The actual cost of food systems on roadway infrastructure

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Abstract
The variations among transportation costs for local, regional and conventional food production and distribution systems were investigated for three Iowa counties.

Keywords
Center for Transportation Research and Education, Architecture, Economic and environmental impacts, Food miles food pathways food system assessments, Models and assessment tools

Disciplines
Architecture | Construction Engineering | Operations and Supply Chain Management | Statistical Models

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The actual cost of food systems on roadway infrastructure

What is the true cost of moving food products on the highway system, including transportation, environmental, safety, and pavement maintenance and deterioration costs?

The research used existing tools and data to answer the question. The Highway Economic Requirements System (HERS-ST) was used to calculate some of the above costs.

Background

This project was designed to provide added insight into the infrastructure challenges of agricultural enterprises in Iowa and also to facilitate the understanding needed to implement broader energy-related policy and planning for food systems.

Specifically, this research effort focused on these objectives:

- Capitalize on current research efforts to develop a systematic methodology for estimating the actual cost of moving food produce from farm to market including: environment (carbon emissions and air quality); infrastructure; energy (fuel); congestion; safety; and user (taxpayer) costs. Use data on the highway system (roads and bridges) from the Iowa Department of Transportation (DOT) to test the methodology.
- Estimate the impact of local, regional and conventional food systems (using truck and vehicle size as a measure) on roadway infrastructure. Correlate impacts to road costs; then develop comparisons using distance as a variable.

The impact of the local food system will be estimated by using case studies in Story, Adams and Taylor counties. The regional and conventional food systems are estimated based on statewide food freight data. The impacts will be correlated to external cost of the distribution of the food system, such as emissions, congestion, safety, and pavement deterioration costs.

Approach and methods

This project used current research to develop a systematic methodology for estimating the actual cost of moving food produce from farm to market. To calculate these costs, three types of data were used: the weight of the food being moved, how far the food is being moved, and how the food is being moved.

For this study, the research team defined a local food system as a countywide system, a regional food system as food produced and consumed in Iowa, and a conventional system as food produced in other states and consumed in Iowa. The team also looked at vehicle miles traveled and the type of vehicles used to transport the produce.
To estimate the impact of local, regional and conventional food systems, the study used three types of data to estimate food freight:
- Food freight data from the Commodity Flow Survey,
- Local consumption data from the U.S. Food Market Estimator, and
- Local consumption data from a fresh fruit and vegetable survey in select counties.

Results and discussion

The volume of trucks moving food freight in Iowa increased 5 percent between 2002 and 2008, and is expected to increase more than 80 percent by 2035. Understandably, the external costs (such as emissions, congestion safety and pavement usage) are slated to increase proportionally with the increase in truck traffic. The external costs of moving food on the conventional and regional food systems far surpass the total revenue the state brings in for transportation-related programs, so much that, at the current levels, it cannot even support pavement maintenance.

Based on the available data, the regional food system moves more freight in terms of weight than the conventional, due to the fact that data did not track the freight that passes through the state. In any case, encouraging the development of a regional food system will not do much to change the food freight trend. Currently, the cost for moving fresh fruits and vegetables within Iowa comes to a staggering $76 per pound compared to 97 cents for Story County and 14 cents each for Adam and Taylor counties. This price tag is not accounted for when the consumer checks out at the grocery stores.

The study of local food systems for the three counties (Story, Adams and Taylor) demonstrated that areas remote from a major highway and with a low population density are more likely to develop local food systems to supply their demand. Having the big grocery stores represented in these remote areas is not feasible. Because of the relatively small demand, it will be too difficult to generate enough vehicle miles traveled to make it economically viable.

Conclusions

The case for encouraging a local food system has much to do with reducing the distance food travels. The shorter distance makes it feasible to move the food with a lighter-weight vehicle that has negligible impact on the pavement, compared to the semi-trailers that dominate the state’s highways with long-distance deliveries.

The emissions costs capture the cost to the environment of carbon monoxide (CO), sulfur oxides (SOx), nitrogen oxides (NOx), and particulate matter less than 2.5 microns in diameter (PM2.5), ground level of ozone (formed by the nitrogen oxides combining in the atmosphere under certain conditions with chemical compounds emitted by motor vehicles among other sources), and atmospheric levels of airborne dust, another pollutant that can be harmful to human health and property when it reaches certain concentrations, caused by the contact of moving vehicles’ tires with road pavement surfaces.
In the local food systems in Adams and Taylor Counties, the farmers’ markets and roadside vendors help to meet the fresh fruit and vegetable demand in these rural counties. In contrast, Story County is close to a major highway and the Interstate system for supplying its fresh fruits and vegetables demand. Therefore, in more urban counties such as Story County, making a case for local food will depend strongly on citing the external costs of transportation. With local food systems, the external costs of transportation are very low compared to the regional and conventional food systems.

In addition, dependence on the conventional food system has a stark disadvantage for the urban areas, as it tends to create food deserts when one group is cut off, disadvantaged by income or access to public transportation. On the other hand, developing a local food system close to the urban counties does have huge economic benefits for the state, as more and more people are deeply interested in where their food comes from, and other studies have shown that consumers are willing to pay more for locally-grown fruits and vegetables.

**Impact of results**

The research team was able to estimate the external costs associated with local, regional and conventional food systems on the roadway infrastructure. Based on the data available, using distance as a variable was not feasible, but the project shows the lack of sustainability for conventional and regional food systems and provides adequate information and background to begin a serious policy discussion on road-use costs in the state.

This information can be used by the farmers and farmers’ networks, consumers, media, policymakers, and the food industry, including producer associations, processors, and food services companies, as well as academia, to provide constructive feedback as the policy discussion unfolds.

**Education and outreach**

The project was presented at a session of the 2009 Mid-Continent Transportation Research Symposium, August 20-21, 2009. The symposium attracted more than 270 people from transportation agencies in the Midwest and around the country; 25 to 35 people attended this session. At the Leopold Center Marketing and Food Systems Initiative and Value Chain Partnerships Workshop, April 1, 2010, 30 to 40 attended the session explaining this project.

**Leveraged funds**

No additional funds were leveraged by this project.