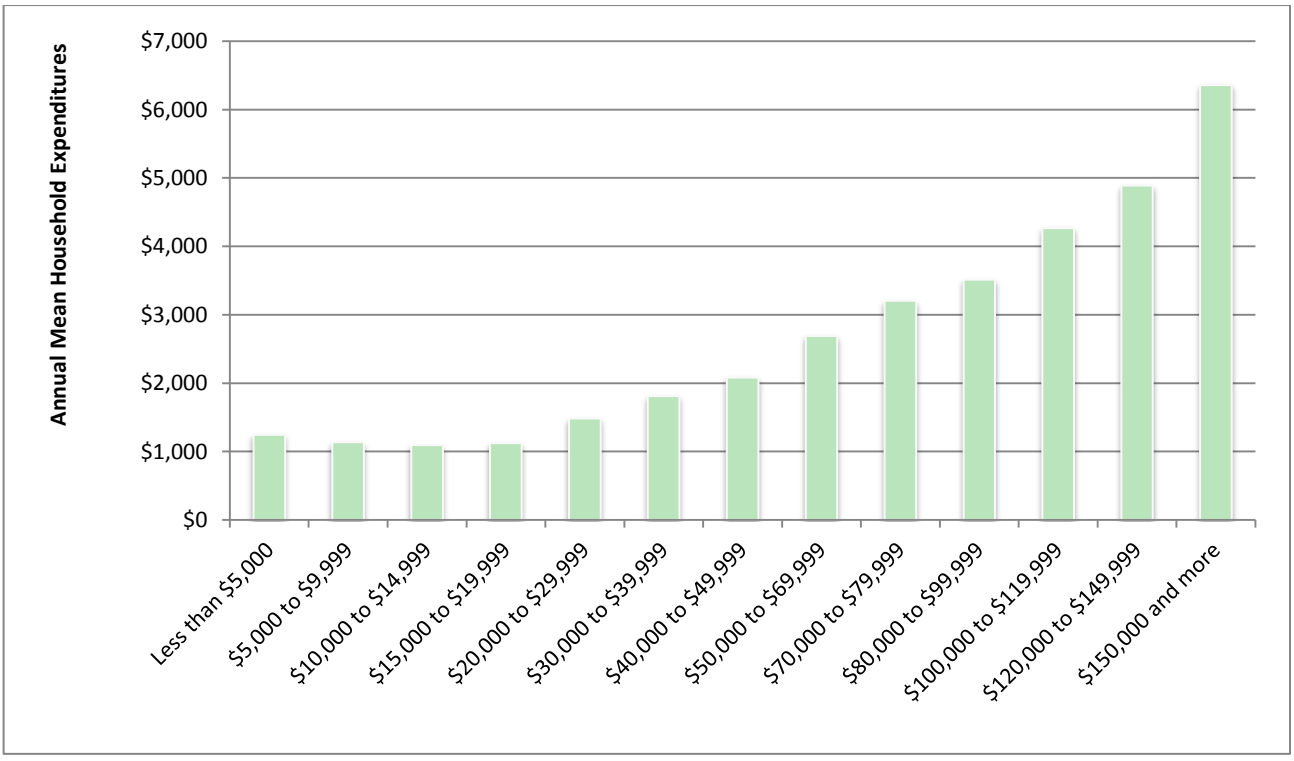
Appendix C – Annual Expenditures by Household Income

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%	S%	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.

Section 4 – AFB Human Capital

The knowledge and skills of a region's residents, also known as human capital, are primary drivers and determinants of economic growth. Human capital is also essential to successful industry clusters through the contributions of a region's labor force and entrepreneurs. Accordingly, Section 4 examines the AFB cluster's labor force in terms of its occupational structure, age distribution, employment churn and wages. Entrepreneurial culture and support is also considered.

Occupational Structure and Job Zones

All industries have an occupational structure, or a typical distribution of workers classified by their skills, tasks, credentials and common experiences. Understanding the occupational structure within food and beverage manufacturing provides important insights to occupational clusters and skills typically concentrated in these industries. Examining occupational wages and concentrations also provides perspectives on: 1) relative job quality in the industry and 2) the potential competitiveness of the region.

The 50 largest occupational categories found in the food and beverage manufacturing industries are listed in Table 4.1 and Table 4.2 respectively. Note that these figures are based on the national occupational distributions for food and beverage manufacturing as reported by the Bureau of Labor Statistics (BLS). Local occupational structures likely will vary in sub-categories of food and beverage manufacturing and within individual firms. Nonetheless, the overall national distributions provide a starting point for determining the occupations that are commonly important to these industries.

Information on regional specialization for each occupation is provided by an occupational location quotient calculated for the combined Madison and Janesville metropolitan statistical areas (MSAs).[30] Each occupation's annual average wage in the region is provided alongside the industry's national average wage to provide some perspective on pay rates. While these MSAs only cover five counties in the study area, detailed occupational figures are not available for other geographies in the Madison Region and Driftless Region.

Overall, the food and beverage manufacturing industries are a mix of diverse occupations. Many jobs are involved with the operation of specific machinery such as packaging and filling machines; cooking, roasting and baking machines; mixing and blending machines; and separating, filtering and clarifying machines. The industries also have occupational concentrations engaged in more general labor such as packaging, material moving and unclassified production work. Additionally, food and beverage manufacturing industries employ occupations that may not be directly involved with producing food or beverage products, but instead provide support as mechanics, truck drivers, food scientists or sales representatives. Specific information about the typical tasks and skills associated with each occupation is available through the Occupational Information Network (O*NET) website at: http://www.onetonline.org/.[31]

[30] Section 1 provides an overview of location quotients.

[31] Occupations can be explored in O*NET using the SOC code provided with each occupation in Table 4.1.

Table 4.1 – Food Manufacturing Occupations by Share of Industry Employment – Top 50 Occupations (2012)

SOC Code	Occupation Title	Percent of Total Employment	Job Zone	MSAs LQ*	National Annual Avg. Wage	MSAs Annual Avg. Wage*
51-3022	Meat, Poultry, and Fish Cutters and Trimmers	8.6%	1	N/A	$23,690	N/A
51-9111	Packaging and Filling Machine Operators and Tenders	8.1%	2	1.70	$28,160	$30,447
51-3092	Food Batchmakers	5.8%	2	1.81	$28,340	$33,809
51-3023	Slaughterers and Meat Packers	5.2%	1	N/A	$24,930	N/A
53-7064	Packers and Packagers, Hand	4.8%	2	1.72	$22,470	$30,551
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	4.1%	2	1.07	$26,410	$26,939
51-9198	Helpers--Production Workers	3.6%	1	0.52	$24,620	$29,703
51-3011	Bakers	3.5%	2	1.18	$25,060	$22,839
51-1011	First-Line Supervisors of Production and Operating Workers	3.2%	2	1.00	$57,420	$56,664
53-7051	Industrial Truck and Tractor Operators	2.5%	2	1.03	$32,090	$31,211
49-9071	Maintenance and Repair Workers, General	2.3%	3	0.80	$37,190	$36,980
49-9041	Industrial Machinery Mechanics	2.0%	3	0.76	$48,690	$44,663
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	2.0%	2	0.93	$37,240	$34,079
51-2092	Team Assemblers	1.9%	2	1.02	$29,910	$30,340
51-9199	Production Workers, All Other	1.9%	2	0.97	$30,380	$32,470
51-3093	Food Cooking Machine Operators and Tenders	1.7%	2	N/A	$28,090	N/A
53-3032	Heavy and Tractor-Trailer Truck Drivers	1.6%	2	0.82	$40,360	$39,932
51-3099	Food Processing Workers, All Other	1.5%	2	0.44	$24,880	$25,420
37-2011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners	1.5%	1	1.04	$24,850	$25,861
53-7061	Cleaners of Vehicles and Equipment	1.3%	1	0.99	$22,620	$23,539
43-5071	Shipping, Receiving, and Traffic Clerks	1.3%	2	1.33	$30,700	$30,695
51-9023	Mixing and Blending Machine Setters, Operators, and Tenders	1.2%	2	0.79	$35,200	$39,680
41-2011	Cashiers	1.2%	1	0.89	$20,370	$19,929
41-4012	Sales Representatives, Wholesale and Mfg., Exc. Technical & Scientific Products	1.1%	3	1.10	$64,300	$65,190
51-3091	Food and Tobacco Roasting, Baking, and Drying Machine Operators & Tenders	1.1%	2	N/A	$29,580	N/A
11-1021	General and Operations Managers	1.1%	3	0.86	$114,850	$104,977
41-2031	Retail Salespersons	1.1%	2	0.80	$25,310	$24,961
53-3031	Driver/Sales Workers	1.0%	1	0.57	$27,730	$21,510
53-7063	Machine Feeders and Offbearers	0.9%	2	1.50	$28,680	$27,960
43-9061	Office Clerks, General	0.8%	2	1.15	$29,270	$31,290
51-9012	Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, etc.	0.8%	2	N/A	$40,340	N/A
42-0700	Industrial Production Managers	0.8%	3	1.19	$97,490	$99,600
53-3033	Light Truck or Delivery Services Drivers	0.7%	2	1.16	$33,940	$34,680
43-3031	Bookkeeping, Accounting, and Auditing Clerks	0.7%	3	1.06	$36,640	$36,399
43-5081	Stock Clerks and Order Fillers	0.7%	1	0.87	$24,440	$23,916
49-9043	Maintenance Workers, Machinery	0.7%	2	1.42	$42,190	$42,403
51-9032	Cutting and Slicing Machine Setters, Operators, and Tenders	0.7%	2	1.34	$32,340	$35,721
45-2041	Graders and Sorters, Agricultural Products	0.6%	1	N/A	$20,870	N/A
35-2021	Food Preparation Workers	0.6%	1	0.78	$20,910	$20,237
51-3021	Butchers and Meat Cutters	0.6%	2	0.27	$30,000	$39,310
51-9192	Cleaning, Washing, and Metal Pickling Equipment Operators and Tenders	0.6%	2	1.65	$28,280	N/A
35-3022	Counter Attendants, Cafeteria, Food Concession, and Coffee Shop	0.6%	1	0.91	$19,430	$19,160
49-1011	First-Line Supervisors of Mechanics, Installers, and Repairers	0.5%	3	0.89	$62,540	$65,140
43-4051	Customer Service Representatives	0.5%	2	1.34	$33,110	$33,713
51-9021	Crushing, Grinding, and Polishing Machine Setters, Operators, and Tenders	0.5%	2	0.68	$33,340	$34,950
19-4011	Agricultural and Food Science Technicians	0.4%	3	1.99	$36,390	$35,550
19-1012	Food Scientists and Technologists	0.4%	4	1.45	$64,140	$55,140
51-9041	Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, etc.	0.4%	2	N/A	$32,880	N/A
51-9193	Cooling and Freezing Equipment Operators and Tenders	0.4%	2	N/A	$30,020	N/A
35-3021	Combined Food Preparation and Serving Workers, Including Fast Food	0.4%	1	1.03	$18,720	$19,012

Sources: BLS, O*NET and Author's Calculations. *MSA Figures include the Madison MSA and the Janesville MSA

Table 4.2 – Beverage Manufacturing Occupations by Share of Industry Employment – Top 50 Occupations (2012)

SOC Code	Occupation Title	Percent of Total Employment	Job Zone	MSAs LQ*	National Annual Avg. Wage	MSAs Annual Avg. Wage*
51-9111	Packaging and Filling Machine Operators and Tenders	11.0%	2	1.70	$33,610	$30,447
51-9012	Separating, Filtering, Clarifying, Precipitating and Still Machine Operators, etc.	5.7%	2	N/A	$40,650	N/A
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	5.7%	2	1.07	$28,360	$26,939
41-4012	Sales Representatives, Wholesale and Manufacturing,	5.4%	3	1.10	$55,560	$65,190
53-3031	Driver/Sales Workers	4.6%	1	0.57	$33,120	$21,510
41-2031	Retail Salespersons	3.8%	2	0.80	$25,350	$24,961
53-7051	Industrial Truck and Tractor Operators	3.5%	2	1.03	$34,200	$31,211
53-3032	Heavy and Tractor-Trailer Truck Drivers	3.3%	2	0.82	$41,800	$39,932
41-9011	Demonstrators and Product Promoters	3.0%	2	0.41	$28,710	$31,750
49-9041	Industrial Machinery Mechanics	2.8%	3	0.76	$51,090	$44,663
51-1011	First-Line Supervisors of Production and Operating Workers	2.8%	2	1.00	$57,720	$56,664
45-2092	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	2.5%	1	0.10	$23,660	$25,200
43-5081	Stock Clerks and Order Fillers	2.5%	1	0.87	$27,270	$23,916
53-3033	Light Truck or Delivery Services Drivers	2.4%	2	1.16	$33,100	$34,680
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	1.8%	2	0.93	$37,720	$34,079
11-1021	General and Operations Managers	1.8%	3	0.86	$104,820	$104,977
35-3031	Waiters and Waitresses	1.7%	1	0.86	$21,130	$20,190
49-9071	Maintenance and Repair Workers, General	1.7%	3	0.80	$42,660	$36,980
51-9198	Helpers--Production Workers	1.6%	1	0.52	$24,300	$29,703
51-2092	Team Assemblers	1.5%	2	1.02	$29,030	$30,340
43-9061	Office Clerks, General	1.2%	2	1.15	$30,820	$31,290
49-9091	Coin, Vending, and Amusement Machine Servicers and Repairers	1.1%	2	0.92	$34,440	$30,910
51-9023	Mixing and Blending Machine Setters, Operators, and Tenders	1.1%	2	0.79	$35,290	$39,680
43-3031	Bookkeeping, Accounting, and Auditing Clerks	1.0%	3	1.06	$38,320	$36,399
43-4051	Customer Service Representatives	0.9%	2	1.34	$32,450	$33,713
27-1026	Merchandise Displayers and Window Trimmers	0.9%	2	0.58	$31,740	$28,100
11-3051	Industrial Production Managers	0.9%	3	1.19	$100,640	$99,600
51-3092	Food Batchmakers	0.8%	2	1.81	$36,150	$33,809
53-1031	First-Line Supervisors of Transportation and Vehicle Operators	0.8%	3	0.72	$56,250	$57,565
43-6014	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	0.7%	2	0.77	$33,750	$34,960
41-2011	Cashiers	0.7%	1	0.89	$22,460	$19,929
43-5071	Shipping, Receiving, and Traffic Clerks	0.7%	2	1.33	$34,360	$30,695
49-1011	First-Line Supervisors of Mechanics, Installers, and Repairers	0.7%	3	0.89	$68,060	$65,140
11-2022	Sales Managers	0.7%	4	1.24	$108,030	$101,467
41-1012	First-Line Supervisors of Non-Retail Sales Workers	0.6%	4	0.91	$69,830	$73,354
49-3031	Bus and Truck Mechanics and Diesel Engine Specialists	0.6%	3	0.83	$45,440	$44,287
13-2011	Accountants and Auditors	0.6%	4	0.95	$70,670	$66,773
49-9043	Maintenance Workers, Machinery	0.6%	2	1.42	$41,940	$42,403
37-2011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners	0.6%	1	1.04	$28,840	$25,861
51-9193	Cooling and Freezing Equipment Operators and Tenders	0.5%	2	N/A	$27,090	N/A
35-3011	Bartenders	0.5%	2	1.95	$22,850	$20,276
41-1011	First-Line Supervisors of Retail Sales Workers	0.5%	2	0.78	$42,250	$40,879
43-1011	First-Line Supervisors of Office and Administrative Support Workers	0.5%	3	0.83	$53,460	$49,575
43-5061	Production, Planning, and Expediting Clerks	0.5%	2	0.94	$44,800	$45,833
13-1161	Market Research Analysts and Marketing Specialists	0.5%	4	1.18	$63,460	$58,966
51-9199	Production Workers, All Other	0.5%	0	0.97	$31,900	$32,470
53-1021	First-Line Supervisors of Helpers, Laborers, and Material Movers, Hand	0.5%	3	1.00	$48,280	$48,739
35-2014	Cooks, Restaurant	0.3%	2	0.77	$23,440	$22,900
53-7064	Packers and Packagers, Hand	0.3%	2	1.72	$22,070	$30,551
11-3071	Transportation, Storage and Distribution Managers	0.3%	4	1.11	$83,140	$85,590

Sources: BLS, O*NET and Author's Calculations. *MSA Figures include the Madison MSA and the Janesville MSA

A number of food and beverage manufacturing occupations show high location quotients in the combined Madison and Janesville metro areas, suggesting a local specialization of these workers.[32] These location quotients are not surprising given the large concentration of food and beverage manufacturing establishments in the region. Nonetheless, they do show the breadth of specialized occupations present in the region. Specific categories with location quotients above 1.25 include:

- Packaging, and filling machine operators and tenders (LQ = 1.70)
- Food batchmakers (LQ = 1.81)
- Hand packers and packagers (LQ = 1.72)
- Machine feeders and offbearers (LQ = 1.50)
- Cutting and slicing machine setters, operators, and tenders (LQ = 1.34)
- Cleaning, washing, and metal pickling equipment operators and tenders (LQ 1.65)
- Agricultural and food science technicians (1.99)
- Food scientists and technologists (1.45)
- Machinery maintenance workers (LQ = 1.42)
- Customer service representatives (LQ = 1.34)

Note that local wage and location quotient data are excluded for several of the most common occupations in food and beverage manufacturing. Figures for 1) meat, poultry, and fish cutters and trimmers; 2) slaughterers and meat packers; 3) food cooking machine operators and tenders; and 4) separating, filtering, clarifying, precipitating and still machine operators are not included in the estimates. Their exclusions do not mean these occupations are not present in the area, but rather that the data have been suppressed by the Bureau of Labor Statistics.

Unfortunately, a similar occupational analysis for agricultural production cannot be conducted due to a lack of available data at the local level. However, a national analysis of agricultural employment from the BLS suggests that employment is heavily concentrated in two occupations: 1) farmworkers and laborers working in crop, nursery and greenhouse establishments; and 2) farmworkers working with farm, ranch and aquaculture animals. These two occupations alone account for 56 percent of employment nationwide in the industry. More information on the occupational structure of agriculture at the national level is available from the Bureau of Labor Statistics at: www.bls.gov/opub/mlr/2014/article/agriculture-occupational-employment-and-wages-1.htm. The University of Wisconsin-Extension's Farm and Risk Management (FARM) Team also provides statewide statistics on agricultural employee characteristics at: www.uwex.edu/ces/farmteam/

Each occupation in food and beverage manufacturing also can be associated with a so-called *Job Zone*. Job zones provide information on the usual types of preparation needed for given occupations within an industry. Job Zones also suggest the typical length of time workers need to acquire information, learn techniques, and develop the capacity needed for average performance in these occupations. Note that training may be acquired in a variety of environments (vocational education, apprenticeship training, on-the-job, etc.) and does not include the orientation time required to become a fully-qualified worker or accustomed to special conditions of a job. Occupations in Job Zone 1 have lower preparation requirements and occupations in Job Zone 5 require the largest amount of preparation (Figure 4.1).

[32] Many of these occupations also are concentrated throughout the State of Wisconsin.

Figure 4.1 – Understanding Job Zones

Job Zone One: Little or No Preparation Needed

- *Education* - Some of these occupations may require a high school diploma or GED certificate.
- *Related Experience* - Little or no previous work-related skill, knowledge, or experience is needed for these occupations. For example, a person can become a waiter or waitress even if he/she has never worked before.
- *Job Training* - Employees in these occupations need anywhere from a few days to a few months of training. Usually, an experienced worker could show you how to do the job.
- *Specific Vocational Preparation Time* – Short demonstration, up to one month or one to 3 months.

Job Zone Two: Some Preparation Needed

- *Education* - These occupations usually require a high school diploma.
- *Related Experience* - Some previous work-related skill, knowledge, or experience is usually needed. For example, a teller would benefit from experience working directly with the public.
- *Job Training* - Employees in these occupations need anywhere from a few months to one year of working with experienced employees. A recognized apprenticeship program may be associated with these occupations.
- *Specific Vocational Preparation Time* – 3 to 6 months, 6 months to 1 year

Job Zone Three: Medium Preparation Needed

- *Education* - Most occupations in this zone require training in vocational schools, related on-the-job experience, or an associate's degree.
- *Related Experience* - Previous work-related skill, knowledge, or experience is required for these occupations. For example, an electrician must have completed three or four years of apprenticeship or several years of vocational training, and often must have passed a licensing exam, in order to perform the job.
- *Job Training* - Employees in these occupations usually need one or two years of training involving both on-the-job experience and informal training with experienced workers. A recognized apprenticeship program may be associated with these occupations.
- *Specific Vocational Preparation Time* – 1 to 2 years

Job Zone Four: Considerable Preparation Needed

- *Education* - Most of these occupations require a four-year bachelor's degree, but some do not.
- *Related Experience* - A considerable amount of work-related skill, knowledge, or experience is needed for these occupations. For example, an accountant must complete four years of college and work for several years in accounting to be considered qualified.
- *Job Training* - Employees in these occupations usually need several years of work-related experience, on-the-job training, and/or vocational training.
- *Specific Vocational Preparation Time* – 2 to 4 years

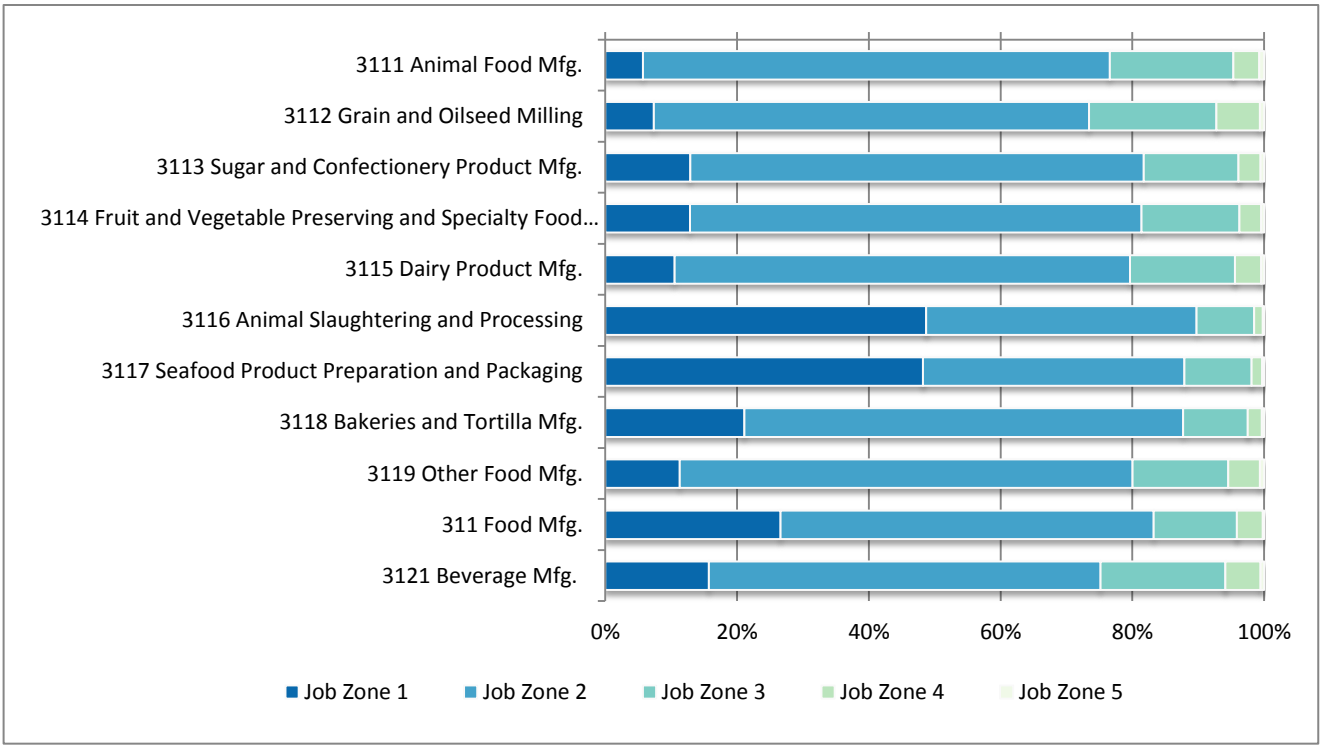
Job Zone Five: Extensive Preparation Needed

- *Education* - Most of these occupations require graduate school. For example, they may require a master's degree, and some require a Ph.D., M.D., or J.D. (law degree).
- *Related Experience* - Extensive skill, knowledge, and experience are needed for these occupations. Many require more than five years of experience. For example, surgeons must complete four years of college and an additional five to seven years of specialized medical training to be able to do their job.
- *Job Training* - Employees may need some on-the-job training, but most of these occupations assume that the person will already have the required skills, knowledge, work-related experience, and/or training.
- *Specific Vocational Preparation Time* – 4 to 10 years, or over 10 years

Source: O*NET

The broad distribution of food and beverage manufacturing industry employment by job zone is summarized in Figure 4.2. When compared to other manufacturing subsectors, food manufacturing has a notably high share of occupations found in Job Zone 1 and Job Zone 2. Every sub-category of food manufacturing has *at least* 75 percent of its occupations in Job Zone 1 and Job Zone 2. Furthermore, almost 75 percent of occupations in beverage manufacturing are found in Job Zone 1 or Job Zone 2. Dairy product manufacturing, animal food manufacturing, grain and oilseed manufacturing and other food manufacturing have the largest shares in Job Zone 2, while animal processing and seafood products have the largest shares in Job Zone 1. Again, the shares of occupations within the food manufacturing industry are based on national distributions reported by the Bureau of Labor Statistics and the local occupational structure likely varies in the region and within individual firm.

Figure 4.2 – Share of Food Manufacturing Occupations by Job Zone



Source: BLS and O*NET and Author's Calculations

The overall shares of occupations found in Job Zone 1 and Job Zone 2 suggest that preparation times and requirements are somewhat less than those found in industries with high shares of jobs in Job Zones 3, 4 or 5. However, the concentration of employment in Job Zone 1 and Job Zone 2 should not necessarily suggest that food and beverage manufacturing requires low skill levels. Many food and beverage manufacturing occupations in these job zones entail specific skills that require specialized training. Furthermore, the industries are becoming more automated and technologically intensive. Increased computerization and automation through the use of new collators, conveyor lines, production equipment and automated case packers and drops adds to the technical skills needed by workers.

While less prevalent, the industries also have important occupations found in Job Zone 3 and Job Zone 4. Many of these occupations are related to food science, nutrition, management, sales and engineering. Individuals in these occupations develop new food and beverage products; perform quality assurance/quality

control; design new packaging, transportation and storing technologies to extend shelf lives of fresh and packaged products; and engineer new manufacturing and processing equipment. Other occupations in Job Zone 3 and Job Zone 4 work in logistics, develop new markets, and manage day-to-day operations related to human resources and finances. While these are relatively small occupational categories in the industries, they remain important to a firm's competitiveness.

Occupations across all job zones are also facing new food safety regulations from the U.S. Food and Drug Administration (FDA). The Food Safety Modernization Act (FSMA) was signed into law in 2011. The FSMA focuses on proactive measures related to food safety and provides the FDA with new enforcement authorities. Several examples of these measures include: requiring food facilities to implement mandatory preventative controls plans; minimum safety standards for producing and harvesting fruits and vegetables; mandated inspection frequencies; greater authority to issue product recalls; enhanced production tracing abilities; and new oversights on imported goods. The gradual implementation of FSMA components likely will require additional training requirements for many occupations.

The distribution of food and beverage manufacturing occupations by job zones also has broader implications for the region's economy. In particular, they offer opportunities for workers without advanced levels of educational attainment. Despite the notable share of residents in Dane County with a college degree, the region's workforce is largely comprised of residents without a bachelor's degree or an associate's degree. In fact, half of all residents age 25 and over in the Madison Region have either a high school degree, or some college, but no degree. In the Driftless Region, 61.1 percent of residents are found in these two levels of educational attainment. Other industries also provide opportunities for residents without a post-secondary degree, but food manufacturing often offers higher annual and hourly wages than found in other industries relying on a high share of occupations in Job Zone 1 and Job Zone 2 (i.e. retail, hospitality, etc.)

Table 4.3 – Highest Level of Educational Attainment for the Population Age 25 and Over (2008-2012)

Highest Level of Educational Attainment	Madison Region	Driftless Region	State of Wisconsin	United States
Total population Age 25 and over	667,539	116,822	3,800,291	204,336,017
Less than 9th grade	2.7%	5.1%	3.5%	6.0%
9th to 12th grade, no diploma	5.5%	6.4%	6.4%	8.2%
High school graduate (includes GED)	29.4%	40.9%	33.1%	28.2%
Some college, no degree	20.7%	20.7%	21.3%	21.3%
Associate's degree	9.4%	9.5%	9.4%	7.7%
Bachelor's degree	20.0%	11.4%	17.5%	17.9%
Graduate or professional degree	12.3%	6.0%	8.9%	10.6%
High school graduate or greater	91.7%	88.5%	90.2%	85.7%
Bachelor's degree or greater	32.2%	17.4%	26.4%	28.5%

Source: U.S. Census Bureau American Community Survey 2008-2012 5-Year Estimates. Figures are subject to a margin of error.

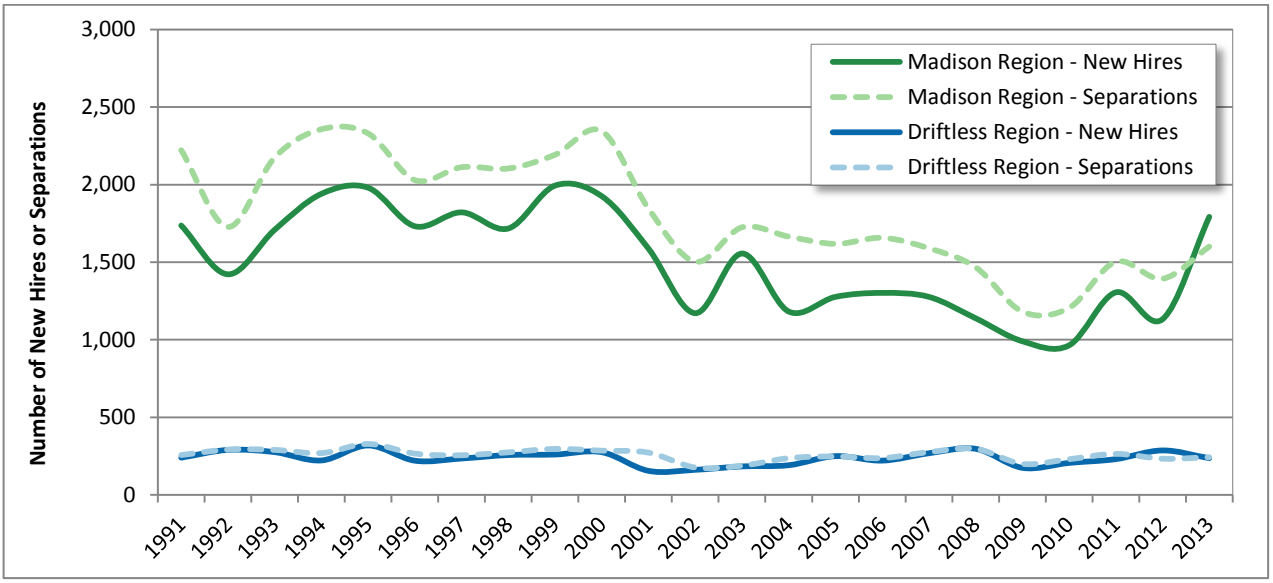
Employment Churn and Age Structure

The food manufacturing employment trends in Section 1 show a growing number of jobs in the Driftless Region and a declining number in the Madison Region. Certainly net job creation in the Driftless Region creates demand for new employees. However, declining employment in the Madison Region should not suggest that food manufacturing establishments do not need new workers. Job separations occur regularly as workers leave firms for other employment opportunities. Workers also may retire or exit the labor force for other reasons. Consequently, hires can occur in establishments that are expanding, contracting, or staying the same size simply for purposes of worker replacement. In fact, most hiring and separations reflect *churn* within an industry, rather than the overall expansion or contraction of the industry. More specifically, churn is defined as the simultaneous hiring and separation within an industry (Hyatt and Spletzer 2013).

New hires and separations in the Madison Region's food manufacturing industry have trended downward since the late 1990s (Figure 4.3).[33] While the overall trend reflects the region's declining employment, employers were still hiring an average of *1,000 new workers per quarter* at the lowest point in 2010. More recently, the Madison Region averaged almost 1,800 new hires and 1,600 separations per quarter, marking the first time in over two decades that new hires exceeded separations. These figures show that employers in the region continue to hire a sizeable number of workers despite overall employment trends in the industry.

Lower levels of new hires and separations occur in the Driftless Region's food manufacturing industry. These lesser values are to be expected given that total food manufacturing employment in the Driftless Region is less than one-quarter the size of that in the Madison Region. Nonetheless, the region's food manufacturing employers still averaged between 150 and 300 new hires and separations per quarter over the past two decades.

Figure 4.3 – Food Manufacturing New Hires and Separations – Quarterly Averages 1991 to 2013



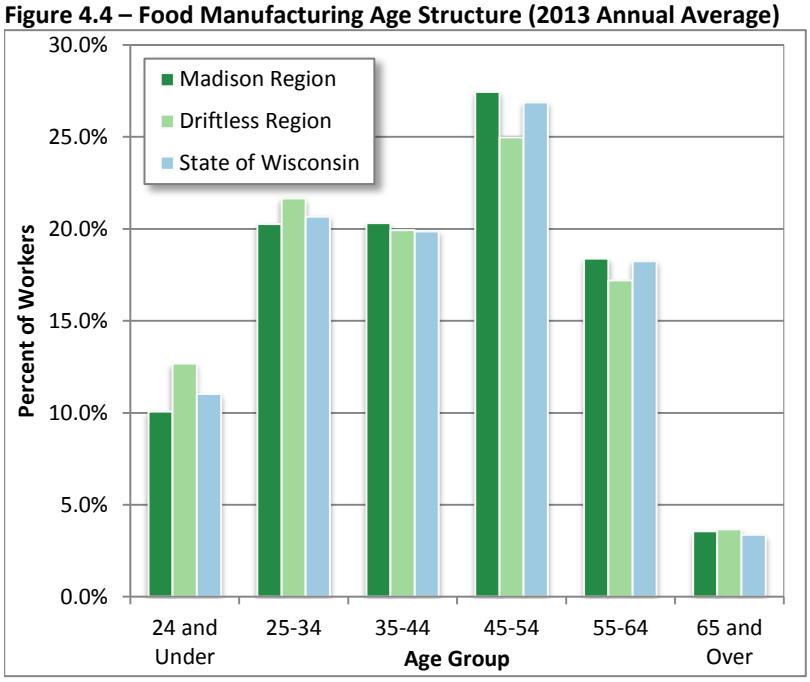
Source: U.S. Census Bureau LEHD and Author's Calculations

[33] New hires are workers who started a new job with an employer and were not employed by that employer in any of the previous four quarters. These figures do not include workers who returned to the same employer where they had worked within the previous year (such as those who may have been recalled from a layoff or work stoppage).

Employees leave their workplace for many reasons such as layoffs, new employment opportunities, schooling, child care, and other reasons. One looming issue facing employers in the Madison Region and Driftless Region is the share of the labor force approaching retirement age. Over 20 percent of food manufacturing employees in the Madison Region, Driftless Region and the State of Wisconsin were age 55 older in 2013 (Figure 4.4). Furthermore, the share of the workforce age 55 and over has almost doubled over the past two decades, increasing from approximately 10 percent in 1993 (Figure 4.5).

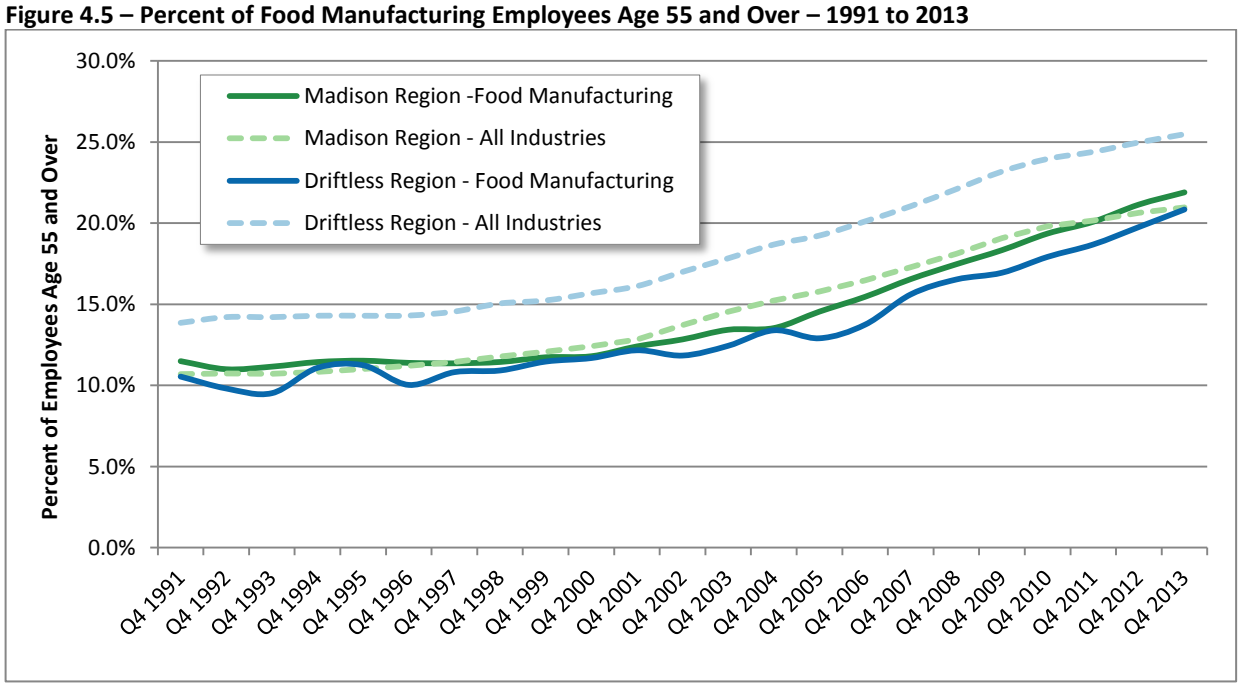
The growing share of food manufacturing workers age 55 and over reflects an overall aging of the labor force in the region. While food manufacturing tends to have a younger workforce than most manufacturing sub-sectors, and increased productivity may reduce labor needs in some areas, a large number of workers across many industries are approaching retirement in the next decade. Accordingly, food manufacturing firms are potentially in competition with many industries for new or replacement workers over the next ten-to-twenty years.

Figure 4.4 – Food Manufacturing Age Structure (2013 Annual Average)



Source: U.S. Census Bureau LEHD and Author's Calculations

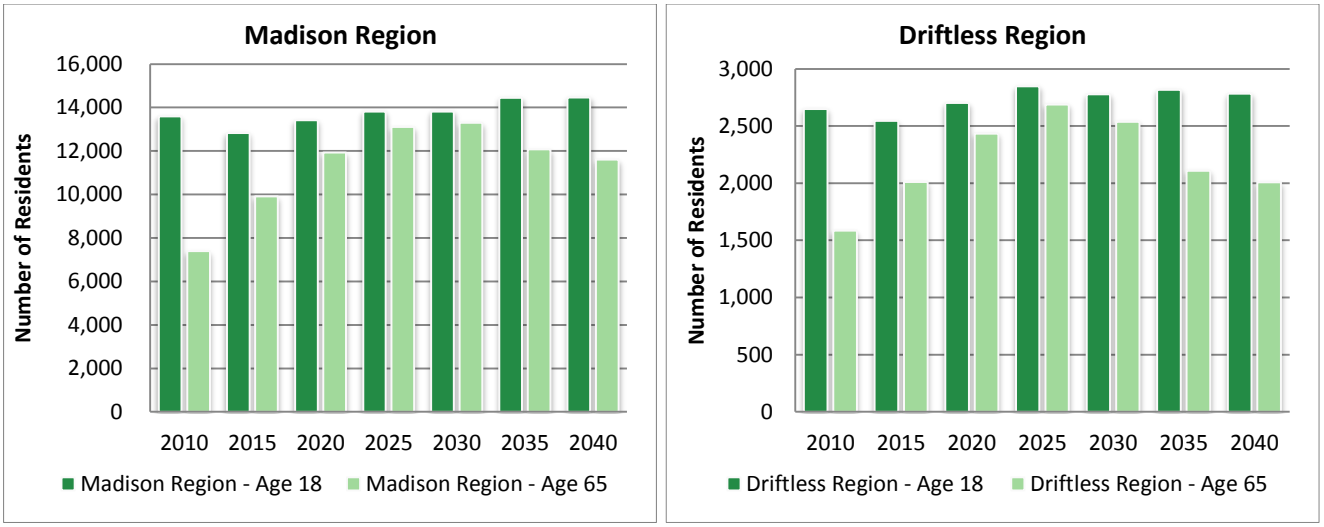
Figure 4.5 – Percent of Food Manufacturing Employees Age 55 and Over – 1991 to 2013



Source: U.S. Census Bureau LEHD and Author's Calculations

To illustrate potential changes in labor force age structure, Figure 4.6 provides estimates on the number of residents turning age 18 and age 65 in the Madison Region and Driftless Region over a 30-year period. Age 18 and age 65 provide proxies for when individuals may respectively enter and exit the labor force. Certainly workers may start a job before age 18 and continue to work past age 65, but these ages provide a beginning point for comparing worker availability. In 2010, there were almost twice as many residents turning age 18 as those turning age 65 in the Madison Region. By 2025, there are approximately as many people turning age 65 as those turning age 18. Somewhat similar ratios are present in the Driftless Region. Specific trends will vary by individual counties, but even Dane County faces an aging workforce, despite the large number of young residents contributed annually to the area by UW-Madison.

Figure 4.6 – Convergence of the Population Age 18 and Age 65 in the Madison and Driftless Regions (2010 to 2040)



Source: Wisconsin Deparment of Administration Demographic Services Center and Author's Calculations

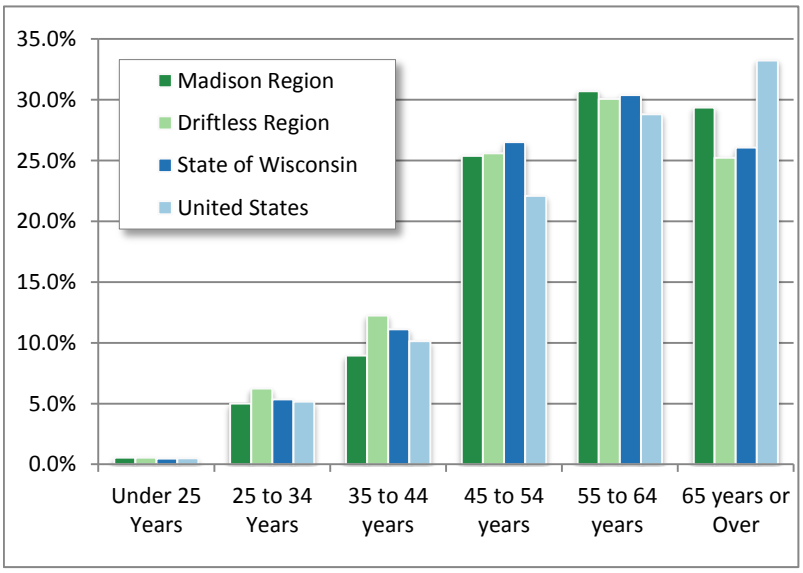
While age data are not available for hired agricultural workers, the 2012 Census of Agriculture provides age information on principal farm operators. According to the USDA, a "farm operator is the person who runs the farm, making the day-to-day management decisions. The operator could be an owner, hired manager, cash tenant, share tenant, and/or a partner. If land is rented or worked on shares, the tenant or renter is the operator."[34] In the case of multiple operators, the principal farm operator is the individual primarily responsible for the farm's usual management.

Principal farm operators in the Driftless Region have a slightly younger age distribution than that of the Madison Region, State of Wisconsin and United States (Figure 4.7). Both the Driftless Region and Madison Region also have a lower share of operators over age 65 than the national average. Nonetheless, the overall age distribution of principal operators is skewed toward older age cohorts. Note that the Census data do not account for the ages of other operators who may be part of a farm. In the case of family-operated enterprises, there may be multiple generations working on the farm. Consequently, younger operators could be in place when the principal operator decides to retire or become less involved. Nonetheless, the age distributions could suggest needs for succession planning or new operators over the next decade. A number of programs in the region are providing potential pathways to new operators, such as those found at UW-Madison's Center

[34] Source: USDA Census of Agriculture

for Integrated Agriculture Systems, Madison College, Blackhawk Technical College and Southwest Wisconsin Technical College. These programs are further detailed in the Investing in Manufacturing Communities Partnership application submitted to the Economic Development Administration by MadREP.

Figure 4.6 – Age of Principal Farm Operator in 2012



Source: USDA 2012 Census of Agriculture

Rates of employment churn and an aging population will require creating a pipeline of workers to fill jobs both now and over the next decade. The challenge will be finding an appropriate balance of supply and demand. Certainly employers have worker requirements that can go unmet if proper training opportunities are not in place or do not adapt to changing needs. However, economic development practitioners and policy makers often push for workforce development programs with the idea that simply having a large number of highly-skilled workers will make the region more competitive. Putting workforce development programs into place without knowing the true demand for specific skills can create workers without sufficient job opportunities.

Unfortunately, quantifying current and longer-term demand for skills and occupations is difficult for workforce development providers. Occupational forecasts are often inaccurate or outdated. In some areas, poor information on occupational supply and demand is also attributed to a lack of deep relationships among workforce development providers, intermediaries and local employers. For instance, strategies that connect employers to workforce development providers through employer representation on advisory boards do not guarantee the communications needed to influence program implementations and outcomes (Harper-Anderson 2008). In particular, advisory boards frequently are weighted with larger firms even though the labor market is often dominated by smaller firms, such as those noted in Section 1 (Grubb 2009). Unless there is an on-going conversation among workforce intermediaries and small-to-medium enterprises in the AFB cluster, workforce development efforts may not fully understand the true need for many occupations in the cluster.

Creating a pipeline of AFB employees will require a large number of potential partners and workforce development intermediaries. In fact, workforce development is one of the most common activities pursued by cluster initiatives. Businesses; economic and workforce development entities; educational institutions (colleges, universities, and K-12); community organizations and other groups will all need to be a part of this effort (Figure 4.7). Each partner will have unique roles, and many are already highly engaged this process. A number specific existing and proposed programs are detailed in the aforementioned IMCP application. Nonetheless, more partnerships and opportunities for engagement likely are needed, particularly among those organizations in Figure 4.7 that are not traditionally associated with workforce development.

Figure 4.7 - Potential AFB Workforce Development Providers, Intermediaries and Partners

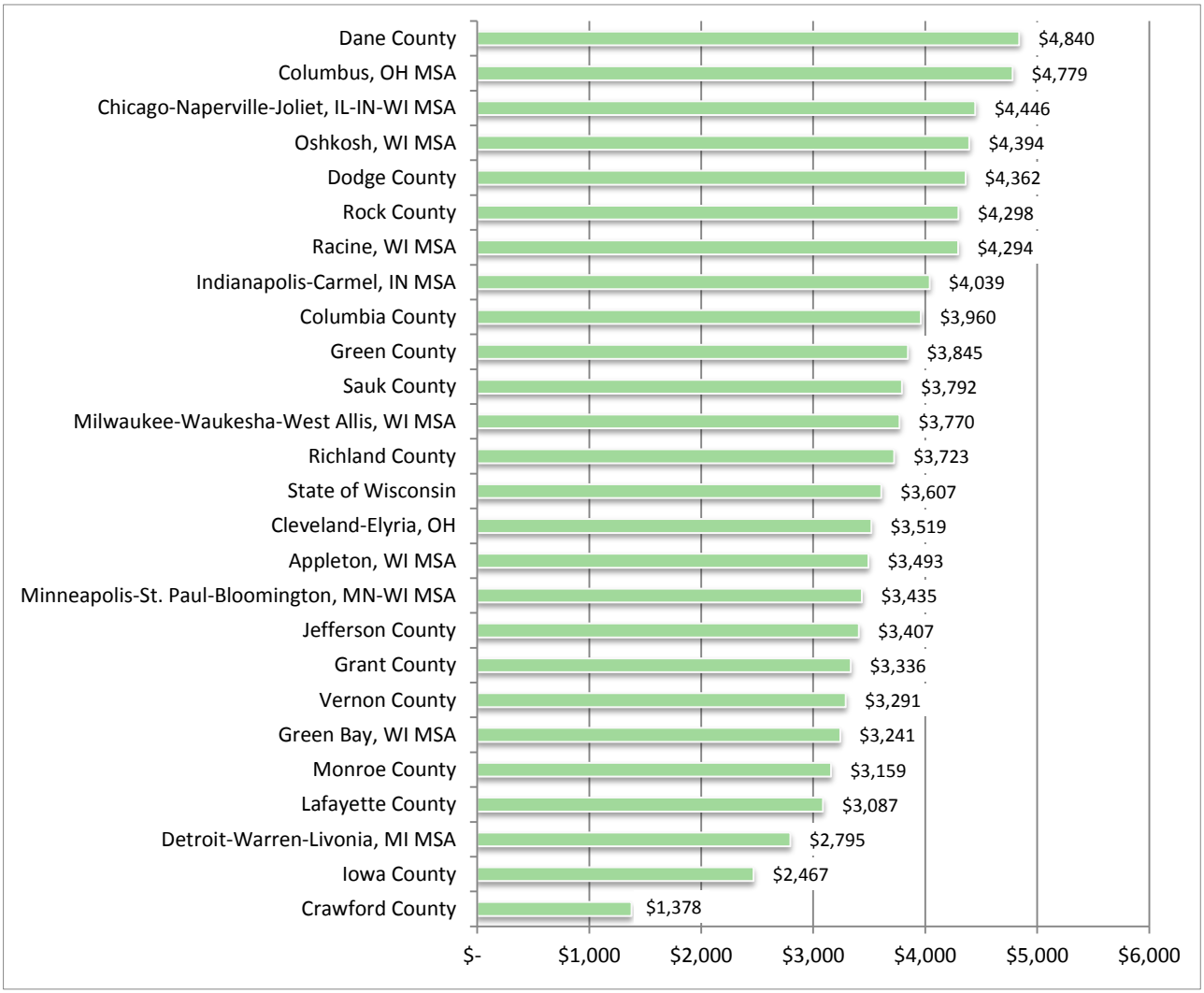
Type of Intermediary	Potential Roles
Community and Technical Colleges	• Offer certificate programs to develop entry-level or specific skills and associate degree programs for more comprehensive training; • Provide student career counseling and job placement assistance; • Provide short-term customized training to support learning and career development among incumbent workers; • Provide technical assistance to employers; • Collaborate with other partners in region to share resources and create centers of excellence in particular technical specialties;
High Schools	• Administer school-to-work or career-specific programs; • Provide instruction to develop technical foundations; • Encourage students to pursue careers in technical fields by providing exposure through career awareness, internships, etc. • Provide college and job placement assistance;
Community and Faith-Based Organizations	• Recruit community residents for employment programs; • Provide basic literacy for youth and adults tied to technical education and employment; • Provide education on soft-skills; • Offer career counseling; • Provide support services for community residents in community college or other training programs (day care, transportation assistance, etc.); • Provide job and college placement assistance; • Work with clients to develop job-keeping skills and promote job retention.
Social Service Agencies	• Provide transportation; • Recruit community residents; • Provide day care.
Economic Development and Workforce Development Organizations	• Align economic development programs with workforce development needs; • Identify emerging employment and training needs among local employers; • Identify key occupations to guide comprehensive economic and workforce development programs; • Recruit employers, community colleges, and organizations to participate in development of a curriculum (DACUM) efforts; • Assist colleges and high schools in identifying internship and employment opportunities for students;
Employers	• Participate in DACUM creation; • Encourage career interest through job shadowing and mentoring programs; • Provide internships for students and teachers; • Establish hiring agreements; • Report job openings;
Labor Organizations	• Participate in DACUM creation; • Establish new points of entry for apprenticeship programs;
Universities	• Offer baccalaureate programs in applied science and technology for graduates of associate degree programs; • Serve as intermediaries in developing integrated pathway or systems for workforce development; • Provide applied research for workforce development initiatives; • Develop program assessment tools; • Offer career counseling and job placement assistance.

Adapted from Fitzgerald, J. (1999). *Principles and Practices for Creating Systems Reform in Urban Workforce Development.* Great Cities Institute Working Paper.

Wage Comparisons

In Q2 2013, average monthly wages in food manufacturing varied across the Madison and Driftless regions, with the highest and lowest wages found in Dane County and Crawford County respectively (Figure 4.8).[35] While average wages in food manufacturing vary by sub-category and by occupation, the industry's overall average monthly wages in the region are mostly between $3,000 and $4,000.[36] Annual average wages in the region largely range from $35,000 to $45,000.[37] Food manufacturing wages in counties across the Madison Region and Driftless Region also fluctuate from those found in many metro areas in Wisconsin and throughout Great Lakes states. Consequently, wages in the study area may or may not provide a potential source of comparative advantage, depending on the areas being compared.

Figure 4.8 – Average Monthly Wage in Food Manufacturing for Selected Areas (Q2 2013)



Source: U.S. Census Bureau LEHD and Author's Calculations

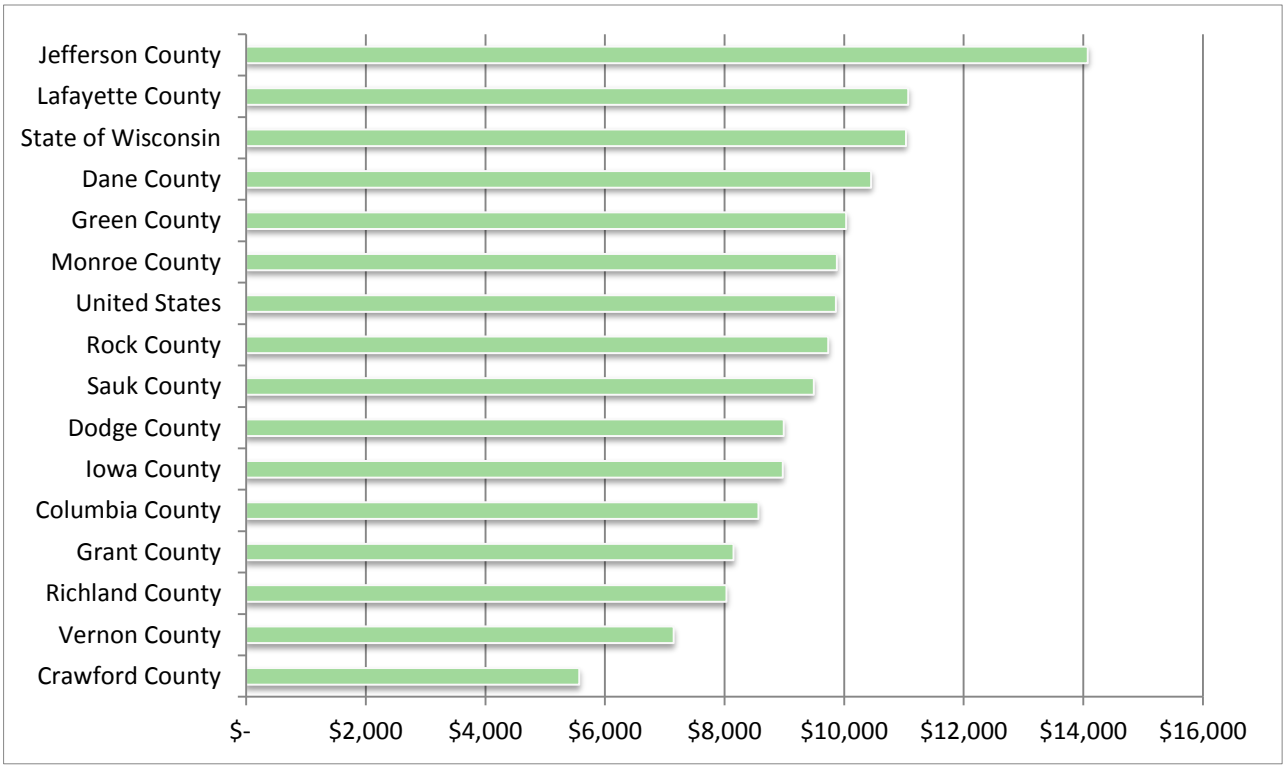
[35] Again, limited data precludes an extensive analysis of wages in beverage manufacturing.

[36] Median wages will differ somewhat from average wages, but the job zone distribution mentioned earlier is largely skewed toward occupations with lower wages.

[37] As reported by the Quarterly Census of Employment and Wages.

Payroll data for hired farm labor provide another perspective on wages in the cluster (Figure 4.9). As noted by the Bureau of Labor Statistics, earnings for hired farm labor tend to be low. Jefferson County has the highest average payroll per worker at slightly over $14,000 per year, while Crawford County has the lowest at just under $5,600. However, these figures must be considered from a broader perspective. As noted in Section 2, hired farm labor is largely part-time in nature, with a low share of hired laborers working more than 150 days per year. Hired farm labor may also receive other monetary benefits (such as housing) not necessarily included in these figures. These data also exclude payments made to contract labor such as contractors, crew leaders, cooperatives, or any other organization hired to furnish a crew of laborers to do a job. Finally, the figures also do not include farm proprietor income, which is an important source of earnings for many workers who are not considered hired farm labor.

Figure 4.9 – Average Annual Payroll per Worker for Hired Farm Labor (2012)



Source: USDA 2012 Census of Agriculture

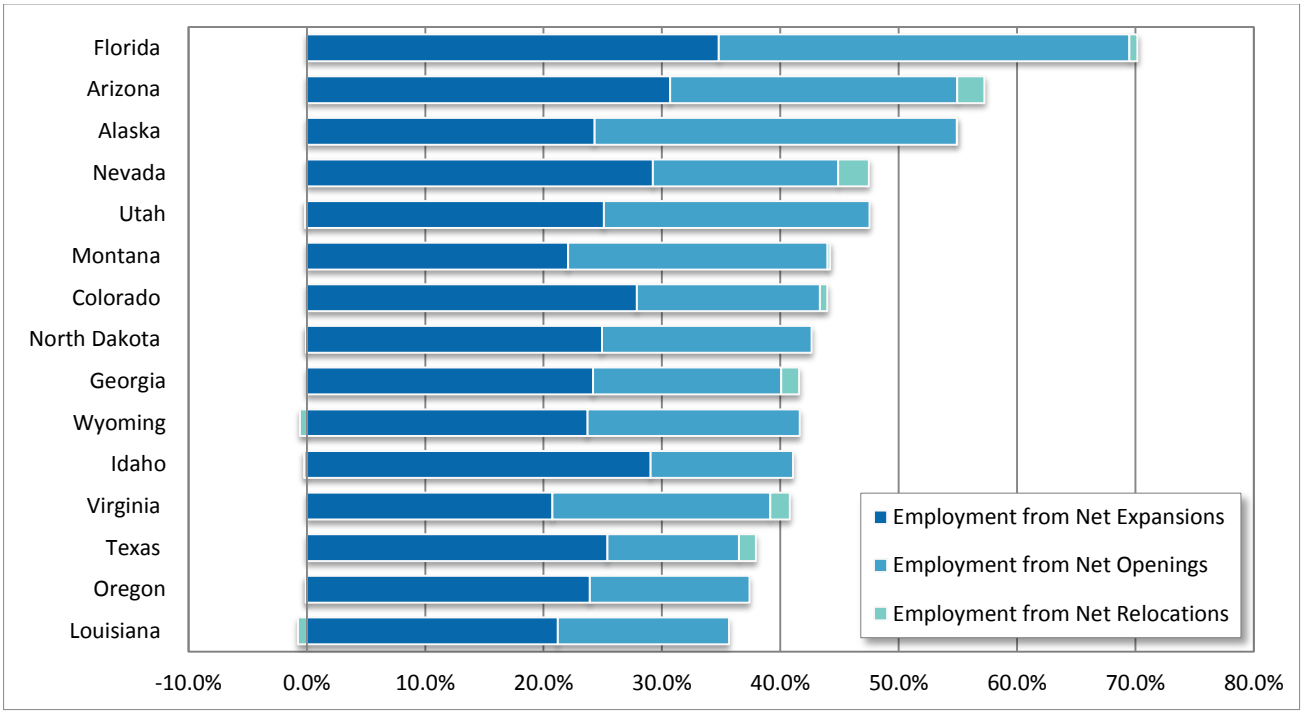
Building Opportunities and Support for Entrepreneurs

Economic development initiatives are traditionally segmented into attraction, retention, expansion and start-up activities. Attraction involves economic development organizations or other entities trying to entice new businesses (or other forms of capital) to move to their community from elsewhere. Retention activities intend to help existing firms remain in the community or maintain employment levels. Initiatives surrounding expansion attempt to help firms grow revenues or employment. Finally, start-up strategies support the formation of new firms or enterprises.

Economic development organizations (EDOs) often engage in one or all these activities. However, industry attraction frequently receives the greatest emphasis. Many communities devote significant resources (financial and otherwise) on trying to lure firms to relocate or build new facilities in their jurisdiction. While attracting a new employer to a community can be an important and visible event, the influence of industry attraction on overall job growth is questionable. As an example, consider the 15 states with the greatest employment growth rates between 1995 and 2012 (Figure 4.10).[38] Job growth in these states can be segmented into three components of change:

1. *Net establishment openings* - Jobs in establishment openings minus jobs in establishment closings;
2. *Net establishment expansions* - Jobs in establishment expansions minus jobs in establishment contractions;
3. *Net establishment relocations* - Jobs in establishments moving into a region minus jobs in establishments moving out of a region;

Figure 4.10 - Components of Job Growth for the 15 States with the Greatest Employment Growth Rates (1995 to 2012)



Source: National Establishment Time Series Database and Author's Calculations

38. While 2012 provides the most recent data available, the period between 1995 and 2012 provides a relevant timeframe for exploring job growth dynamics as it included periods of rapid job growth, tepid employment changes and steep job declines.

The data in Figure 4.10 show that establishment expansions and net openings *by far* contribute the greatest shares of new jobs in these fastest growing states.[39] Employment from net openings does involve some level of industry attraction, but a large share is also from endogenous new start-ups. In contrast, employment attributed to net relocations provides only minor influences on new employment in some states, with no contributions in others. While these figures offer just one perspective, additional research shows similar links between economic growth and business start-up and expansion activity across the rural-urban continuum[40]

If business expansions and openings are in fact the drivers of job growth, then why do communities continue to prioritize industry attraction? That is, why do communities often have a reluctance to emphasize entrepreneurial support? In short, developing initiatives and policies to further entrepreneurship often entail significant challenges. Specific concerns include those outlined by Markely et al (2005): [41]

- Communities frequently face a shortage of institutional support for economic development strategies rooted in entrepreneurship;
- Policies that effectively encourage the development of entrepreneurs are well not understood, particularly at the local level;
- Similarly, there are limited examples of state and local strategies that can serve as models for EDOs seeking to support entrepreneurs;
- The outcomes of entrepreneurship tend to be incremental and may not be immediately visible to funders, taxpayers or elected officials;

A lack of widespread support for entrepreneurs also arises from loosely-defined characterizations of an "entrepreneur." Practitioners and academics in economics, sociology, psychology and political science do not have consensus as to what constitutes an entrepreneur. While the debate over definitions is outside the scope of this abstract, at least some formal definition is needed for this discussion of entrepreneurs and entrepreneurial ventures.

Ahmad and Hoffman (2008) define entrepreneurs as "people who design, produce and generate value through the creation or expansion of economic activity." This definition, or a similar one, is significant for two reasons. First, the focus of the definition is on people and not economic institutions. *In other words, entrepreneurs are a source of human capital to be leveraged.* Consequently, a primary strategy for fostering entrepreneurs should be developing people, not merely enhancing infrastructure and business climate. Second, Ahmad and Hoffman's definition encompasses *all* economic activity and is not restricted to the creation or expansion of businesses. As noted by Drucker (1985), entrepreneurial ventures are not limited to businesses, but can include non-profits, universities and government institutions.

39. Rankings of fastest growing states will vary depending on the data source. The rankings in Chart 4.10 rely on the National Establishment Time Series (NETS) database used by YourEconomy.org.

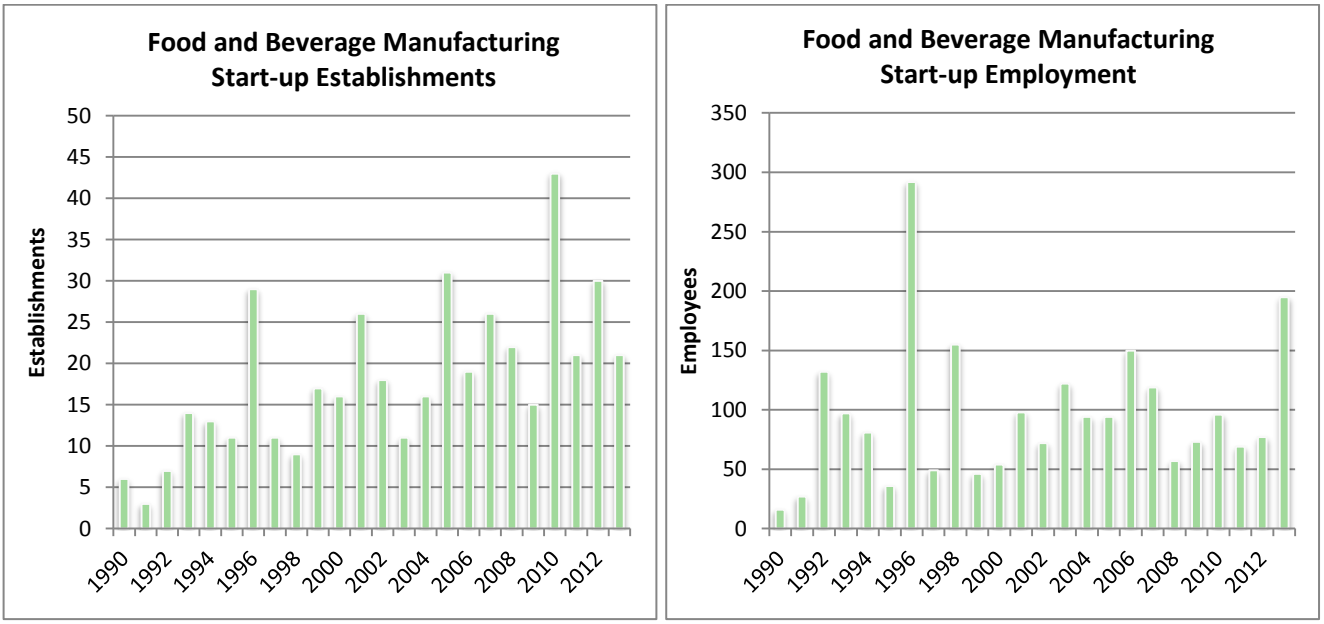
40. Some examples include Acs and Armington 2003; Walzer, Athiyaman and Hamm 2007; and Glaeser, Kerr and Kerr 2012;

41. Some of the information in this discussion of entrepreneurship is based on previous research conducted by the author and published elsewhere.

The preceding numbers in Figure 4.10 focus on the importance of business start-ups and expansions to state employment growth across all industries. However, does a similar importance of entrepreneurs also extend to the food and beverage manufacturing industry locally? In 2013, the National Establishment Time Series (NETS) database reported over 1,800 food manufacturing establishments in the State of Wisconsin. Only 34 of these establishments currently in existence previously relocated from another state at some point over the past two decades. Employment within these 34 relocating establishments accounted for approximately 1,900 jobs in 2013, or only *three percent* of current food manufacturing employment in Wisconsin.

Another perspective comes from food and beverage manufacturing start-up figures in the Madison Region and Driftless Region. According to NETS data, 435 new food and beverage manufacturing start-ups occurred in the 14-county study area between 1990 and 2013. These establishments accounted for 2,300 jobs over this period (Figure 4.11). Not all of the establishments in Figure 4.11 are still in business, but in the last four years alone, start-up establishments account for almost three percent of the region's total current employment in food and beverage manufacturing.

Figure 4.11 - Components of Job Growth for the 15 States with the Greatest Employment Growth Rates (1995 to 2012)



Source: National Establishment Time Series Database and Author's Calculations

Since 2004, the 14-county study area has averaged at least 15 new start-up establishments per year. Some of these firms have closed. Not all of these firms have high growth potential. In fact, the establishment spike that occurred in 2010 may partly reflect individuals that started new firms out of necessity after facing layoffs or other employment challenges that arose during the recent recessionary period. However, others have remained in business and increased their revenue and employment levels. As noted in Section 1, the region also has numerous establishments with 1 to 9 employees (stage 1 firms) and 10 to 99 employees (stage 2) who may not necessarily be new firms, but could have the desire to grow into larger enterprises. *The challenge for communities and EDOs is to find new and existing entrepreneurs that want to grow and help them achieve their desired scale.* In some ways, this challenge is no different than assisting the region's small agricultural producers mentioned in Section 2.

Each entrepreneur may face unique needs related to technical assistance, access to capital or workforce development. Consequently, broad assumptions should not be made about how to best serve these firms. Instead, community leaders and economic developers should learn more about the needs of existing and nascent firms in the AFB cluster through one-on-one conversations or other learning opportunities. Importantly, many of these conversations are already occurring in the region.

While the exact needs of individual entrepreneurs will vary, communities and EDOs can also broadly support entrepreneurship by creating an ecosystem where latent, new and existing entrepreneurs can succeed. In other words, the region needs to continually enhance its *entrepreneurial culture*. While a detailed discussion the region's entrepreneurial culture is beyond the scope of this study, an entrepreneurial culture can be broadly described as one in which a community is aware of the importance of entrepreneurs to the local economy. It is open to new and different ideas and it accepts failure. It is willing to experiment. Ultimately, it encourages and supports a breadth of entrepreneurs.

More specifically, Hustedde (2007) and Macke et al (2014) maintain that an entrepreneurial culture and support system are fostered by:

- *Welcoming fresh voices and embracing diversity* – Communities often have preconceptions about entrepreneurs. In reality, not all entrepreneurs have the same vision or goals for starting a firm. Some entrepreneurs are interested in generating high-growth companies. Other individuals may desire a limited enterprise that supports a specific lifestyle. A nascent entrepreneur may have never started a company before, while another may be a serial entrepreneur who has started many companies. Consequently, creating an entrepreneurial culture and support system for the AFB cluster requires understanding the needs and motivations of many entrepreneurial types;

- *Creating opportunities to learn, question and think differently about entrepreneurship* - Too often in communities, entrepreneurship outreach and learning are delivered in a reactionary manner. For instance, individuals may be introduced to entrepreneurship in response to an economic shock such as a plant closing. Learning opportunities should occur proactively throughout the community and can start with young residents rather than waiting until they become adults. Importantly, learning opportunities are not just about developing existing and prospective entrepreneurs. Not everyone should be an entrepreneur and outreach also should stress how entrepreneurship is not a good fit for many people; [42]

- *Mobilizing resources for entrepreneurs* – Resources can include technical assistance, access to capital, workforce development, broadband, business spaces, business support services, places to network and other forms of support;

- *Cultivating networks for entrepreneurs to thrive* – Entrepreneurs learn from each other, whether or not they are engaged in the same industry or produce a similar product. Connections can be fostered

[42] Economic environments, family backgrounds, employment histories, organizational experiences, social networks, and personality traits all affect the probability of someone acting entrepreneurially (Rauch and Frese 2000). Some of these factors are deeply engrained in individuals and in societies and may vary within the region. However, some of these factors can be influenced in manners that grow a community's pipeline of entrepreneurs.

through entrepreneur networks, peer groups, mentors and advisory boards. These networks can occur in physical and virtual spaces;

- *Focusing on assets instead of deficits* – Too often communities focus on what is missing rather than what is present. AFB entrepreneurs in the Madison Region and Driftless Region have access to many competitive assets including a diversity of producers, prime agricultural land, access to significant markets, robust university resources, a growing number of entrepreneur networks, and other comparative advantages;

- *Building a shared vision about entrepreneurship* – Placing an emphasis on entrepreneurs does not mean that industry attraction or other economic development strategies should be abandoned. Instead, communities in the region need a shared understanding about the importance of creating new firms and helping existing firms grow;

- *Fostering entrepreneurial leaders and advocates* – Communities need individuals and organizations who understand entrepreneurs and who can advocate for their needs. These leaders also tolerate failure and celebrate success;

Existing entrepreneurial support organizations (ESOs) and institutions such as Capital Entrepreneurs, Sector67, gener8tor, 100State, MERLIN, small business development centers, chambers of commerce, EDOs, FEED Kitchens, the VEDA Food Enterprise Center, the Wisconsin Innovation Kitchen, other incubators, UW-Extension's Food and Finance Institute, WWBIC and many others are important partners in building this culture, whether they directly serve AFB businesses or not. *In fact, there may be opportunities to connect entrepreneurs working in other industries or sectors that can build resources or products for firms in the AFB Cluster.* However, more advocates, organizations and partners are likely needed. Importantly, the creation of an entrepreneurial culture and support environment does not explicitly depend on infrastructure and financing. While funding, scalable facilities, traditional built infrastructure (roads, water, and power) and broadband access are necessary and important, these factors are not necessarily the most critical in developing a community's culture of entrepreneurship (Yenerall 2008).

Finally, the region's educational system should be viewed as a primary partner in creating and supporting entrepreneurs. As noted in Section 3 and the aforementioned IMCP application, there are many educational institutions providing support to the region's AFB establishments. The region's K-12 system, colleges, and universities provide assistance in workforce development. UW-Madison has tremendous research and development capacity in food science, animal science, dairy science, food systems, food safety, and horticulture. Furthermore, the Wisconsin Alumni Research Foundation holds over 200 inventions and patents in agriculture and food and supplements.

While workforce development, technology transfer, and research activities are commonly recognized contributions from educational institutions, the region's colleges and universities also support the entrepreneurial ecosystem in other manners. Specific opportunities suggested by Boh, De-Haan and Strom (2012) are largely present in the region's universities and colleges and include:

1. *Project-based classes on technology commercialization* – These classes create interdisciplinary teams or teams of MBA students to develop business plans and roadmaps for commercialization of university

technologies. Instructors often work directly with a technology licensing office (TLO) to identify appropriate invention disclosures or those with provisional or utility patents filed. Faculty primary investigators of the selected inventions also participate. Other interested faculty or graduate students may apply to participate in the class using their own technology for potential commercialization;

2. *Mentoring programs* – Mentors offer guidance and advice to new entrepreneurs at the university level (both faculty and students). Other services include referrals to lawyers, industry experts, potential customers, licensees, and investors who help founding teams build their networks;

3. *Business plan competitions* – These competitions can play a key role in spinoff development by providing a platform for team formation and offering an opportunity to develop a business plan and strategic roadmap. Competitions can also enhance credibility and publicity;

4. *Entrepreneurship education for students* – Entrepreneurship education is integral to building an entrepreneurial culture. Education can help inspire students to pursue entrepreneurship and provide knowledge of the skills needed in the future;

5. *Accelerator/incubator programs* - Accelerator or incubator programs help startups over longer periods of time by providing mentoring, funding, office space, enhanced credibility, oversight, and management;

6. *Entrepreneurship education for faculty* – Faculty members can be unfamiliar with the commercialization process and may not be aware of entrepreneurial options. While faculty can be reluctant to participate in workshops or educational programs not related to their research, universities and colleges still can offer entrepreneurial educational programs and resources available for access if faculty choose to do so.

Conclusion

In summary, the success of the AFB cluster will depend on the current and future levels of human capital in the region. The region's workforce shows specializations of important occupations found in the food and beverage manufacturing industry. The occupational distribution by job zone provides potential opportunities to many workers without a formal post-secondary degree. The industries also tend to have a younger workforce and lower rates of churn compared than many sectors in the region. Nonetheless, food manufacturers in the study area are currently replacing 2,000 workers per quarter. Technology requirements in the industry are growing. The industry also is facing a potentially smaller pool of workers that could be in demand from other sectors. Working with AFB businesses and workforce development providers to continually track demand for existing and future occupations will be vital to creating a pool of workers for the cluster.

AFB human capital in the form of current and future entrepreneurs will also be a determinant in the future success of the AFB cluster. Developing entrepreneurs and enhancing their support systems are not necessarily a panacea for growing the cluster. However, new start-ups and the growth of existing businesses likely provide more growth opportunities than overly focusing on industry attraction. Increasing entrepreneurial activity and the region's overall culture will take a long-term, focused effort. MadREP is already part of this endeavor. Other components are in place in the form existing entrepreneurial support organizations, but a better understanding of entrepreneurship is needed throughout the region. This abstract broadly mentions how to support the region's entrepreneurial culture, but more in-depth work and research are needed.

Section 5 - Positioning the AFB Cluster for Success

The Madison Region and Driftless Region clearly have a number of comparative advantages in the AFB cluster. Its geographic location provides close access to some the nation's largest concentrations of consumer and industry demand for food and beverage products. The area is rich in land and water resources. While the area is not immune to changes in growing conditions, it offers more potential stability than many other diverse agricultural areas (as exhibited by the current water crisis in California). Dairy production and processing are clearly a source of specialization, but the region also provides opportunities from many other producers who are varied in their products, ownership structures, and operational scales.

Industry clusters are driven not by the industries in which they compete, but rather how they compete in a given industry (Shaffer, Deller and Marcouiller 2004). One path to develop the AFB cluster would be seeking to compete on a low-cost, large-scale basis and focusing on traditional industry retention and recruitment strategies. In fact, the importance of cost and scale should not be ignored as important factors in AFB industry development. Industrial recruitment and retention efforts should not be discounted either. However, the study area is home to a high level of human capital in the AFB cluster. The knowledge and skills of the region's labor force; its research and support institutions; and its entrepreneurs provide other important means for differentiating the region's AFB cluster from competing food-related clusters in the nation. Consequently, AFB cluster development has an additional path that leverages human capital, drives innovation, fosters new business enterprises, and creates expansion opportunities at existing firms.

While the connection is not explicitly made by *Advance Now*, the region's other key industry clusters also support innovation in the AFB cluster. Information technology, design and advanced manufacturing could advance food science and safety; foster new production methods; create next generation packing and distribution opportunities; engineer new manufacturing and agricultural equipment; and generate information technology that better connects growers, processors, distributions and consumers. In general, the area could be thought of as a *food innovation region* whose focus is creating an economy at the forefront of food production, processing, distribution, and consumption.[43]

Convening the AFB Cluster

Industry cluster development efforts should be strategically-driven, collaborative and interactive. A foundation for strategy and collaboration is already in place through many existing partnerships and initiatives. A number of these are identified in *Advance Now* and in the recently submitted *Investing in Manufacturing Communities Partnership (IMCP)* application submitted by MadREP to the Economic Development Administration. Both of these documents identify opportunities to support the AFB cluster through workforce development, technical assistance, export opportunities, and entrepreneurial support. While these projects provide a starting point, the AFB cluster initiative must evolve to a long-term, concerted strategy built by stakeholders.

[43] The notion of a food innovation region should not be confused with a Food Innovation District as suggested by Cantrell et al 2013. Food innovation districts focus on activities such as regional food hubs, business incubation, retail and restaurants, farmers markets, nutrition education, urban agriculture, and community kitchens. While a food innovation region could consider these activities, a larger focus is placed on export markets, research and development, and the integration of associated technologies.

Unfortunately, engaging potential partners is not always easy. Individual organizations and firms may have different beliefs on the future direction the AFB cluster. Furthermore, stakeholders may not initially see the value in participating in cluster initiatives as they do not see the benefits to their respective businesses or organizations. *Consequently, organization and implementation is perhaps the most challenging component of the cluster development process.*

Developing the region's AFB cluster will require strong organizational development skills. The breadth and geographic distribution of potential stakeholders presents a challenge. Cluster businesses are located across a 14 county region that spans the rural-urban continuum. Industries are diverse in scale and scope. Organizations may be competing with each other for resources. MadREP already has trust with many potential partners, but it will take time to grow additional buy-in and support from other individuals. The time and process required to build the region's AFB cluster will likely frustrate some stakeholders. However, cluster development is not a short-term activity.

MadREP's precise role in developing the AFB cluster is up to its staff, leadership and board of directors. However, MadREP has a potentially important role in convening the AFB cluster; one that cannot be precisely replicated by other organizations or individuals in the region. Specifically, MadREP's unique role as a regional economic development organization allows it to serve as a convener for diverse cluster constituents across the Madison Region and Driftless Region. No other organization likely has the ability or mission to reach all of these stakeholders. Outreach to individual businesses and organizations will be important, but two broad audiences that should be engaged as part of the AFB cluster development process include: 1) firms in the industry; and 2) other economic development entities, support organizations and academic institutions.

AFB Industry Involvement

As mentioned in the introduction to this abstract, the region does not have a functional industry cluster until a number of firms and organizations agree to engage with each other at some level. Instead, it has a concentration of loosely-related firms. Undoubtedly, many businesses and organizations involved in agriculture, food and beverage industries are already connected and involved. The question is whether these firms are engaged to a degree where the cluster can fully benefit and realize its competitive potential. There may also be portions of the cluster that are not being fully connected. In particular, farm operators, small enterprises, and nascent entrepreneurs are often overlooked in the cluster development process. All of these groups need to be involved.

Creating trust and encouraging collaboration is difficult. Cooperating with other cluster firms may seem counterintuitive, as it may appear to undermine a company's internal strategy and sales potential. In fact, many economists are doubtful that appropriate arrangements will emerge as firm cooperation is limited by incomplete information, rivalries, and opportunistic behavior. *Accordingly, a consensus for promoting joint cluster benefits will only occur when the total gains are expected to be large and when the distribution of costs and benefits are clear to firms in the cluster (Barkley and Henry 2001).*

The potential benefits of cluster engagement can be discovered by identifying and addressing issues that commonly face cluster firms (e.g. what issues keep a business operator awake at night?). MadREP can help identify cross-cluster needs and build trust by exploring issues such as:[44]

- *Human capital development* – Are there opportunities to develop specialized training programs for the cluster's major occupations? Does the industry itself invest in training? Are there opportunities to better partner with workforce development intermediaries? Do nascent entrepreneurs need mentoring or other support?

- *Supply chain issues* – Are primary inputs and primary support industries available locally or do they require importation from outside the region? Are there notable gaps in industry supply chains? Do logistics or transportation-related opportunities or challenges exist?

- *Capital availability* – How well does the region's lenders understand the capital needs of the industry? Do local lenders meet the needs for various forms of capital required at different business stages?

- *Intensity of relationships and competition* – Do firms in the cluster already collaborate to some degree or does existing competition preclude cooperation? Are there opportunities to connect with other organizations or individuals not traditionally associated with the cluster?

- *Innovation* – How does the innovation process within the cluster operate? Are there greater opportunities to partner with other firms or educational institutions on technology transfer or research?

- *Shared vision and leadership* – If they choose to do so, how can firms develop a collective identity, create a plan, or determine shared goals for the cluster? Are there individual leaders or institutions that can maintain a cluster's collective competitiveness and keep it organized?

Again, efforts to identify some of these issues are already underway. However, MadREP and its partners can further these efforts by fostering additional networking opportunities. The social networks of cluster industries play an important role in identifying other businesses, individuals or issues that should be part of the initiative (Reid, Smith and Carroll 2008). Social network analysis, formal networking opportunities, or informal conversations can better identify these potential cluster members and opportunities.

Importantly, networking should not be dismissed as a minor or unimportant means of cluster development. Surveys of manufacturing networks suggest that establishments engaged in networking find significant advantages through cooperation with their counterparts. Networking firms also report that their competitiveness and profitability are enhanced by inter-firm cooperation and collaboration (Barkley and Henry 2001). While government can provide a venue and resources for making these connections, local business champions, MadREP, and its partners will likely need to drive these efforts. Furthermore, cluster network development opportunities should occur with no formal expectations of commitments from firms (especially financial commitments).

[44] These are issues identifiedby Rosenfeld (1997):

AFB Support Organization and Institution Involvement

In addition to private-sector firms, numerous organizations and institutions are potential partners in the AFB cluster. As many of these entities are identified in the *Advance Now* economic development strategy and the aforementioned IMCP application, they are not repeated here. In fact, many of the supporting organizations mentioned in the IMCP application are already engaged in the cluster development process. However, other organizations and institutions not mentioned in these documents are potentially part the cluster and should be included.

Cluster industry owners and operators certainly have their own ideas about the future direction of the AFB cluster. Support organizations and institutions have ideas as well, but may be more likely to represent a specific agenda. For instance, the Madison Region and Driftless Region are home to organizations that support the interests of small growers, larger producers, local food movements, international exporters, organic production, genetically-modified organisms, small entrepreneurs, large corporations, labor, and a host of other food system stakeholders. Furthermore, economic development organizations also represent many diverse communities in the region. Some stakeholders will fully embrace the cluster process. However, the MadREP and its partners should be prepared to confront the following challenges:

- *Self-interest and suspicion* - Economic and cluster development is sometimes considered to be a win-lose proposition. That is, the cluster must overcome the mindset that for one community, organization or business to win, another must lose.

- *Producing results that are driven by industry/economic cycles rather than election or funding cycles* – The cluster development process requires a long-term effort. Support organizations and economic development practitioners often must answer to funders and elected officials who want to demonstrate short-term positive change;

- *Differing levels of available resources* – Not all cluster partners will enter the initiative with the same level of capacity. If organizations and institutions do not enter the relationship as equal partners, trust issues may surface;

- *Fear of change* – Changing the status quo, if necessary, is difficult for individuals and organizations.

Overcoming these potential challenges is not easy. One new tactic to engaging AFB organizations and institutions could be the use of a *Collective Impact approach.* Collective impact has its roots in organizations addressing social issues such as poverty alleviation or school achievement. Specifically, groups of funders and non-profits often believe they are working on the same social issue. However, a closer examination of these groups frequently finds that is not the same issue at all. Each organization may have a slightly different definition of the problem and the ultimate goal it is working towards. Such differences are easily ignored when organizations work independently on isolated initiatives, yet these differing opinions can splinter the efforts and undermine the impact of the field as a whole (Kania and Kramer 2011).

In short, the non-profit sector frequently operates using an approach called *isolated impact*. This approach is tilted toward finding and funding a solution embodied within a single organization. The isolated impact approach also hopes that the most effective organizations will grow (or replicate) to extend their impact more widely. *Despite the prevalence of this approach, little evidence suggests that isolated initiatives are the best way to solve complex and interdependent issues.* Collective impact requires that organizations discuss and resolve differences. Importantly, every organization does not need to agree with every other participant on all dimensions of the problem. In fact, disagreements often divide participants in collective impact initiatives. However, all participants must agree on the primary goals for the collective impact initiative as a whole (Kania and Kramer 2011).

A similar, but modified approach could be extended to building the AFB cluster in the region. *The primary goal of the approach could be to grow AFB industries in a manner that maintains the region's quality of life.* In particular, the AFB cluster initiative could benefit from adopting the five conditions for success prescribed by the collective impact approach: These include: 1) creating a common agenda; 2) developing a shared measurement system; 3) identifying mutually reinforcing activities; 4) fostering continuous communication; and 5) designating backbone support organizations. More information on these five conditions is provided in Figure 5.2. A detailed description on collective impact is worth exploring and is available in the Stanford Social Innovation Review at: http://www.ssireview.org/articles/entry/collective_impact

Finally, MadREP and potential partner organizations should consider researching how other food-related clusters organize and operate. Several examples are found in Figure 5.1. These other food-industry cluster initiatives may provide insights into best practices. However, not all similar clusters will be successful. Instead, the region's AFB cluster may learn from their mistakes or failures.

Figure 5.1 - Other Examples of Food Industry Cluster Initiatives:

- *City and County of San Francisco Food Industry Cluster-* www.sf-planning.org/index.aspx?page=3541
- *Oregon Business Council – Food Processors* www.oregonbusinessplan.org/Industry-Clusters/About-Oregons-Industry-Clusters/Food-Processing.aspx
- *Cleveland-Cuyahoga County Food Policy Coalition - Sustainable Foods Business Cluster -* cccfoodpolicy.org/document/sustainable-foods-business-cluster-roadmap-final-report
- *Sacramento Metro Chamber Agriculture and Food Cluster –* www.metrochamber.org/agriculture-and-food.html
- *Finger Lakes (NY) Food Processing Cluster Initiative –* www.rit.edu/gis/flfpci/
- *Rockford (IL) Area Economic Development Council –* www.rockfordil.com/industries/food
- *Southeast North Carolina Agri-Industry & Food Processing –* www.ncse.org/industry-clusters/agriculture-food-processing

Figure 5.2 - Collective Impact – Five Conditions of Success

Common Agenda – "Collective impact requires all participants to have a shared vision for change, one that includes a common understanding of the issue, and a joint approach to solving it through agreed upon actions. Often, a group of organizations believe they are working on the same issues. However, each organization often has a slightly different definition of the issue and the ultimate goal. Differences are easily ignored when organizations work independently, yet these differences splinter the efforts and undermine the impact of the field as a whole. Collective impact requires that these differences be discussed and resolved. Every participant need not agree with every other participant on all dimensions of the problem."

Shared Measurement Systems – "Developing a shared measurement system is essential to collective impact. Agreement on a common agenda is illusory without agreement on the ways success will be measured and reported. Collecting data and measuring results consistently on a short list of indicators not only ensures that all efforts remain aligned, it also enables the participants to hold each other informally accountable and learn from each other's successes and failures."

Mutually Reinforcing Activities – "Collective impact initiatives depend on a diverse group of stakeholders working together, not by requiring that all participants do the same thing, but by encouraging each participant to undertake the specific set of activities at which it excels in a way that supports and is coordinated with the actions of others. The power of collective action comes not from the sheer number of participants or the uniformity of their efforts, but from the coordination of their differentiated activities through a mutually reinforcing plan of action."

Continuous Communication – "Developing trust among nonprofits, corporations, and government agencies is a monumental challenge. Participants need several years of regular meetings to build up enough experience with each other to recognize and appreciate the common motivation behind their different efforts. They need time to see that their own interests will be treated fairly, and that decisions will be made on the basis of objective evidence and the best possible solution to issue, not to favor the priorities of one organization over another."

Backbone Support Organizations – "Creating and managing collective impact requires a separate organization and staff with a very specific set of skills to serve as the backbone for the entire initiative. The expectation that collaboration can occur without a supporting infrastructure is one of the most frequent reasons why it fails. The backbone organization requires a dedicated staff separate from the participating organizations who can plan, manage, and support the initiative through ongoing facilitation, technology and communications support, data collection and reporting, and handling the myriad logistical and administrative details needed for the initiative to function smoothly."

Source: Kania and Kramer 2011, pp. 39-40.

References

Acs, Z.J. and Armington, C. (2003). Endogenous growth and entrepreneurial activity in cities. *Working Papers 03-02*, Center for Economic Studies, U.S. Census Bureau.

Ahmad, N. and R.G. Seymour. (2008). Defining entrepreneurial activity: definitions supporting frameworks for data collection. *OECD Statistics Working Papers, 2008/01*. OECD Publishing.

Barkley, D.L. and Henry, M.S. (2001). Advantages and disadvantages of targeting industry clusters. REDRL Research Report. Regional Economic Development Research Laboratory, Clemson University.

Boh, W.F., De-Haan, U. and Strom, R. (2012). University technology transfer through entrepreneurship: faculty and students in spinoffs. Ewing Marion Kauffman Foundation.

Brown, J.P., Goetz, S.J., Ahearn, M. C., and Liang, C. (2014). Linkages between community-focused agriculture, farm sales, and regional growth. *Economic Development Quarterly*, 28(1), 5-16.

Cantrell, P., Colasanti, K., Goddeeris, L., Lucas, S., McCauley, M. (2013). *Food innovation districts: an economic gardening tool.* Michigan State University Urban Planning Practicum 2012. Northwest Michigan Council of Governments. Available at: www.nwm.org/food-innovation-districts

Delgado, M., Porter, M.E., and Stern, S. (2014). Defining clusters of related industries. *NBER Working Paper No. 20375*.

Deller, S.C., Brown, L., Haines, A. and Fortenbery, R. (2014). *Local foods and rural economic growth*. Staff Paper No. 570. Agricultural & Applied Economics Staff Paper Series. Department of Agricultural and Applied Economics, University of Wisconsin-Madison. Available at: http://www.aae.wisc.edu/pubs/sps/pdf/stpap570.pdf

Deller, S. (2012). Targeting industrial gaps and disconnects for community economic development. *Choices*, 27(2).

Drucker, P.F. (1985). The practice of entrepreneurship. In *Innovation and Entrepreneurship Practice and Principles* (pp. 141-188). New York: Harper & Row.

Edward Lowe Foundation. (2013). *Economic gardening: an entrepreneur-oriented approach to economic prosperity*. Available at: edwardlowe.org/edlowenetwp/wp-content/uploads/2013/09/EG-4-pager.pdf

Fitzgerald, J. (1999). Principles and practices for creating systems reform in urban workforce development. Great Cities Institute Working Paper.

Glaeser, E.L., Kerr, S.P. and Kerr, W.R. (2012). Entrepreneurship and urban growth: an empirical assessment with historical mines. NBER Working Paper No. 18333.

Greene, C. and McBride, W. (2015). Consumer demand for organic milk continues to expand – can the U.S. dairy sector catch up? *Choices*, 30(1).

Grubb, W.N. (2009). The education gospel and the metropolis: the multiple roles of community colleges in workforce and economic development. In H. Wolman and N. Pindus (Eds.), *Urban and Regional Policy and Its Effects, Volume 2* (pp. 124–166). Washington, DC: Brookings Institution Press.

Hand, M.S., and Martinez, S. (2010). Just what does local mean. *Choices*, 25(1).

Harper-Anderson, E.L. (2008). Measuring the connection between workforce development and economic development: examining the role of sector-based strategies for local outcomes. *Economic Development Quarterly,* 22(2), 119-135.

Holcomb, R.B., Palma, M.A., Velandia, M.M. (2013). Food safety policies and implications for local food systems. *Choices*, 28(4).

Howitt, R., Medellin-Azuara, J., MacEwan, D., Lund, J. and Sumner, D. (2014). *Economic analysis of the 2014 drought for California agriculture*. Center for Watershed Sciences, University of California, Davis, California. 20p. Available at watershed.ucdavis.edu.

Hustedde, R. (2007). What's culture go to do with it? Strategies for strengthening an entrepreneurial culture. In N. Walzer (Ed.), *Entrepreneurship and Local Economic Development* (pp. 39–58). Lanham, MD: Lexington Books

Hyatt, H.R. and Spletzer, J.R. (2013). The recent decline in employment dynamics. Center for Economic Studies paper CES 13-03, U.S. Census Bureau.

Kania, J. and Kramer, M. (2011). Collective impact. *Stanford Social Innovation Review*, Winter 2011, 36-41.

Jesse, E. and Mitchell, B. (2014). Bringing back the milk: what's behind the turnaround in Wisconsin dairying? *Status of Wisconsin Agriculture 2014.* Department of Agricultural and Applied Economics, UW-Madison and Cooperative Extension, UW-Extension. Available at: www.aae.wisc.edu/pubs/status/docs/status2014.pdf.

King, R.P., Hand, M.S., DiGiacomo, G., Clancy, K., Gomez, M.I., Hardesty, S.D., Lev, L., McLaughlin, E. W., (2010). *Comparing the structure, size, and performance of local and mainstream food supply chains.* Economic Research Report Number 99. USDA Economic Research Service.

Low, S.A. and Vogel, S. (2011). *Direct and intermediated marketing of local foods in the United States*. Economic Research Report Number 128. USDA Economic Research Service.

Macke, D., Markley, D., and Fulwider, D. (2014) *Energizing entrepreneurial communities: a pathway to prosperity*. Lincoln, NE: Center for Rural Entrepreneurship.

Markley, D., Macke, D. and Luther, V.B. (2005). *Energizing entrepreneurs: charting a course for rural communities.* RUPRI Center for Rural Entrepreneurship and Heartland Center for Leadership Development.

Martinez, S., Hand, M., Da Pra, M., Pollack, S., Ralston, K., Smith, T., Vogel, S., Clark, S., Lohr, L., Low, S. and Newman, C. (2010). *Local food systems: concepts, impacts and issues*. Economic Research Report Number 97. USDA Economic Research Service.

McDonald, F., Huang, Q., Tsagdis, D. and Tüselmann, H.J. (2007). Is there evidence to support porter-type cluster policies? *Regional Studies*, 41(1), 39-49.

Minnesota IMPLAN Group. (2000). *IMPLAN professional data guide*.

Motoyama, Y. (2008). What was new about the cluster theory? What could it answer and what could it not answer? *Economic Development Quarterly*, 22(4), 353-363.

Ollinger, M., Nguyen, S.V., Blayney, D., Chambers, W. and Nelson, K. (2005). *Structural change in the meat, poultry, dairy and grain processing industries.* USDA Economic Research Report Number 3. USDA Economic Research Service.

Onozaka, Y., Nurse, G., McFadden, D.T. (2010). Local food consumers: how motivations and perceptions translate to buying behavior. *Choices*, 25(1).

Palazuelos, M. (2005). Clusters: myth or realistic ambition for policy-makers? *Local Economy*, 20(2): 131–140.

Porter, M.E. (2000). Location, competition, and economic development: local clusters in a global economy. Economic Development Quarterly, 14(1): 14-34.

Porter, M.E. (1998). *On competition*. Boston: Harvard Business School Press.

Rauch, A., and Frese, M. (2000). Psychological approaches to entrepreneurial success: a general model and an overview of findings. In C.L. Cooper & I.T. Robertson (Eds.), *International Review of Industrial and Organizational Psychology* (pp. 101-142). Chichester: Wiley.

Reid, N., Smith, B.W. and Carroll, M.C. (2008). Cluster regions: A social network perspective. *Economic Development Quarterly*, 22(4): 345-352.

Rosenfeld, S.A. (2001). Backing into clusters: retrofitting public policies. Presented at *Integration Pressures: Lessons from Around the World*. John F. Kennedy School Symposium, Harvard University, March 29-30, 2001.

Rosenfeld, S.A. (1997). Bringing business clusters into the mainstream of economic development. *European Planning Studies* 5(1): 3-23.

Shaffer, R., Deller, S., and Marcouiller, D. (2004). *Community economics: linking theory and practice*. Ames, IA: Blackwell Publishing.

Stephenson, M. and Cropp, B. (2014). Dairy overview. *Status of Wisconsin Agriculture 2014.* Department of Agricultural and Applied Economics, UW-Madison and Cooperative Extension, UW-Extension. Available at: www.aae.wisc.edu/pubs/status/docs/status2014.pdf.

Walzer, N., Athiyaman, A., and Hamm, G.F. (2007). Entrepreneurship and small business growth. In N. Walzer (Ed.), *Entrepreneurship and Local Economic Development* (pp. 59–80). Lanham, MD: Lexington Books.

USDA Economic Research Service. (2014). Organic market overview. Available at: www.ers.usda.gov/topics/natural-resources-environment/organic-agriculture/organic-market-overview.aspx

Woodward, D.P. (2012). Industry location, economic development incentives, and clusters. *The Review of Regional Studies*, 42(1), 5-23.

Yenerall, J. (2008). What entrepreneurs mean for your community, and how entrepreneurship can be fostered. *Rural Development Paper No. 40*. Northeast Regional Center for Rural Development, Pennsylvania State University.