FOOD LOGISTICS & TRANSPORTATION:
A SUSTAINABLE, REGIONAL APPROACH

LINDSEY DAY FARNSWORTH
UW-Madison Community & Regional Food Systems Project

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UW-Madison Community & Regional Food Systems Project
A 5-year USDA-funded research project working to identify the characteristics and functions of a healthy community and regional food system and how they contribute to increased community food security.

Center for Integrated Agricultural Systems (CIAS)
 Conducts applied participatory research how integrated agri-food systems can contribute to environmental, economic, social, and intergenerational sustainability.

Center for Freight Infrastructure Research & Education (CFIRE)
 Conducts research, education, and outreach to advance technology and expertise in the planning, design, construction & operation of sustainable freight transport systems.
Presentation overview

Planning context

- Regional food systems development as an integrated strategy: Economic development, Sustainability, Healthy food access

Regional food distribution system development

- An Upper Midwest Case Study

Preliminary findings from CFIRE & WI DOT Study

- Map commodity flow across highway segments
- Identify factors contributing to successful regional cold chains
Planning for the food supply

1900 - World War I:
Supplying increasingly dense urban markets

1923 - World War II:
Regionalization & technological advancements in food transport

World War II - early 1980s:
Nationalization of the food supply

1980s - early 2000s:
Globalization of food

Present:
Demand for local food and public health concerns now driving urban agriculture planning and a return to regionalization
The Demand for Local Food

Local food sales were estimated to be $4.8 billion in 2008 and were projected to climb to $7 billion in 2011.

Source: http://www.ers.usda.gov/media/138320/err128_reportsummary_1_.pdf
Number of Farms with Direct Sales per 10K Population 2007

Source: Brown, Deller and Haines
Good to Grow: Scaling Up a Midwest Regional Food System

0. Personal Production of Food
   - Backyard gardens, Community gardens, canning

1. Direct Producer to Consumer
   - Farmers' Markets, Farm stands, CSAs, Direct mail order

2. Strategic Partners in Supply Chain Relationships
   - Willy St. Co-op, Country Natural Beef, Shepherd's Grain, Red Tomato

3. Large Volume Aggregation & Distribution
   - Sysco, Goodness Greenness, Reinart

4. Global Anonymous Aggregation & Distribution
   - ADM, Unilever, Cargill, Ajinomoto

Tiers of a Food System
Source: Jim Bower, Blue Planet Partners; Ron Doetch, Michael Fields Agricultural Institute; Steve Stevenson, Center for Integrated Agricultural Systems–University of Wisconsin
The Potential of Regional Food Systems

The development of more robust regional food systems has the potential to contribute to:

- Sustainability
- Economic development
- Improved access to healthy food
  - Rural
  - Urban
Sustainability

More than food miles

- Local supply generally higher per unit costs
- Longer movements offer higher profit/mile due to lower average costs

“When food miles are small, product aggregation to achieve large load sizes and logistical efficiencies can yield highly fuel-efficient distribution systems.”

Other factors

- Production practices (IPM, organic)
- Labor standards
- Packaging

Because local food isn’t necessarily more sustainable, it pays to know the agricultural profile of your region:

- WI has the 2nd largest number of organic farms in the U.S.
- WI ranks 1st in the US for its number of organic dairy and beef farms, 3rd for organic vegetable farms.

Source: King et al., CIAS
Number of farms with organic production, 2007

Source: Brown, Deller and Haines
Economic development

• Better prices for farmers

• Development of related industries
  • Processing
  • Culinary & agri-tourism
  • Logistics

“Although farms in direct market supply chains retain nearly 100 percent of the retail price, costs incurred to bring their product to market total between 13 and 62 percent of the retail price.”

- King et al., p.68
Increased access to fresh fruits & vegetables

Local foods sold through direct-to-consumer and intermediated channels, grossed $4.8 billion in 2008—about four times higher than estimates of direct-to-consumer sales alone.

Challenges:
- About 1/3 of adult Americans consume the recommended daily portion of fruits or vegetables
- About 1 in 6 Americans is food insecure
- 29.7 million people in the US live in low-income areas more than 1 mile from a supermarket

Solutions:
- Double Up Food Bucks Programs at farmers markets
- Farm to institution
- Increase availability of fresh and/or locally sourced product in grocery stores & corner stores

Sources: Nord et al., King et al., Low and Vogel.
Regional Food Distribution: Challenges & Opportunities

Aggregation
- Sourcing from small-mid size farms requires new aggregation strategies to:
  - Supply high-volume regional markets
  - Diversify product lines

Transportation & logistics
- Inefficiencies associated with the “first and last mile”
- Transaction cost of product changing hands multiple times
- Variability of load size due to seasonality, production volume
- Strategic location decisions for food hubs and distribution centers

Transparency across the food supply chain
- Food safety
- Marketing value
  - Consumers want to know where their food comes from
  - Source-identified foods can capture premiums for farmers
Solutions

Aggregation
- Food hubs
- Food Innovation Districts

Transportation & Logistics
- Physical infrastructure
  - Research to identify hauling needs, capacity & economics
  - Research to inform location decisions for food hubs & DCs
- Building relationships
  - Develop regional marketing organization
  - Engage regional planning and intergovernmental organizations

Transparency across the supply chain
- New approaches to supply chain governance
- Technologies (e.g. RFID, QR Codes)
- Telling the story of product – “food with a face”
Networking Across the Supply Chain
February 20-21, 2013
La Crosse, Wisconsin

Transportation Services Division
Agricultural Marketing Service
U.S. Department of Agriculture

This Project is supported by Cooperative Agreement No. 12-25-A-5639 between the Agricultural Marketing Service/USDA and the Center for Integrated Agriculture at the University of Wisconsin-Madison.
direct sales
(farmers market, CSA, farm stand)

varietal selection, harvest approach
production assistance for IPM, organic

vegetable production

breeding, production research

technical assistance

midwest consumer spends an average of $85/wk on retail food purchases

varietal selection, harvest approach

on-farm processed

fresh

wholesale processed

dried (chipped, powdered)
canned
frozen
distributor warehouse

packing house/storage

self-distributed retailers

regional retails (11-100 stores)

independent retails (1-10 stores)

chains (100+ stores)

restaurants

direct consumer feedback

85% self-distributed

21 chains in midwest, carry more private label

institutions - schools, hospitals, hotels, restaurant chains

85% self-distributed retailers

retails

retails

retails

retails

retails

retails

retails

retails

retails
**Wholesale Market Segmentation**

- Red = institutional market
- Green = grocery
- Blue = restaurant

- Megabox
- Fast food
- Private cafeteria
- Gourmet retail
- White table cloth restaurants
- Meal service
- Grow your own resources
Why this meeting?
Critical link between producers and consumers of food:

Source: USDA-AMS, Study of Rural Transportation Issues www.ams.usda.gov/RuralTransportationStudy
(maps of rail and waterway systems are available in Chapter 2)
What is the whole under management?
The Driftless Area is a unique region in the Upper Mississippi River Basin encompassing southwestern Minnesota, southwestern Wisconsin, northeast Iowa, and a part of northwestern Illinois. The glacial history of the Midwest bypassed the Driftless Area, giving rivers time to cut down into ancient bedrock and create distinctive landforms. Many of the soils that cover the steep slopes are fragile, ecosystems are diverse, and most of the cold-water streams and rivers are recognized on a state and national basis for their economic, environmental, and recreational importance.
Diversity and resilience in the food system

- Food economies based on regions can create a more resilient food system through redundancy
- Complex systems are more resilient than simple systems
- Diversity contributes to complexity
- The “edge effect” applies to food and economy
innovative+authentic+sustainable
What is the emerging story of this region?

- Who is creating and telling the story? Who is listening?
- How are urban markets driving innovation?
- How are the people in the production region interpreting innovations?
- Who pays for change?
- Who profits from change?
Standard civic engagement approach
The Driftless Bioregion & Sustainable Agriculture

High-value perennial crops

- Apples, especially identified by variety, farm
- Wine grapes with a strong tourism association
- Aronia and other berries
- Hazelnuts
- Wildcrafted mushrooms, fish, game
- Pastures for animal habitat
  - Farm animals, pollinators, wild game

Value-added options

- Organically grown
  - Organic Valley
- Grass-fed, humanly treated livestock
- Artisan sausages
  - Brats, hazelnut finished pork
- Grass-fed dairy
- Artisan cheeses
  - Raw milk cheeses
- Processed fruits and vegetables
  - wine, jams, fruit for yogurt, etc.
- Baked goods from local products
- Wildcrafting
  - Maple syrup, smoked fish, herbal preparations
Rural Economic Development Potential of Food Supply Chain

- Farmers markets
  - Low economic impact
  - High educational / authenticity potential
  - Critical market scale for beginning farmers

- Regional markets
  - Aggregate or be aggregated
  - Warehousing, processing, marketing
  - Calling card for tourism, Farm-to-School

- Artisan markets
  - High-value crafted food for up-scale urban consumer

- Agro- and culinary tourism
Number of food processors
Power dynamic

- City dwellers are the market.
- Rural landscapes and communities produce food.
- Is the relationship equitable?
Number of Vegetable, Melon, and Potato Farms per 10K Population, 2007
Number of Fruit, Nuts, and Berry Farms per 10K Population, 2007
Emerging ideas from LaCrosse

• What is local?

• Consumers and their wholesale buyers looking for authenticity and story.

• Sustainability is at the heart of “local” – distance to market is not necessarily the best measure.

• Why is Chicago market nascent and Twin Cities market thriving?

• Logistics drives infrastructure development – now is the time to incorporate changing logistics into mid-range planning work.

• Relationships drive logistics – need for opportunities to develop regional relationships.
Emerging ideas from LaCrosse

• Competing goals – reduce transactional costs AND increase transaction quality and quantity.
• Food pantry leadership reassessing their approach to address the fundamental obstacles to food access – distribution key.
• Diversity of wholesale buyers each with their own needs and contributions – white tablecloth restaurants to institutional buyers.
• Regional food distribution requires more attention to the First/Last Mile transportation issues.
Regional Cold Chain Analysis: Research Questions

- Is the Circle City becoming self-sufficient in its food system?

- How much product does the Driftless Area contribute to this system?

- What can be done to ensure transportation & logistics sustainability on a regional level?
Driftless Area is at the heart of the Circle City.
Methods of Study

• Analyze cold chain commodities transported from Wisconsin Driftless-Origins to MSA-Destinations using TRANSEARCH

• Map commodity flow across highway segments

• Identify factors that contribute to successful regional cold chain transportation across the supply chain
TRANSEARCH

- Survey-based origin/destination commodity flow database
  - Commodity Flow Survey (CFS)
  - Bureau of Economic Analysis (BEA)
  - US Department of Agriculture (USDA) production/distribution data

- Groups commodities using Standard Transportation Commodity Codes (STCC)

- Provides commodity flows across all four modes
  - Truckload flows modeled on a county-to-county basis
## Dairy Farm Products & Cheese/Special Dairy Products

*Truckload Tons Originating from the Driftless Wisconsin Counties*

<table>
<thead>
<tr>
<th>MSA Destinations</th>
<th>ALL MSAs</th>
<th>CHICAGO (Pop: 9.5 mil)</th>
<th>TWIN CITIES (Pop: 3.2 mil)</th>
<th>LOS ANGELES (Pop: 13 mil)</th>
<th>NEW YORK (Pop: 18.8 mil)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy Farm Products, unprocessed</td>
<td>294,162</td>
<td>61,287 (20.8%)</td>
<td>72,205 (24.5%)</td>
<td>23 (&lt;0.1%)</td>
<td>0</td>
</tr>
<tr>
<td>Cheese &amp; Special Dairy Products</td>
<td>100,050</td>
<td>1,524 (1.5%)</td>
<td>17,409 (17.4%)</td>
<td>0</td>
<td>774 (&lt;0.1%)</td>
</tr>
</tbody>
</table>

Sources: U.S. Census Bureau 2007, TRANSEARCH Database 2007
Dairy Farm Products & Cheese/Special Dairy Products

Share of Driftless Commodities Consumed by MSAs (% Truckload Tons)

Driftless Dairy Farm Products

- Chicago: 20.8%
- Twin Cities: 24.5%
- Los Angeles: 54.6%
- New York: 1.5%
- Other MSAs: 81.0%

Driftless Cheese/Special Dairy Products

- Chicago: 1.5%
- Twin Cities: 17.4%
- Los Angeles: 81.0%
- New York: 1.5%
- Other MSAs: 1.5%
Commodity Flow of Driftless Products

Dairy Farm Products

Originating Truckload Tons from Driftless WI

- 0
- Less than 10,000
- 10,000 to 50,000
- More than 50,000

Cheese & Special Dairy

Originating Truckload Tons from Driftless WI

- 0
- Less than 50,000
- 50,000 to 100,000
- More than 100,000

Source: TRANSEARCH Database 2007
# Meat Commodities

*Truckload Tons Originating from the Driftless Wisconsin Counties*

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<th>MSA Destinations</th>
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<tr>
<td>Fresh, Chilled Meat</td>
<td>14,421</td>
<td>148 (1%)</td>
<td>2 (&lt;0.1%)</td>
<td>1,077 (7.5%)</td>
<td>1,875 (13%)</td>
</tr>
<tr>
<td>Fresh, Frozen Meat</td>
<td>11,936</td>
<td>151 (1.3%)</td>
<td>2 (&lt;0.1%)</td>
<td>700 (5.9%)</td>
<td>1,636 (13.7%)</td>
</tr>
<tr>
<td>Meat Products</td>
<td>67,579</td>
<td>0</td>
<td>1,135 (1.7%)</td>
<td>19,676 (29%)</td>
<td>6,411 (9.5%)</td>
</tr>
</tbody>
</table>

Sources: U.S. Census Bureau 2007, TRANSEARCH Database 2007
Meat Commodities

Share of Driftless Commodities Consumed by MSAs (% Truckload Tons)

Driftless Fresh, Chilled Meat
- 1.0%
- 7.5%
- 13.0%
- 78.4%

Driftless Fresh, Frozen Products
- 1.3%
- 5.9%
- 13.7%
- 79.0%

Driftless Meat Products
- 1.7%
- 29.0%
- 9.5%
- 59.8%
Commodity Flow of Driftless Products

**Fresh, Chilled Meat**

- Originating Truckload Tons from Driftless WI
  - 0
  - Less than 1,000
  - 1,000 to 5,000
  - More than 5,000

**Meat Products**

- Originating Truckload Tons from Driftless WI
  - 0
  - Less than 5,000
  - 5,000 to 15,000
  - More than 15,000

Source: TRANSEARCH Database 2007
Factors to Improve Transport Logistics

- Packing Methods & Refrigeration Standards

- Mixed Load Compatibilities

55-65°F

85-95%

No pineapple w/avocado

No ice contact

Rel. Humidity N/A

Avocados  Olives
Bananas  Papayas
Eggplant  Limes
Grapefruit  Guava
Pineapples  Mangoes
Tomatoes  Watermelons
Muskmelons

United States Department of Agriculture

Protecting Perishable Foods
During Transport by Truck

Handbook Number 919
September 1995
Reprinted July 2006
Factors to Improve Transport Logistics

- Reducing empty backhaul
- Available Infrastructure
- Federal & State DOT Coordination on Freight Policy & Regulation
  - MAP-21 implications on food transport
  - National Freight Advisory Committee

Photo Credits (left to right): shipwatchers.com, freighttruck.org, blogs.usda.gov,
Final Thoughts

Aggregation
- Food hubs
- Food Innovation Districts

Transportation & Logistics
- Physical infrastructure
  - Research to identify hauling needs, capacity & economics
  - Research to inform location decisions for food hubs & DCs
- Building relationships
  - Develop regional marketing organization
  - Engage regional planning and intergovernmental organizations

Transparency across the supply chain
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- Technologies (e.g. RFID, QR Codes)
- Telling the story of product – “food with a face”
Sources & Resources

- TRANSEARCH Database 2007 (courtesy of WisDOT).
Questions?

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