



Government & Public Affairs Division

Policy Research Paper

Follow That French Fry: Food Miles and Roadway Damage

Contributors:

Gretchen Stoeltje

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125 East 11th Street
Austin, Texas 78701
512-463-6086
512-463-9389 fax
www.TxDOT.gov

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How Much Road Do We Chew Up When We Eat?

See that shiny, red apple on your table? Do you know what it cost? You may know what you paid for it at the store, but the full cost of transporting a simple piece of fruit from the orchard to your home includes other intangibles not reflected in the retail price, like the distance food travels and the external costs of that journey. Food Miles is the name of a new set of metrics designed to measure – and potentially help us manage – the impact of those intangibles. Recently, thanks to a spate of news stories about global warming and tainted food products from China, consumers and others are starting to ask questions about the real costs of common foods. Parents, health officials, and anyone anxious to avoid unsafe food are concerned about contaminated imports and the government's inability to track them. Environmentalists concerned about the emissions levels from long distance food transport have raised questions about their impact on air quality. Even major investment bankers convinced that we have exhausted our oil supplies warn that we must abandon our oil-dependent food transport system. The transportation sector, and the taxpayers who pay for it, have not yet started asking tough questions about the real costs of food transport. But with growing concerns about our decaying interstates – and the long, hard miles traveled by staples such as french fries, fruits and grains — it's time we start.

Consider: Most food in the United States travels a very long way from its point of origin to its point of consumption — some 1,500 miles, on average¹ — typically in trucks that can each cause the same amount of roadway damage as 9,600 cars.² But a recent Iowa study found that foods grown in-state only traveled 56 miles from Iowa farmer to Iowa consumer.³ Are all these extra miles necessary? What is their true cost? And what can we eat or not eat to reduce the demand for, and damage to, our roads? At another time and place, these questions might not seem so pressing. But today, we are in the midst of an escalating national mobility crisis. The Highway Trust Fund is set to run dry in 2009;⁴ Congress and most states have declined to raise the gas tax



since the early 1990s,⁵ and our transportation network is falling apart.⁶ If the need for infrastructure maintenance wasn't glaringly apparent before, the collapse of the I-35W bridge in Minneapolis last summer should have brought it into clear focus. According to the National Conference of State Legislatures, we are facing a transportation funding gap which, by 2015, could be as wide as \$1,000,000,000,000 (1 trillion dollars).⁷ Given this alarming state of affairs, policy makers and consumers alike might want to consider innovative solutions, like the evaluation and management of food miles that can help us preserve our nation's aging roadways.

Do the Math: What's in a Food Mile?

Food miles researchers measure the external costs, or externalities, of long distance food transport. Externalities are the costs of a process borne by society as a whole and not borne by the transport user or operator.⁸ Roadway wear and tear is one example of a food transport externality. Others include congestion, carbon emissions, compromised roadway safety, and ailing local agricultural economies. A food miles study can measure these external costs, driven by such pointed questions as: How much congestion could we reduce? How much time and money could we save? How much could we reduce polluting emissions? How much economic opportunity could we create? What might we lose? And what might we gain by changing our food transport system?

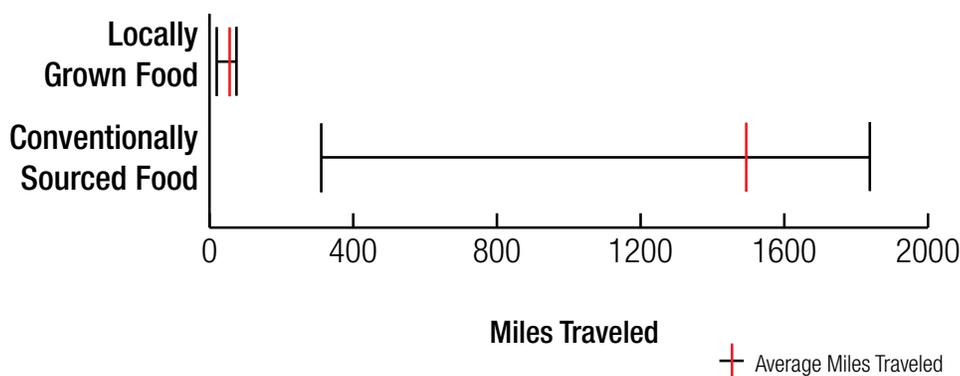
Researchers in England, Canada, and Iowa, have asked and answered some of these questions in recent food miles studies. In Britain, the amount of food moved by Heavy Goods Vehicles (HGVs) has increased 23% since 1978 so that food transport now constitutes 25% of HGV

traffic in the UK, costing over £9 billion each year in congestion-dominated environmental, social and economic costs.⁹ The Department of the Environment, Food and Rural Affairs (Defra) measured food transport's share of congestion, infrastructure damage, accidents, carbon dioxide emissions, bad air quality, and noise and found that a combination of six different solutions could result in a 17.3% reduction in the cost of domestic food transport externalities.¹⁰

Canadian researchers at the Region of Waterloo Public Health Department in Ontario measured the distances traveled by imported food, all of which could be grown or raised in the Waterloo Region, as well as the greenhouse gas emissions resulting from the transport of this imported food. The results showed that replacing the studied food items with locally produced equivalents would annually reduce greenhouse gas emissions by 49,485 metric tonnes, the equivalent of taking 16,191 cars off the roads.¹¹

And in the US, the Leopold Center for Sustainable Agriculture at Iowa State University has produced several studies measuring a number of different external costs. In one, researchers examined three levels of food transportation systems: the conventional system using large semitrailer trucks; Iowa-based regional systems, using large semitrailer and midsize trucks; and local systems, using small light trucks. This study found that conventionally sourced and transported food in the United States traveled 1,518 miles to reach the table in 1998, a 22% increase since 1981.¹² In July 2003 a second Leopold Center study of food miles compared the distance that 16 different produce items traveled to an institutional market, both when grown close to home, and when

grown elsewhere in the United States and transported to Iowa conventionally. The locally grown food traveled an average of 56 miles (between 20 and 75), while conventionally sourced food traveled an average of 1,494 miles (between 311 and 1,838) before they reached market.¹³



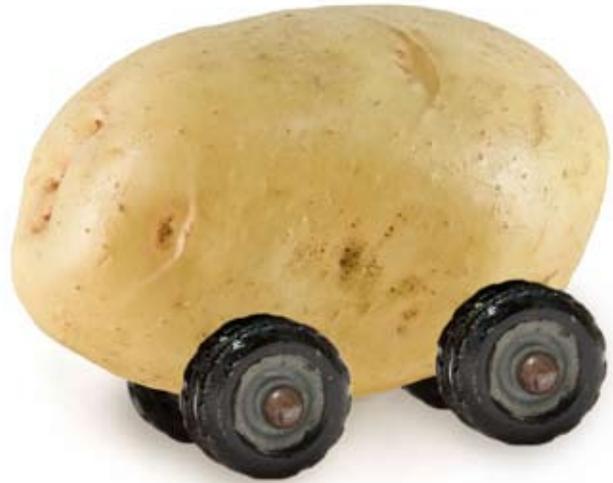
Miles traveled: locally sourced vs. conventionally sourced food

These studies offer compelling evidence that reducing even some of our food miles is not only possible but possibly beneficial to congestion relief, air quality improvement and roadway safety enhancement efforts. What most food miles studies did not calculate – but that other researchers could – is the number of roadway miles that would be preserved by reducing conventional food transport or the amount of roadway that could be funded and maintained by charging consumers the true cost to transport their food.

You Mean My Roads Aren't Immortal?

Transportation systems, especially roads, are easily taken for granted because they seem so permanent, and they always seem to work – until one day, they just don't. Americans have rarely been forced to collectively recognize the mortality of our roads because we only began building them, on a national scale in 1956.¹⁴ So we are only now learning what happens when aging transportation systems begin to fail and what it costs to replace them. Roadway maintenance in the US, like new construction, is a hidden but nevertheless real cost that citizens pay in part when they purchase gasoline or pay a vehicle registration fee, but never see itemized on any bill. Not so hard to see are the costs the traveling public pays for ailing roads in the form of increased car care. A 2008 report by TRIP, a Washington D.C.-based, national transportation research group, found that the average American motorist pays an additional \$413.00 annually for additional vehicle maintenance needs and increased fuel consumption caused by driving on poorly maintained roads.¹⁵

Food makes up a significant portion of roadway freight. In Texas alone, a 2006 measure of roadway freight showed that 26% of all trucks hauling freight to, from and within the state bore food.¹⁶ The United States Department of Transportation expects that number to increase to 29% by the year 2035.¹⁷ Moreover, these trucks do not pay their share of highway costs in proportion to the damage they cause. The Federal Highway Administration finds that cars typically pay their share of highway costs, and that pickups and vans typically pay more than their share of highway costs. But according to American Association of State Highway and Transit Officials, the extra weight borne by freight hauling vehicles, typically single-unit trucks and combination trucks, imposes the



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same amount of roadway damage as 9,600 cars,¹⁸ yet those trucks only pay between 60% and 90% of their share of highway costs.¹⁹ So from a transportation perspective, reducing the number of food-bearing trucks or funding those that continue to use our roads could start to look like serious roadway preservation.

Travels with Twinkie: Processed Food Miles

Processed foods are super globe-trotters and travel many more miles than fresh food. So roads take a greater beating from, say, a french fry than they do from a carrot. And though processed food may be cheaply priced and convenient, it may not merit the energy used to move it or our financial commitment to it. Eric Schlosser's best-seller *Fast Food Nation*, revealed that Americans spend about 90% of their food budgets on processed foods.²⁰ However processed food, as opposed to fresh food, requires many more miles traveled in the processing than simply the distance between where it is grown and where it gets consumed. All of the separate components of any one processed food product must be manufactured and transported, and not always to or from the

same locations. Schlosser's description of the life cycle of a typical potato used in the fast food industry makes this point. Grown in Idaho, the potato will be transported from field to processing plant, perhaps in Idaho, perhaps not. There it will be sliced, diced and infused with chemically manufactured smells and flavors (produced in New Jersey), and preservatives, (so that it is safe and palatable after its many weeks-long journey from farm to fork), before being packaged and shipped to fast food restaurants and grocery stores across the country as a frozen french fry.²¹

Some foods actually criss-cross the globe for processing or packaging before they return home for local sale. In the British Isles, for example, Scottish prawns are shipped to China to be hand-shelled, then shipped back to Scotland where they are breaded and then sold.²² Haddock, caught by British trawlers in the Atlantic, goes to Poland for processing, and then back to Britain for sale.²³ Welsh cockles find their way to Holland to be pickled and canned before winding up on British super market shelves.²⁴ There is no doubt that, if packaged in Britain, British seafood would be more expensive because British labor is more expensive than Chinese or Dutch labor.²⁵ However, globe-trotting, cheap food isn't really cheap. We just don't see the full costs on food price tags because some of those costs we pay at the gas pump.

How Much Did That Burger Really Cost?

Lost Economic Opportunities

We also pay for cheap food in the form of economic loss to our local agricultural economy. "Get the Farmer Out of the Mud" was the slogan of the early nation-wide push to get farm goods to market, known in Texas as the Farm to Market Road system.²⁶ In the early 20th century, rural Texas roads were often little more than deep, rutted trenches. Congress authorized the repair and upgrade of rural routes in 1912 enabling farmers to more easily transport and sell the fruits of their labor.²⁷ Today's food transport system begs this question, though: What farmers, and what markets? Economist John Ikerd estimates that American farmers, on average, make only about 20 cents of each food dollar spent; the remaining 80 cents going to pay for processing, transportation, packing and other marketing costs.²⁸ "Farmers who sell direct to local



At Boggy Creek Farms, an in-city farm, produce is picked and sold on the same day, and food travel is measured in feet, not miles.

customers, on the other hand receive the full retail value, a dollar for each food dollar spent."²⁹ And for every dollar a food shopper spends on local food, the local food economy gains about three dollars.³⁰

States have begun to plug the leaks in their agricultural economies. In August of 2007, the Illinois legislature enacted The Illinois Food, Farms and Jobs Act. The law provides for support of local and organic Illinois farming efforts in the hopes of keeping food dollars within the State, thereby revitalizing the Illinois state economy.³¹ Among the findings that support the bill are the facts that food consumed in Illinois traveled 1,500 miles to the state's consumers, but that only 0.2% of Illinois farm sales comprised food sold directly for in state human consumption.³²

In Texas, the Department of Agriculture's Go Texan Program already promotes Texas grown-and-raised products, proudly announcing that Texas is the third largest agricultural commodities exporter in the nation. But while Texas sells live animals and red meat, wheat, and feeds and fodder to out of state buyers,³³ by Fall 2007, only

11% of food available in Central Texas was grown locally. Furthermore, while Texas is the second largest agricultural state in the nation, it surpasses all of the other states in prime farmland loss and is therefore less and less able to feed its own population.³⁴ What would an increase in direct sales of locally grown food do for the Texas farmer and rancher? For the Texas economy?

Bad Air

Measuring the effects of food miles on air quality has been a tricky and often-challenged proposition. The reason is that, in some cases, it actually creates less air pollution overall to produce food sustainably in a remote part of the world and transport it to its point of consumption than it does to grow it locally. Sometimes growing that same food locally requires more energy. For example, one study found that growing a tomato in chilly Britain, out of season and under glass, requires more energy than growing it in sunny Spain and shipping it, by water, to Britain.³⁵ Therefore, it can be an oversimplification to say that sourcing food from remote locations is bad for air quality or for the environment in general.

Nevertheless, what can be said about the polluting emissions from conventional, roadway food transport is that reducing food miles would reduce the emissions of food-hauling trucks. Measuring those miles would show the



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potential amount of that reduction, as it has in previous studies. UK food miles studies showed that food transport produced 19 million tonnes (metric) of carbon dioxide in 2002.³⁶ Canadian researchers in Waterloo estimate that locally sourcing the foods they studied would result in an annual reduction of 49,485 tonnes of greenhouse gas emissions (metric).³⁷ And in Iowa, researchers at the Leopold Center found that locally sourcing just 10% more produce than the state currently does would result in a reduction of Iowa CO₂ emissions of 6.7 to 7.9 million pounds.³⁸ Iowa's potential reduction, estimated from only a 10% projected shift to local food production, accounts for .13% of total US CO₂ emissions from energy and industry for 2006 (6,045 million metric tons).³⁹ If other states reduced conventional food transport by 10% or more, that number could increase significantly.

Congestion

“What causes congestion? In a word, you.”⁴⁰

While reducing congestion is the primary focus of state departments of transportation everywhere, actually changing this situation requires a movement that only travelers and freight consumers can truly launch, for they are its first cause.⁴¹ According to the most recent findings from the Texas Transportation Institute, “The 2007 Urban Mobility Report,” congestion is at an all time high and getting “worse in urban areas of all sizes.”⁴² In Texas, for instance, metropolitan Texans lose up to 58 hours of their time to congestion annually and waste as much as 42 gallons of fuel each year.⁴³ Given these numbers, travelers and consumers should welcome any information that empowers them to change that situation. Commercial truck traffic makes up as much as 38% of traffic on Texas roadways.⁴⁴ Reducing even a small percent of truck travel related to food could have an impact.

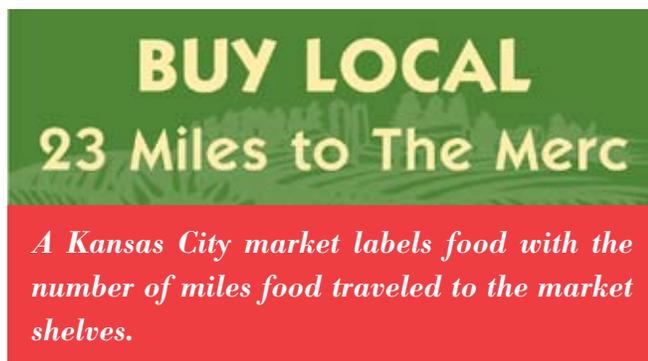
Roadway Fatalities

Another reason to reduce truck traffic on regular roads is to improve safety. Roadway fatalities from crashes involving trucks reached 5,200 in 2005, and of those fatalities, only 803 were truck occupants.⁴⁵ The other 4,400 were occupants of lighter vehicles. Reducing the number of trucks on regular roads could save thousands of lives.

Hop That Train

Public interest in food sourcing has risen dramatically in recent years, and consumers are now more than ever shopping for local food. Farmer's Markets, Community Supported Agriculture programs, Food Circles, and institutional food programs that source locally are on the rise. Inspired by authors James McKinnon and Alisa Smith who, for one year ate food sourced from within a 100 mile radius of their home in Vancouver, communities across the country are taking up the 100 Mile Diet Challenge.⁴⁶ Restaurants everywhere feature menus that pull from the local food shed, and grocery stores not only sell, but label, locally sourced food. The food magazine franchise Edible Communities now serves 40 North American communities, publishing a seasonal, quarterly magazine named for the community it serves (for example, *Edible Austin*), and devoted entirely to that area's local food sources.⁴⁷ So prevalent is the phenomenon that the New Oxford American Dictionary declared *locavore*, or one who eats locally sourced food, the 2007 word of the year.⁴⁸ The issue even hit the cover of *Time* magazine in March of 2007, making it a trend, a craze, even a fashion. But first it is a demand.

A September 2007 study conducted by the Leopold Center for Sustainable Agriculture surveyed 500 consumers on how and where food is sourced, and the corresponding environmental impacts. The study concluded that consumer concerns about food safety, food sourcing, and the environmental impact and cost of the current food system have grown so quickly that the issue warrants a multi-agency investigation into our food supply chains.⁴⁹ The results are telling. Almost half of the respondents were willing to pay a 10% to 30% premium for food produced in a food supply chain that emitted half as much greenhouse gas as a conventional supply chain; 69% "somewhat" or "strongly" agreed that local



food is healthier to eat than food that has traveled across the country; and 85% of respondents believed that local food is safe or somewhat safe, while only 12% could say the same for the global food system.⁵⁰ Accurate or not, consumer perceptions drive choice and demand.

With enough momentum, demands like this have brought about policy changes in ways that governmental regulation cannot. The organic food revolution, with its radical changes in food growing and consuming practices, is one such example. In his 2006 bestseller, *The Omnivore's Dilemma*, Michael Pollan describes how pesticide-free farming, food co-ops, and a counter-culture cuisine based on organic ingredients combined to create an informed consumer base that eventually demanded organic food. The result is an \$11 billion organic marketplace, the product of "consumers and farmers working informally together outside the system, with exactly no help from the government."⁵¹ *Fast Food Nation* author Eric Schlosser credits McDonald's customers with driving important health and safety changes in the meat packing industry that would have taken Congress years to achieve. Competition for customers between the major fast food chains requires a quick responsiveness to consumer demand, and McDonald's consumers were demanding healthier food. In response McDonald's began pressuring their suppliers to deliver ground beef that was free of lethal pathogens. Suppliers increased investment in new equipment and microbial testing, and began producing a less toxic beef supply to all American consumers, not just McDonald's customers.⁵²

If consumers do wield the power to make change, state governments might want to consider riding this wave of consumer interest in food sourcing by measuring those food miles and naming the implications. Clearly, some of these food miles are necessary since not all regions can grow food in equal measure. However, at this point in the transportation story, it is worth investigating all possibly extraneous food miles traveled. If we measure food miles, calculate the costs, and publicize results, people might actually make different choices.

Follow That French Fry

A publicized study that evaluated and revealed the hidden costs of our current food transport system would enable consumers to weigh the external costs against the

benefits and decide for themselves whether they want to pay those costs. A collaborative effort between Departments of Transportation, of Agriculture, of Health, of Economic Development, and of Environmental Quality could show that something as tangible and personal as food, and as abstract and impersonal as roads, are directly connected, at direct cost to the traveling and eating public. Following in Britain's congestion-busting footsteps, states could then create an Annual Food Transport Indicator that would monitor food miles on a yearly basis.⁵³ A yearly measurement could track changes and monitor progress between transportation infrastructure, vehicle technology, fuel efficiency, agricultural activity, and consumer behavior.

And then what? Assuming a food miles study reveals opportunities for positive change, what sort of solutions should we pursue to implement these changes? A number of possible approaches come to mind, falling into one of two categories: those practices that cover the full costs of long distance food transport, and those that reduce the number of food-bearing trucks on the roads.

Solutions That Charge for the Roads We Consume

“More than ever before, Americans take for granted buying imported fresh fruits, vegetables, and flowers at their local supermarkets; next-day delivery of goods purchased over the Internet; and tracking express packages online to know their whereabouts at any given time.”⁵⁴

So says the United States Department of Transportation in its 2006 analysis of freight movement, “Freight in America: A New National Picture.” The same report notes that trucking is the shipping choice for many businesses and is increasing its market share.⁵⁵ The anticipated increase in freight traffic, taken together with the shrinking transportation budgets of almost every state, suggests that one major response to measuring the external costs of food transport is to charge the full transportation costs of our food shipments by tolling the food miles used.

Tolling is a user fee approach, as wildly unpopular a funding approach with most consumers as a gas tax increase. Tolling might become more appealing, however, when considered alongside the true costs of food transport. The Truck Only Toll lane (TOT) is one type of tolling scheme currently under consideration in the US by



Concept Drawing of Truck Only Toll Lanes on I-70 in Missouri. Source: MoDOT

some State and Federal governments.⁵⁶ TOTs come in a number of forms. They may be regular lanes on existing roadways converted into truck lanes and separated from other traffic by a barrier; lanes elevated above existing roadways; or new construction projects, dedicated to truck traffic alone. The idea in all cases is to separate truck traffic from other traffic and to design roads with the needs of trucks and truckers in mind.

The trucking industry understandably might not want to absorb costs they would incur under a tolled scheme. Shippers exist not for their own sake, but to satisfy the appetites of consumers who purchase the goods trucks bear. So any costs imposed on shippers should be passed on to those who profit most from long-distance trucking: consumers. When goods are priced to include the actual shipping cost, prices will go up, but will only be paid by consumers who buy those goods. Under such a scheme, a coffee aficionado who favors a Kenyan bean would pay the shipping costs for that remotely sourced import, while a McDonald's patron would pay the true costs of a Big Mac whose many ingredients traversed the country perhaps more than once. Neither would pay the transport costs of the other's commodities, as they do today.

On the other hand, some TOTs may be so efficient for trucks that at least some large trucking firms would be willing to pay tolls. A 2002 Reason Foundation policy study, estimated that self-financing Toll Truckways can be designed so specifically for longer combination vehicles (where a single driver carries several times the state-permitted payload) that even after paying tolls, companies can still turn a healthy profit.⁵⁷

Solutions That Reduce Our Appetite for Roads

- *Local Sourcing and Ecolabeling*

Labeling food with a Food Miles count could incentivize road-friendly consumer behavior. Food ecolabeling programs are gaining popularity in Europe and the US and can identify a food's origin, environmental or social impact, or show miles traveled and transportation mode used. The 2002 Farm Bill included a Country of Origin Labeling requirement,⁵⁸ and a Lawrence, Kansas supermarket, the Community Mercantile (the Merc) has begun its own labeling program called Miles to the Merc that labels the distances food travels to its shelves.⁵⁹ Denmark has even been experimenting with a secondary bar code database that shows images of the farm where meat is raised, information on an animal's genetics, feed, medication and slaughter date.⁶⁰ Consumers who know how far food has traveled will know how many road miles their choices consume and can more easily choose food that travels shorter distances to reach them.

- *Road-to-Rail Shift*

Though rail played a leading role in the nation's early infrastructure development, by 2000 it moved only 16% of the nation's freight; 78% went by truck.⁶¹ By 1996, 93% of fresh produce transported between cities in the US traveled by truck.⁶² Perhaps it is time to relieve our roadways and revitalize our rail lines. Shifting food transport to rail shares the same advantages as shifting any freight to rail: trains emit significantly less pollution,⁶³ cause far fewer fatalities,⁶⁴ cause little highway congestion, and consume far less fuel than trucks.⁶⁵ Rail is not as timely as truck transport, so fresh food may spoil more easily traveling by rail. However, increasing local production of fresh food could reduce the need to transport fresh food over long distances.

- *Transport Collaboration and Out of Hours Deliveries*

Transport collaboration is a collaboration between shippers to share the leg of a trip when neither has a full load. A 2007 UK study shows that by combining collaboration between vertical supply chain partners and horizontal collaboration between other logistics service providers, shippers can more easily comply with new, transport-friendly regulation, and can also reduce transport costs.⁶⁶ Out of Hours Deliveries, specific to urban environments, help reduce urban congestion during business hours by

shifting freight deliveries to non-business hours.

Food has always been a form of cultural exchange, a way to learn about people in other parts of the world. It is hard to argue with the educational benefits of eating a new dish and knowing its cultural origins, different from your own. Part of that education, however, is to discover what can actually be grown in one's own backyard. What cannot be grown locally becomes a treat we pay for, rather than an everyday entitlement we expect.

One Apple at a Time

"The solutions to this problem will require commitment by the public, and by national, state and local officials to increase investment levels and identify projects, programs and policies that can achieve mobility goals."⁶⁷

As congestion experts Tim Lomax and David Shrank point out, the solution to our mobility problems will be a collaborative effort between the public and the government, applied to more than one area of change. Food transport is one of those areas, and government is beginning to play its part. Cities and counties have been declaring official local eating days and weeks and months for the last couple of years. Recently Humboldt County, California joined the ranks of official local eaters when the County Board of Supervisors announced in 2007 that September was Local Foods Month,⁶⁸ and Austin, Texas proclaimed December 8-15 Eat Local Week.⁶⁹ And in British Columbia, Vancouver is taking local eating to



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a whole new level. The City Council will soon consider a proposal to extend a pre-existing set of "urban agriculture" guidelines for high density developments to all new multifamily projects in Vancouver. Those guidelines include edible landscaping and food-producing gardens in shared garden plots, and on rooftops and balconies.⁷⁰

If knowledge is power, why not further arm consumers with information about how their transportation dollars are supporting the food system, and let them decide whether and how they want to spend those dollars? In 2002 trucks bore 90% of the dollar value of US freight⁷¹ and the nation's freight tonnage is expected to increase nearly 70% by 2020.⁷² Learning the true cost of food miles could trigger a reduction in the American consumer's appetite for freight in general. For a nation facing a staggering transportation funding gap, measuring food miles might start to look like part of the solution.

Gretchen Stoeltje is a researcher in the Government and Public Affairs Division of the Texas Department of Transportation (TxDOT). She holds an undergraduate degree in film from the University of California, Santa Cruz, and a law degree from Santa Clara University in Santa Clara, California. She may be reached at gstoelt@dot.state.tx.us or 512.416.2385.

Endnotes

- 1 Hendrickson, John, "Energy Use in the U.S. Food System: A Summary of Existing Research and Analysis," 2004: 8. University of Wisconsin-Madison, College of Agricultural and Life Sciences, 27 February 2008 <http://www.cias.wisc.edu/pdf/energyuse2.pdf>.
- 2 The American Association of State Highway and Transportation Officials (AASHTO), AASHTO Guide for Design of Pavement Structures 1993, (AASHTO 1993), Appendix D.
- 3 Pirog, Rich and Andrew Benjamin. "Checking the Food Odometer: Comparing Food Miles for Local versus Conventional Produce Sales to Iowa Institutions." July 2003: 4. Leopold Center for Sustainable Agriculture, Iowa State University. 29 February 2008 http://www.leopold.iastate.edu/pubs/staff/files/food_travel072103.pdf.
- 4 "CBO Testimony: Statement of Donald B. Marron, Deputy Director, Status of the Highway Trust Fund: 2007," March 27, 2007: 1. Congressional Budget Office, 27 February 2008 http://www.cbo.gov/ftpdocs/79xx/doc7909/03-27-Highway_Testimony.pdf.
- 5 Kelderman, Eric, "The State of the Union – Crumbling," Stateline. Org. 16 January 2008: 2. 11 February 2008 <http://www.stateline.org/live/details/story?contentId=270952>.
- 6 Kelderman 1.
- 7 Sundeen, Matt and James B. Reed, "Surface Transportation Funding: Options for States," 2006: xii. National Conference of State Legislatures, 27 February 2008 <http://www.ncsl.org/print/transportation/item014233.pdf>.
- 8 Fisher, Dawn, Andrew Palmer and Alan McKinnon, "Reducing the External Costs of the Domestic Transportation of Food by the Food Industry," 16 April 2007: 0. Faber Maunsell, 27 February 2008 [http://statistics.defra.gov.uk/esg/reports/costfoodtransport/Defra Final Report 17 May 2007.pdf](http://statistics.defra.gov.uk/esg/reports/costfoodtransport/Defra%20Final%20Report%2017%20May%202007.pdf).
- 9 Watkiss, Paul et al, "Validity of Food Miles as an Indicator of Sustainable Development," July 2005: i-ii. AEA Technology, 27 February 2008 <http://statistics.defra.gov.uk/esg/reports/food-miles/final.pdf>.
- 10 Fisher, Palmer and McKinnon 3.
- 11 Xuereb, Marc, "Food Miles: Environmental Implications of Food Imports to Waterloo Region," November 2005:3. Region of Waterloo Public Health, 27 February 2008 [http://chd.region.waterloo.on.ca/web/health.nsf/0/54ED787F44ACA44C852571410056AEB0/\\$file/FOOD_MILES_REPORT.pdf?openelement](http://chd.region.waterloo.on.ca/web/health.nsf/0/54ED787F44ACA44C852571410056AEB0/$file/FOOD_MILES_REPORT.pdf?openelement).
- 12 Pirog, Rich, Timothy Van Pelt, Kamyar Enshayan, Ellen Cook, "Food Duel and Freeways: An Iowa Perspective on How Far Food Travels, Fuel Usage and Greenhouse Gas Emissions," June 2001:1. Leopold Center for Sustainable Agriculture, 27 February 2008 <http://www.leopold.iastate.edu/pubs/staff/ppp/food_mil.pdf>.
- 13 Pirog and Benjamin 4.

- 14 United States Department of Transportation, Federal Highway Administration, Dwight D. Eisenhower National System of Interstate and Defense Highways. p. 2. 27 February 2008 <http://www.fhwa.dot.gov/programadmin/interstate.cfm>.
- 15 TRIP, Keep Both Hands on the Wheel: Metro Areas with the Roughest Rides and Strategies to Make Our Roads Smoother, March 2008: 2. Washington D.C. 12 March 2008. <http://www.tripnet.org/RoughRideReportOct2006.pdf>.
- 16 United States Department of Transportation, Federal Highway Administration, Freight Analysis Framework: FAF2 Data and Documentation: 2002-2035. 2007. Interpreted by Tianjia Tang, Office of Freight Management and Operations, Federal Highway Administration in email to author, November 20, 2007.
- 17 United States Department of Transportation, Federal Highway Administration, Freight Analysis Framework, Tang.
- 18 AASHTO Appendix D.
- 19 March , James W., "Federal Highway Cost Allocation Study," Public Roads, Vol. 61, No. 4, January/February 1998: 7. United States Department of Transportation, Federal Highways Administration. 1 February 2008 <<http://www.tfhr.gov/pubrds/janpr/cost.htm>>.
- 20 Schlosser, Eric. Fast Food Nation: The Dark Side of the All-American Meal. 2001:120. Houghton Mifflin Books.
- 21 Schlosser 111-131.
- 22 Ungood-Thomas, Jon, "British Prawns go to China to be Shelled," May 20, 2007: 1 The Sunday Times, The TimesOnline. 21 November 2007 <http://www.timesonline.co.uk/tol/news/uk/article1813836.ece>.
- 23 Ungood-Thomas 1.
- 24 Ungood-Thomas 2.
- 25 Ungood-Thomas 1.
- 26 Burka, Paul, "The Farm to Market Road," Texas Monthly Magazine. 22 October 2007 <http://www.texasmonthly.com/ranch/readme/farm.php>.
- 27 Texas Transportation Institute, "Getting it Built," Texas Transportation Researcher: Mobility and the Environment, Volume 41, Number 4:1. 23 October 2007 <http://tti.tamu.edu/publications/researcher/newsletter.htm?vol=41&issue=4&article=9>.
- 28 Ikerd, John "Eating Local: A Matter of Integrity." The Eat Local Challenge Kickoff Event. Eco Trust, Portland, OR. 2 June 2005. Also Sierra Farm Tour and the Alabama Sustainable Agriculture Network Field Day, Banks Alabama. 18 June 2005: 5. 28 February 2008 <http://web.missouri.edu/ikerdj/papers/Alabama-Eat%20Local.htm>.
- 29 Ikerd 5.
- 30 Ikerd 5.
- 31 Illinois Food, Farms and Jobs Act. Pub. Act 095-0145: sec. 5, para. 13. 14 August 2007.
- 32 Illinois Food, Farms and Jobs Act, Pub. Act 095-0145: sec. 5, para. 2.
- 33 Texas Department of Agriculture. Texas Agriculture Packs a Punch. Texas Agriculture Facts, Go Texan Program. 12 July 2007 http://www.gotexan.org/gt/channel/render/items/0,1218,1670_1693_0_0,00.html.
- 34 "Farm Marketing" Sustainable Food Center. 8 October 2007: 1 http://www.sustainablefoodcenter.org/AFM_overview.html,
- 35 Watkiss et al 66-68.
- 36 Watkiss et al 11.
- 37 Xuereb 13.
- 38 Pirog et al "Food, Fuel and Freeways" 18.
- 39 Energy Information Administration, Emissions of Greenhouse Gases in the United States 2006. November 2007: 11. United States Department of Energy. 28 February 2008 <ftp://ftp.eia.doe.gov/pub/oiaf/1605/cdrom/pdf/ggrpt/057306.pdf>.
- 40 Lomax, Tim and David Schrank. The 2007 Urban Mobility Report September 2007:7. Texas Transportation Institute. 28 February 2008 http://tti.tamu.edu/documents/mobility_report_2007_wappx.pdf.
- 41 Lomax and Schrank 7.
- 42 Lomax and Schrank 2.
- 43 Lomax and Schrank 32, 33.
- 44 Texas Department of Transportation, press release. "TTC-35 Draft Report Refines Study Area and Identifies Project Need". April 2006: 2. 29 February 2008 <http://www.dot.state.tx.us/news/008-2006.htm>.
- 45 Currier, Christina. Overview of Truck-Only Toll Lane in the United States. Texas Department of Transportation. 7 May 2007:4. 29 February 2008 http://www.dot.state.tx.us/publications/government_and_public_affairs/truck-only_toll_lanes.pdf.
- 46 Blog contributors. Your Stories. The 100 Mile Diet. 29 February 2008 <http://www.100milediet.org/category/your-stories/>.
- 47 Subscription page. Edible Austin. No. 4 Spring 2008:50.
- 48 OUP Blog. "Oxford Word of the Year: Locavore." 12 November 2007. Oxford University Press. 29 February 2008 <http://blog.oup.com/2007/11/locavore>.
- 49 Pirog, Rich, and Andy Larson, "Consumer Perceptions of the Safety, Health, and Environmental Impact of Various Scales and Geographic Origin of Food Supply Chain," September 2007: 4. Leopold Center for Sustainable Agriculture. 29 February 2008 http://www.leopold.iastate.edu/pubs/staff/consumer/consumer_0907.pdf.
- 50 Pirog and Larson 3.

- 51 Pollan, Michael. The Omnivore's Dilemma: A Natural History of Four Meals. 11 April 2006: 140-143, 257. The Penguin Press.
- 52 Schlosser 267-270.
- 53 Watkiss et al viii.
- 54 United States Department of Transportation. Freight in America. Research and Innovative Technology Administration, Bureau of Transportation Statistics. January 2006: 1. 29 February 2008 http://www.bts.gov/publications/freight_in_america/pdf/entire.pdf.
- 55 United States Department of Transportation. Freight in America 1.
- 56 Currier 3-7.
- 57 Samuel, Peter, Robert Poole Jr., and José Holguin-Veras, "Toll Truckways: A New Path Toward Safer and More Efficient Freight Transportation," Policy Summary No. 294, Reason Public Policy Institute, 2002:1. Reason Foundation. 29 February 2008 <http://www.reason.org/ps294/polsum.pdf>.
- 58 Farm Security and Rural Investment Act Of 2002. Pub. L. 107-171. 13 May 2002. 116 Stat. 533.
- 59 Van Dalsem, Sarah. "Traveling Light: '100-Mile Diet' Limits Pollution, Supports Locally Produced Food," 1 August 2007: 1. Lawrence Journal World and News. 29 February 2008 http://www2.ljworld.com/news/2007/aug/01/traveling_light/.
- 60 Pollan Omnivore's Dilemma 244.
- 61 American Association of State Highways and Transportation Officials. Transportation/Invest in America: Freight-Rail Bottom Line. 2007:13. (AASHTO) 29 February 2008 <http://freight.transportation.org/doc/FreightRailReport.pdf>.
- 62 Pirog, Van Pelt, Enshayan, Cook 12.
- 63 AASHTO, Transportation/Invest in America 29.
- 64 United States Department of Transportation, Federal Highway Administration. Freight Management and Operations, Table 5-1: Transportation Fatalities by Freight Transportation Mode. 11 February 2005. 29 February 2008 http://ops.fhwa.dot.gov/freight/freight_analysis/nat_freight_stats/docs/04factsfigures/table5_1.htm.
- 65 AASHTO, Transportation/Invest in America 29.
- 66 Mason, Robert, Chandra Lalwani, Roger Broughton, "Combining Vertical and Horizontal Collaboration for Transport Optimization." Supply Chain Management: An International Journal. 2007:187-188, 196.
- 67 Lomax and Schrank 1.
- 68 Doran, Bob "It's Official! Community Alliance Rolls Out Local Foods Month." The North Coast Journal of Politics, People and Art. 6 September 2007. 29 February 2008 <http://www.north-coastjournal.com/090607/food0906.html>.
- 69 "Edible Austin Eat Local Week—Dec. 8-15." Edible Austin. 8 November 2007. 29 February 2008 <http://www.edibleaustin.com/pages/eatlocal.htm#top>.
- 70 Ramslie, Dave, Sustainability Group Manager, Sustainable Development Program, City of Vancouver. email to the author. 22 February 2007.
- 71 Samuel, Poole, and Holguin-Veras 1.
- 72 United States Department of Transportation. Freight in America: A New National Picture. Research and Innovative Technology Administration, Bureau of Transportation Statistics. Washington DC. 2006: 3.