Innovations in Logistics

Innovations in the Food System: Shaping the Future of Food, a Food Forum Workshop
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Moving food to people and moving people to food

- 1960s – distribution heyday
- 1970s – fuel price volatility
- 1980s – shake up in the labor market; privatizing supply chains
- 1990s – Big Box and the rise of logistics
- 2000s – consolidation and access issues
- 2010s – climate volatility


Concentration and Power in the Food System Howard, P. 2017. London: Bloomsbury Academic

A Framework for Assessing Effects of the Food System


The Dynamics of Change in the US Food Marketing Environment Tropp, D. 2008. USDA-AMS Agriculture Handbook 728-3


CAS: The role of certainty (volatility mgt) and agreement (trust/control) in a dynamic system
CAS: System Characteristics Necessary for Adaptation and Evolution

- Diversity
- Flow
- Non-linearity
- Aggregation


**A Framework for Assessing Effects of the Food System**


“Metropolitan foodsheds: a resilient response to the climate change challenge?”


**Diversity Flow Non-linearity Aggregation**

- To lessen seasonal volatility, fruit and vegetable production moved to “Fruitful Rim”
- Oversimplified, highly efficient production & distribution systems are creating unintended environmental disruptions
- Optimizing diversity in products and supply chain ownership at multiple scales and parts of the food system is critical for resiliency


Systems Thinking for Social Change Stroh 2015 Chelsea Green

Diversity Food Flow Non-linearity Aggregation

- Regional flow is insufficiently organized
- Chicago is the epicenter for private food warehousing
- Last-mile *public* terminals are critical for smaller supply chains
- *Logistics for small supply chains are underdeveloped, lack analytics*
“Environmental and economic impacts of localizing food systems: the case of dairy supply chains in the Northeastern US”


“Design of a Logistics Nonlinear System for a Complex, Multiechelon, Supply Chain Network with Uncertain Demands”

Diversity Flow Non-linear supply chains Aggregation

• Temporal -- seasonal production
• Geographic – route
• Longer chains = bullwhip effect = need for higher “agreement”
• Agreement through trust, communication, reduced risk, vertical integration (ownership of supply chain capital)
Regional Food Freight: Lessons from the Chicago Region


Diversity Flow Non-linearity
Aggregation critical thresholds

First Mile Trip Segment
- Distance to aggregation, processing
- Is this a point of sale?

Over-the-Road /Regional Trip Segment
- Distance to wholesale market
- Access to transportation
- Tractor-trailer efficiencies
- Sufficient single product load (interregional) & diversity of product (intraregional)

Last Mile Trip Segment
- Access to cold storage warehousing
- Truck size
- Traffic congestion
- Increasing to serve e-commerce
- Single point of pick up – Click and Collect
- Who pays to move food – consumer, wholesale buyer, seller
The supply chain – first to last mile
Public food procurement – promoting population health, food security and ecosystem resilience. 2019 Session at the Royal Geographic Society – Institute of British Geographers, Annual International Conference.


Technological responses
Organizational responses
Ecological responses
Sustainability as an emergent property

- Economically viable
- Socially acceptable
- Environmentally sound
Sustainability redefined

- Environmentally sound
- Socially acceptable
- Economically viable
- Eco-regionally appropriate
- Supports health and well-being
- Promotes community
Barriers to innovation

Human organization
- Scale disconnect
- Ownership
- Sharing risk and reward
- Underdeveloped governance
- Reduced market access

Technology
- Scale disconnect
- Ownership
- Sharing risk and reward
- Underdeveloped governance
- Technology access
- Data overload

Regional food freight: lessons from the Chicago region
Miller et.al. 2016. USDA-NIFA project report

Internet of Food and Farm 2020
Sundmaeker et.al. 2011. Wageningen University and Research
https://www.iof2020.eu/

“Let them eat kale: the misplaced narrative of food access”

“GPS in Interstate Trucking in Australia: Intelligence, Surveillance, or Compliance Tool?”
Organizational innovations – to increase agreement

Regionalization: System redesign to address market and food access, reduce waste & energy consumption
- Agroecology, agency, ownership
- Return of regional freight
- Public food terminals
- Stakeholder governance

Open source
- Compatible platforms
- Global standards

Connectivity
- Rural broadband

Regional food freight: lessons from the Chicago region Miller et.al. 2016. USDA-NIFA project report

“New Thinking on Regional”
Clancy, K., Ruhf, K. 2018. JAFSD Vol 8, Issue 3

Agroecological and other innovative approaches for sustainable agriculture and food systems that enhance food security and nutrition.
Technological innovations- to reduce uncertainty

Machine learning
• Algorithms to understand production volatility
• Also applied at the supply chain scale

Distributed ledgers
• Assist with supply chain information flow & transparency
• Distributed storage & processing of big data

Multi-tenant apps
• Many supply chains sharing software and server
• Critical for cold chains
Technological innovations – to reduce uncertainty

Digital twins
• Product can be monitored, controlled, planned and optimized remotely
• Real-time virtual rather than on-site observation

Engine innovations
• Hybrid-electric & renewables
• Vehicle specialization

Telematics
• GPS asset tracking
• Load matching systems

Automated material handling
• Response to low labor availability
• Need to improve fulfillment requirements


Madison Terminal Market Study. Gottwals 2019. City of Madison, WI

“Food waste prevent in Europe – A cause-driven approach to indentify the most relevant leverage points for action” Priefer et al. 2016 Resources, Conservation and Recycling Vol 109
CR England trajectory

- North America’s largest wholesale cold chain
- Founded in 1920 as regional food carrier in UT
- First reefer in 1950
- 1960 1st cross country runs to public food terminal
- 1978 opened 1st DC in NJ
- 2015 also in CA, IN, TX
- 2016 LA dropyard to separate duty cycles, improve last mile
- EPA SmartWay awardee
- Run efficiencies shared with client

CR England Company History
http://www.crengland.com/about-us/company-information/company-history

SmartWay Excellence Awards
USEPA 2015.
https://nepis.epa.gov/exe/Zy
Wage rates as a leverage point for transportation labor

Diagram showing the interrelations between various factors such as cost to shipper, customer service expectations, recruiting and training costs, insurance costs, accidents, driver turnover, delivery uncertainty, pressure to hurry, time to delivery, traffic congestion, wages (mi/hr), and vehicles on the road.
Food Sovereignty & the Ontario Food Terminal
Farmers make money in wholesale markets

- Too small – too diverse and operating under economic thresholds
- Too big – too efficient and operating beyond environmental limits
- Just right – serving regional markets

Regional market requirements

- Within 200 miles/four hours of a single drop point
- Enough production to fill 53’ trucks
- Affordable cold storage space
- Enough production diversity for healthy soil
- Enough efficiency to streamline farm labor
- Partner with 12 month supply

“The financial performance implications of differential marketing strategies: exploring farms that pursue local markets as a core competitive advantage”.
Thilmany, McFadden, Bauman and Jablonski, 2016. Presented at the 153th Congress of the European Association of Agricultural Economists, Gaeta, Italy

Regional food freight: lessons from the Chicago region Miller et.al. 2016. USDA-NIFA project report
Truckers, wholesale buyers must make money

- Regular hauling and buying contracts
- Full trucks
- 1-day runs (no overnights)
- One point of delivery
- Anticipated, minimal road congestion
- Trip-segment (duty cycle) specific engineering
- Affordable cold storage space
- 1-truck delivery to buyer
- Wholesale B-B market within 50mi of retail buyers
Systemic change to improve food access

• Food is a right, not a privilege. Physical and economic access is a public good.

• Increase the food flow first, then neighborhood groceries will emerge, not the other way around. Avoid gentrification by creating means for ownership.

• Food terminals are a public utility. If the private sector is not meeting the needs of small wholesale supply chains and independent business ownership, then there is a need for a public terminal.

• Terminal design must hold space for businesses of all sizes, and improve last mile and region-to-region freight movements.

• Terminals give access to high-tech innovations and logistics improvements for independent businesses.

• Terminals need to optimize energy efficiency (esp refrigeration) and product diversity.

• Terminals need a governance structure that protects the public interest in food, decent work, environmental protections, and gives users a stake in facilities management.
Logistics in the public interest

• Detailed, dynamic understanding of food flow at national and regional levels

• Algorithms for seasonal logistics accessible to small business collaborations

• Drive time data analysis accessible to small, independent, regional fleets

• Food access emergency planning data

• Regional systems designs for improved food access within cities and rural areas under anticipated climate scenarios

• Support for USDA(AMS, ERS, NIFA) to collect and analyze relevant data and assist with infrastructure development

• Public policies that support civic interest in resilient food supply chains
Thank you.

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