Energy Efficiency as an Integral Part of Sustainable Agriculture: Food Miles and Fuel Usage in Food Transport

ACEEE Forum on
Energy Efficiency in Agriculture
November 16, 2005

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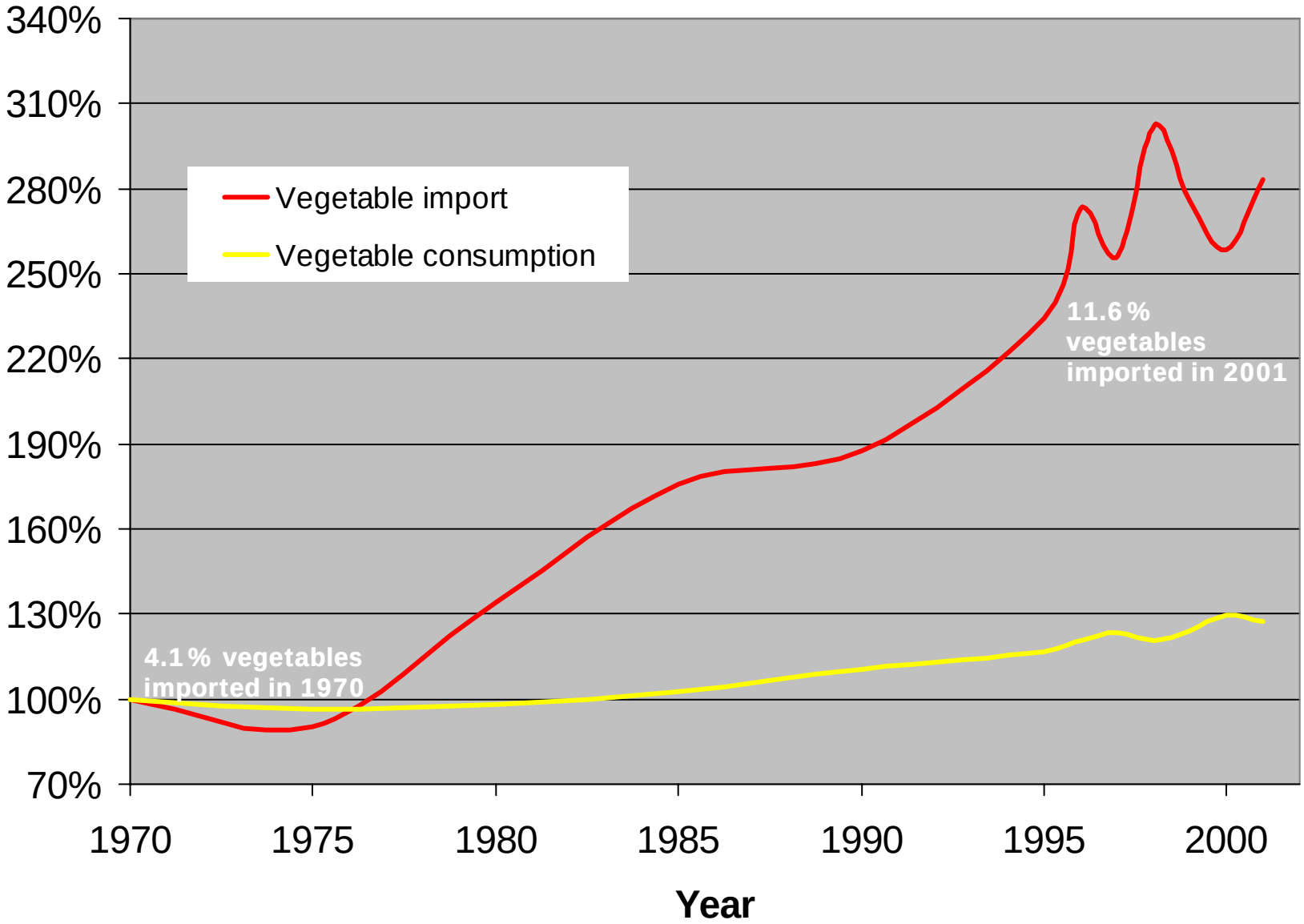
Energy Use in the Food System

- Food systems account for 16-17 percent of total U.S. energy consumption*
- Transportation accounts for 11 percent of energy use within the food system*
- In the UK, agricultural/food production accounts for 28% of goods transported on UK roads, imposing external costs of 2.35 billion pounds per year**

* Hendrickson, John, "Energy Use in the Food System: A Summary of Existing Research and Analysis" 1996.

**From "Farm costs and food miles: An assessment of the full cost of the UK weekly food basket (Jules Pretty et. al., *Food Policy* 30 (2005) 1-19).

U.S. total vegetable imports and per capita consumption trends relative to 1970 base year



Data from USDA Economic Research Service

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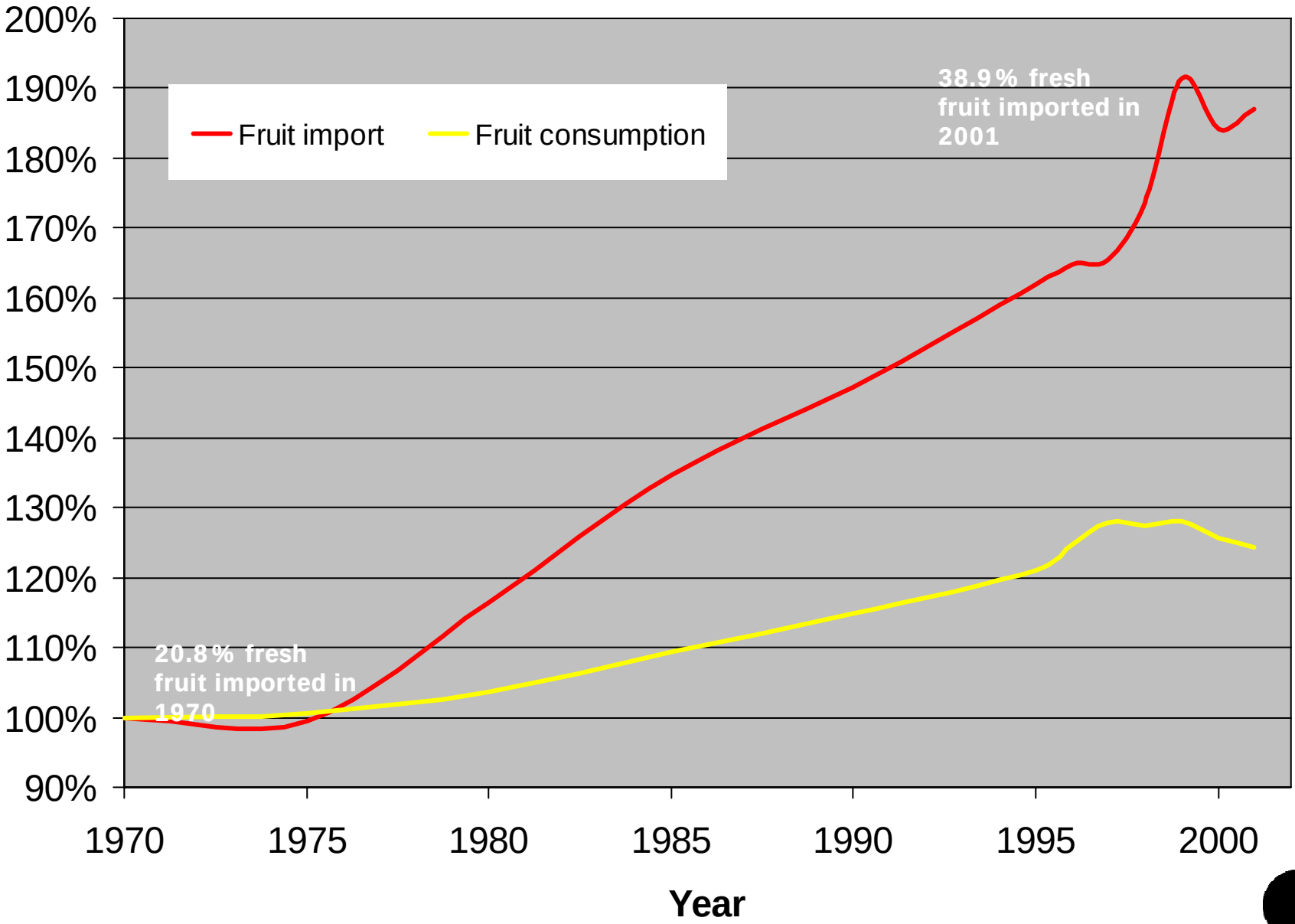
U.S. total fresh fruit imports and per capita consumption trends relative to 1970 base year



Data from USDA Economic Research Service

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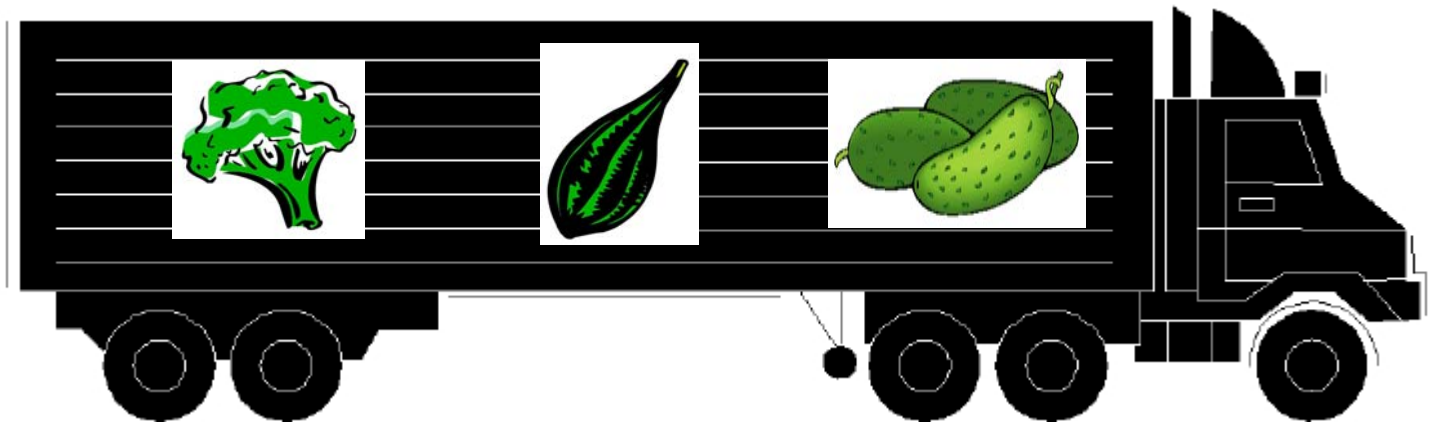
In California more than 485,000 truckloads of fresh fruits and vegetables travel 100 to 3,100 miles to reach their destinations*



*Hagen, J.W., D. Minami, B. Mason, and W. Dunton. 1999. “California’s Produce trucking Industry: Characteristics and Important Issues”

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What are “food miles?”

- Distance food travels from where it is grown/raised to where it is purchased (consumer or end-user)
- 1969 DOE study – 1,346 miles
- 1980 estimation (UW) for produce – 1,500 miles
- Food miles in industrial nations have increased significantly in last 50 years

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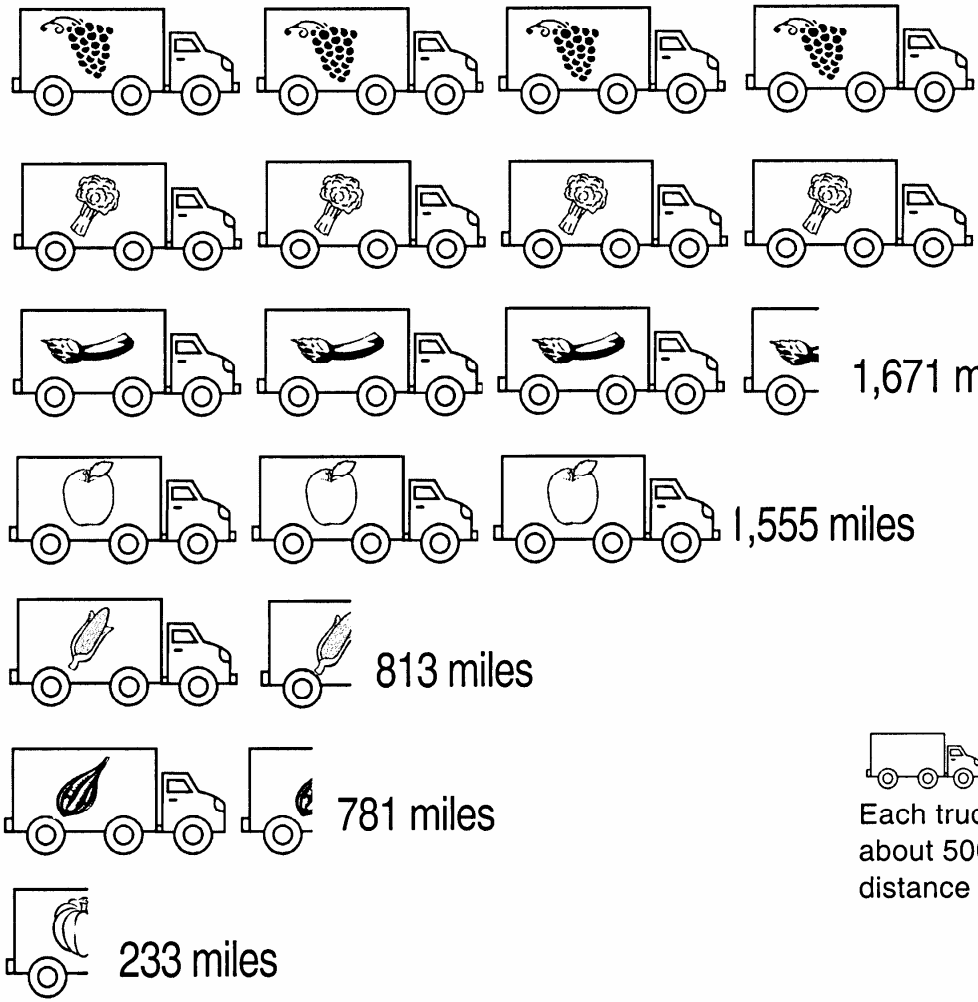
Average distance by truck to Chicago Terminal Market*

(Continental U.S. only)



	# States supplying this item	% Total from Mexico
Grapes	1	7
Broccoli	3	3
Asparagus	5	37
Apples	8	0
Sweet Corn	16	7
Squash	12	43
Pumpkins	5	0

Weighted average source distances calculated from USDA AMS arrival data -1998 Chicago Terminal Market. Estimations do not include distance from terminal market to point of retail sale

Weighted Average Source Distances (WASD) for Fresh Produce - Chicago Terminal Market

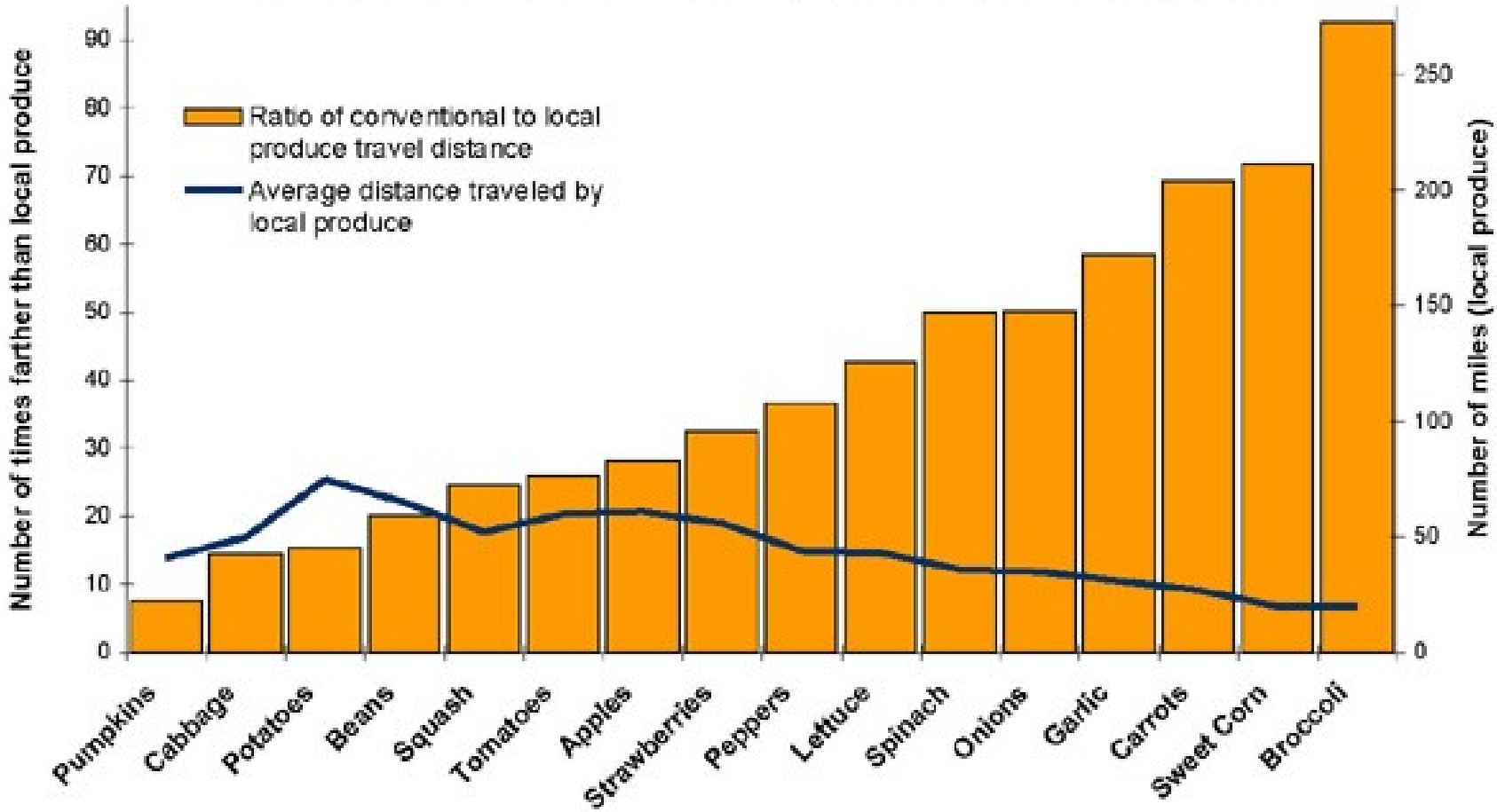
	1981	1989	1998
Truck WASD – continental U.S. (miles)	1,245 miles	1,424 miles	1,518 miles
Arrivals by truck – overall (% of total)	49.6%	68.6%	86.9%
Arrivals by rail – overall (% of total)	50.4%	31.4%	13.1%
Foreign arrivals (% of total)	12.5%	16.4%	21.5%

Tonnage and distance traveled by food in the UK (1978-1999)

	Quantity (millions of tonnes)	Average distance (kilometers)
1978	287	82
1983	264	89
1988	302	100
1993	300	119
1998	346	123
1999	333	125

DETR, 1999. Transport of Goods by Road 1998, Dept. of the Environment Transport And the Regions. HMSO, London.

How much farther does conventional produce travel?



Source: Leopold Center for Sustainable Agriculture, 2003

Local produce data from 2001 Practical Farmers of Iowa "All Iowa" meals. Conventional data extrapolated from 1998 USDA AMS produce arrival data for Chicago and St. Louis

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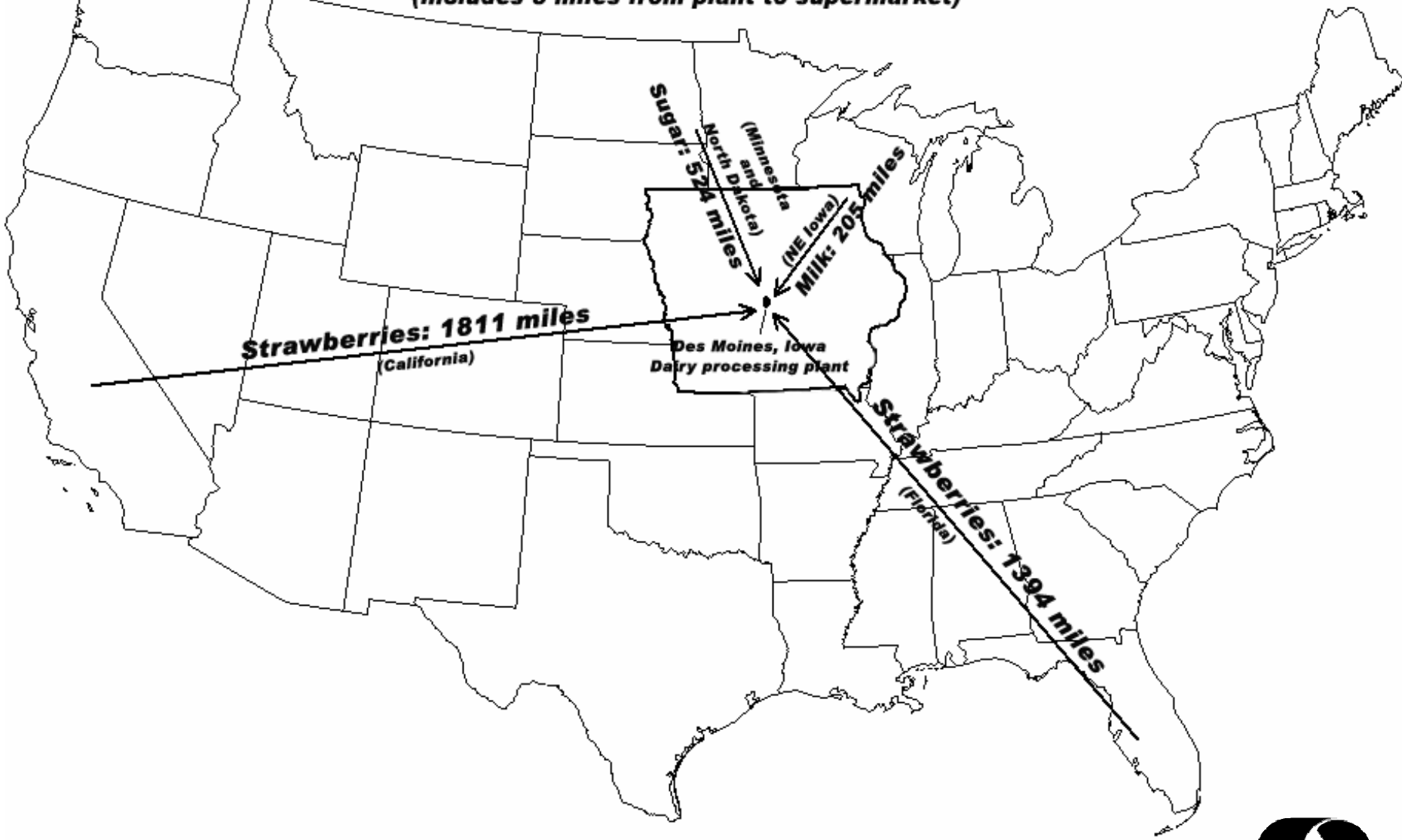
Ingredient Sources for Strawberry Yogurt
Total Weighted Source Distance: 2216 Miles
(includes 5 miles from plant to supermarket)



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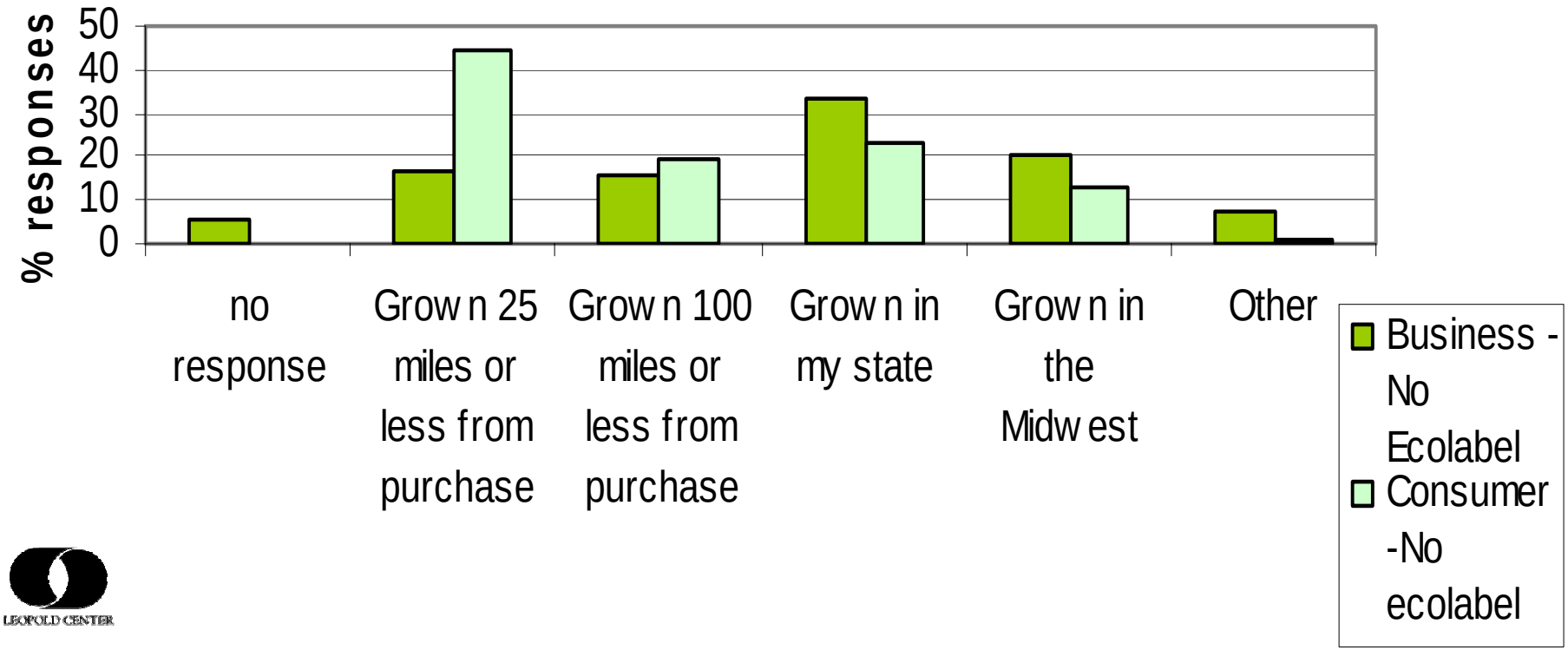
Ecolabel Value Assessment – Phase I

What do you consider "local" when making a food purchase or carrying a food product through your store or business?



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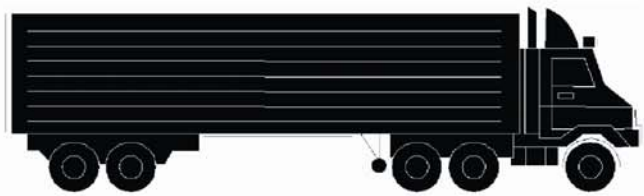
Environmental impact of food transportation

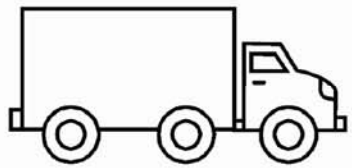
Estimating fuel usage, CO_2 emissions and miles traveled

Three food (produce) distribution systems

- **Conventional system** — integrated retail/wholesale national system using semitrailer trucks

- **Iowa-based regional system** — based on existing regional distribution system using semitrailer and midsized trucks





- **Local system** — CSA/farmers markets and institutional markets using light trucks

Estimated fuel consumption, CO2 emissions, and distance traveled for three truck-based food transport systems.

Food transport system	Fuel Consumption (gal/year)	Co2 Emissions (lbs./year)	Distance traveled (miles)
National semitrailer	368,000	8,400,000	2,245,000
Regional midsize truck	44,000	993,000	370,000
Local small truck (institutional)	88,000	1,730,000	1,518,000

From: Food, Fuel, and Freeways – Leopold Center, 2001. Each system was to transport 10% of per capita consumption of fresh produce to feed Iowa

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Food miles & CO_2 emissions in Japan

- CO_2 emission levels from transportation sector in Japan is rising rapidly: 21% increase between 1990-1998, and 40% by 2010.
- Transportation of agricultural products is largely responsible : total distance traveled thru Japan's food imports is $5{,}00\ \mathrm{billion\ t\text{-}km}$.
- Significance of local markets such as Teikei for minimizing environmental adverse effects from transportation needs to be verified.

From "CO2 Emissions from Transportation of Fresh Vegetables: Comparison among Local, National and International Markets" *Yoko Taniguchi et. al*

Mode of transportation makes a big difference in fuel usage

- Air transport
- Truck (road transport)
- Rail
- Water

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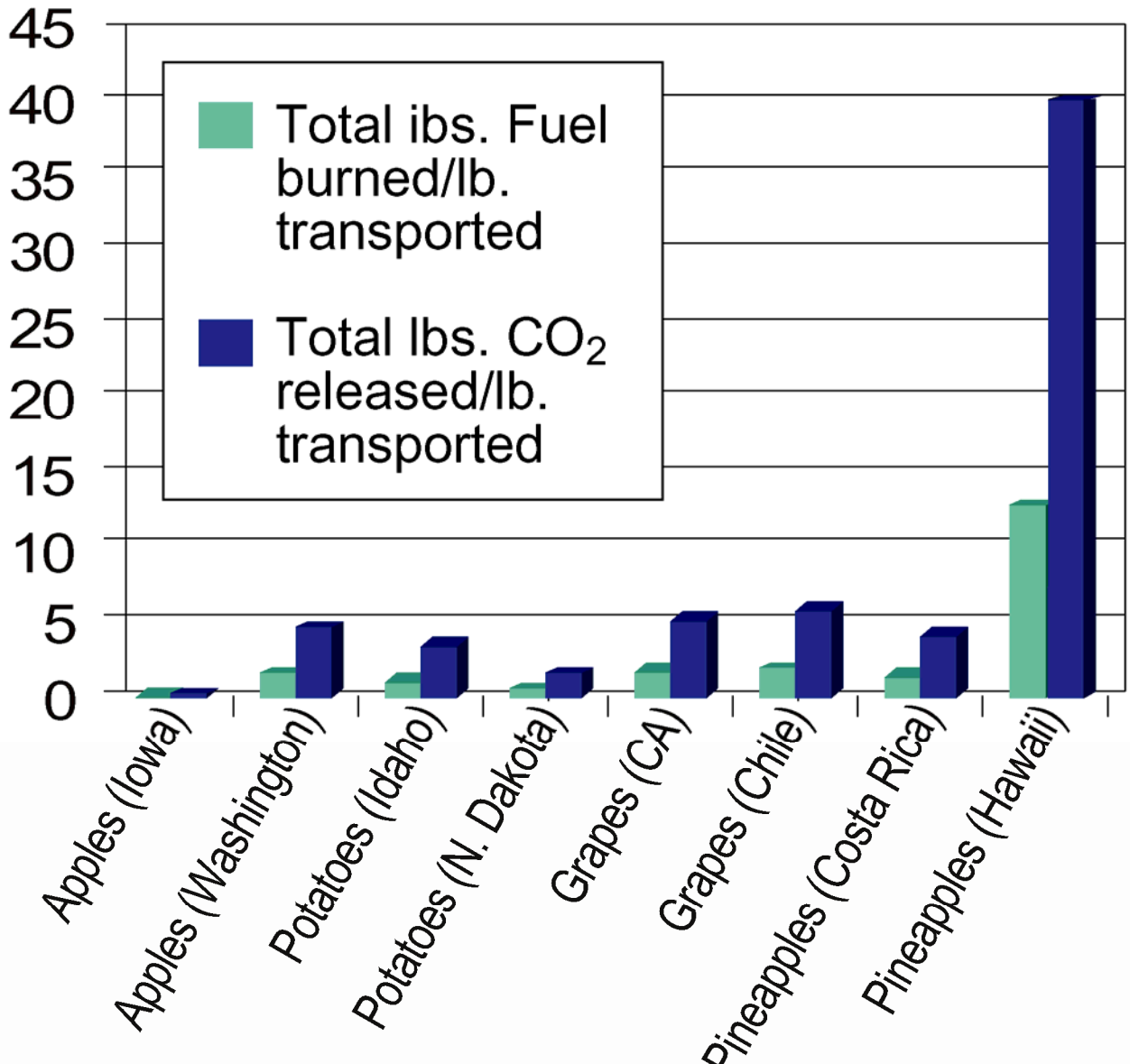
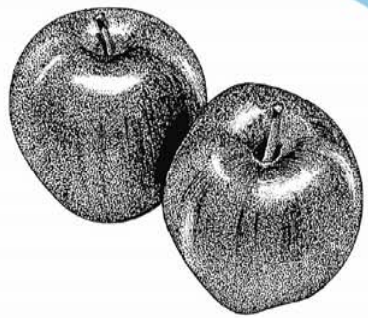
Comparison of fuel usage and CO_2 emissions to transport selected produce items to Des Moines, Iowa supermarket



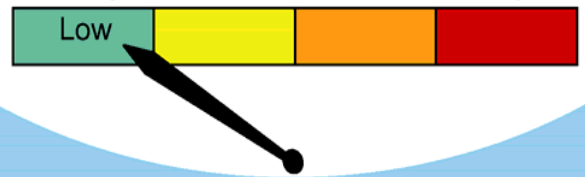
Food miles ecolabel
Point of purchase: supermarket
in Des Moines, Iowa

Apples



Source: Iowa
Food miles (farm-to-store distance): 60 miles
Transported by:

Transport Environmental Impact



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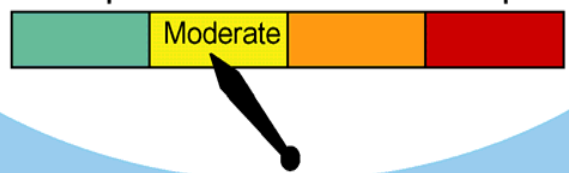
Food miles ecolabel
Point of purchase: supermarket
in Des Moines, Iowa

Potatoes

Source: North Dakota
Food miles (farm-to-store distance): 558 miles
Transported by:

Transport Environmental Impact



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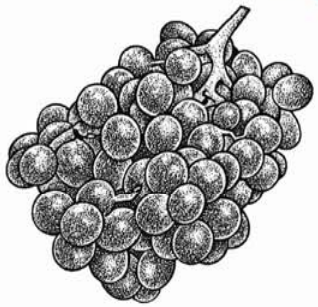
Food miles ecolabel
Point of purchase: supermarket in Des Moines, Iowa

Table grapes

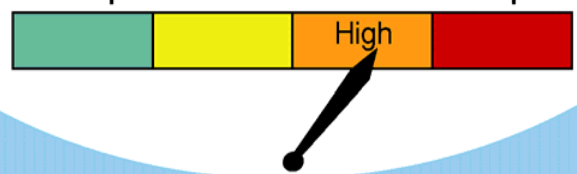


Source: Chile

Food miles (farm-to-store distance): 7268 miles

Transported by:

Transport Environmental Impact



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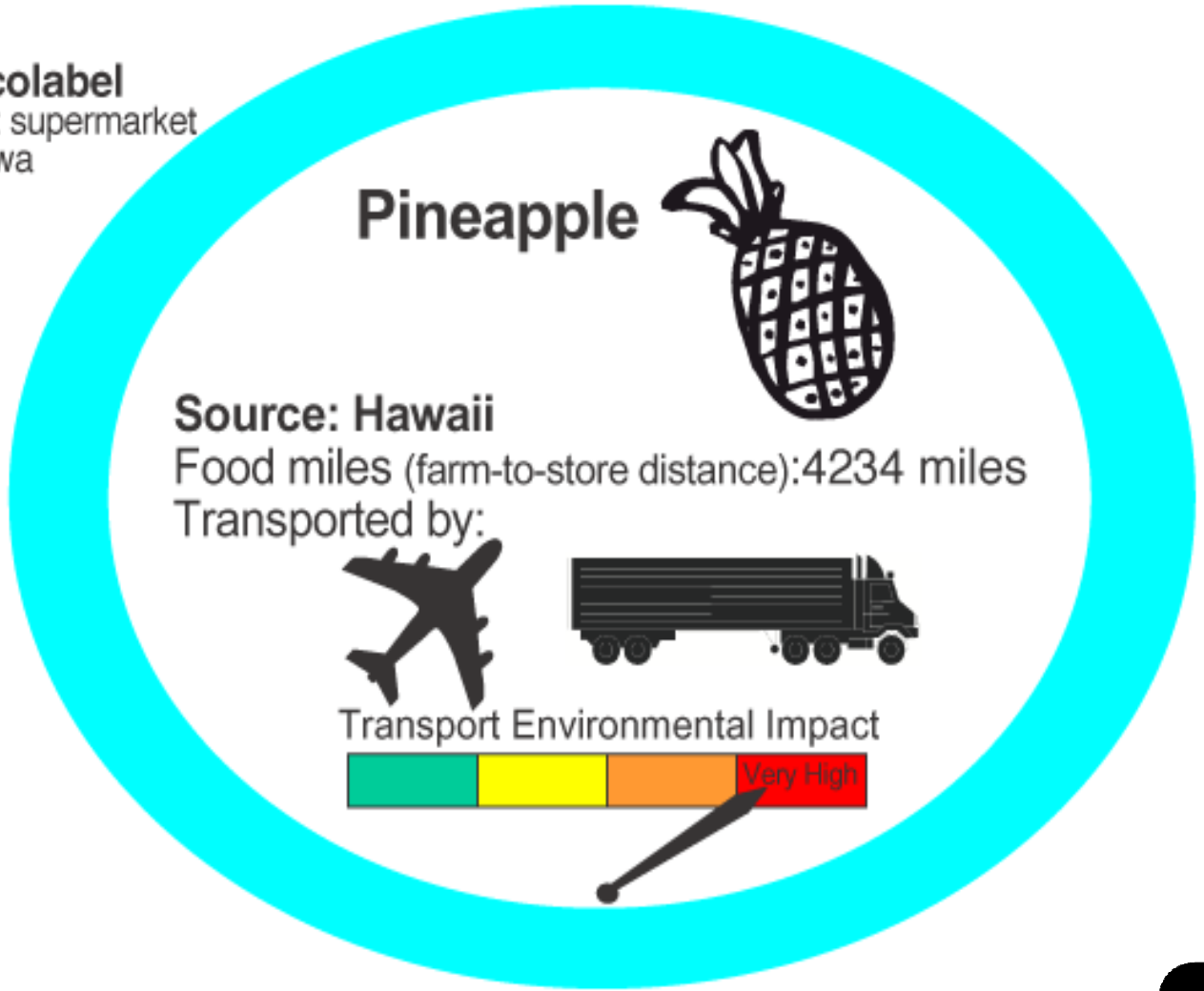
Food miles ecolabel
Point of purchase: supermarket
in Des Moines, Iowa



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Limitations in using food miles

- Higher food miles for certain foods don't always translate into higher energy use
- Local foods grown in greenhouses might use more energy than foods grown in open fields and transported across U.S.
- Need to apply Life Cycle Analysis to agricultural products

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Summary

- Food miles offer a simple metaphor to contrast food systems (local vs. global)
- Developing or redeveloping a local or regional food system may help reduce fuel use and greenhouse gas emissions (food transport)
- Mode of transport plays a key role in total fuel usage and greenhouse gas emissions
- Need to apply LCA to agricultural products

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