Supplementary Material

Life Cycle Assessment of Dietary Patterns in the United States: A Full Food Supply Chain Perspective

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Table S1. EIO-LCA commodity sector mapping for each food group.

Food Group	I/O Industry Code	EIO-LCA commodity sector mapping	CEDA GHGEs results (kg CO_2-eq/kg)[a]
Vegetables	31142B	Vegetable canning, pickling, and drying*	1.79
Fruit and Juices	31142A	Fruit canning, pickling, and drying*	1.93
Milk and Dairy	311513	Cheese manufacturing	6.90
	31151A	Fluid milk and butter manufacturing	1.24
	311514	Dry, condensed, and evaporated dairy product manufacturing	8.38
	311520	Ice cream and frozen dessert manufacturing	1.73
Grains	311810	Bread and bakery product manufacturing	0.93
Red meat	31161A	Animal (beef) slaughtering, rendering, and processing*	35.4[b]
	31161B	Animal (pork) slaughtering, rendering, and processing*	8.5[b]
	31161C	Animal (other) slaughtering, rendering, and processing*	26.5[b]
Poultry	311615	Poultry processing	5.57[b]
Eggs	11230B	Egg production*	3.26
Fish and Seafood	311700	Seafood product preparation and packaging	6.30
Beans and Peas	31122A	Soybean and other oilseed processing	2.79
Nuts and Seeds	111335	Tree nut farming	2.22
Fats and Oils	311225	Fats and oils refining and blending	1.61
Sweeteners	31131A	Sugar cane mills and refining	1.64

* new, disaggregated sector. [a] cradle-to-retail gate emission factor. [b] boneless meat.

Table S2. Expenditure in U.S. dollar per household per year and average purchase price per kg of each food group. CEDA price conversion factor is multiplied by the purchase price to obtain producer's price.

Food Group	Expenditure in U.S. dollars per household [1]	Purchase price per kg	CEDA price conversion factor
Vegetables	$ 541	$ 1.71	0.870729
Fruit and Juices	$ 574	$ 2.33	0.870729
Milk and Dairy	$ 690	$ 2.27	0.910615
Grains	$ 420	$ 1.82	1
Red meat	$ 846	$ 6.93	0.876392
Beef	$ 386	$ 5.69	0.876392
Pork	$ 271	$ 5.09	0.876392
Other	$ 190	$ 11.9	0.876392
Poultry	$ 255	$ 3.11	0.937044
Eggs	$ 79.1	$ 2.07	0.923671
Fish and Seafood	$ 216	$ 11.4	0.744562
Beans and Peas	$ 19.7	$ 2.52	0.877288
Nuts and Seeds	$ 39.0	$ 3.14	0.924242
Fats and Oils	$ 172	$ 1.43	0.925119
Sweeteners	$ 226	$ 1.32	0.855876

Table S3. Estimated annual food consumption per household associated with dietary patterns among the U.S. population.

Food Group	Estimated and projected U.S. annual food consumption per household per year				
	CFP 2547 (2,547 kcal diet)	RFP 2000 (2,000 kcal diet)	RFP 2600 (2,600 kcal diet)	RFP 2000_Veg (2,000 kcal vegetarian diet)	RFP 2600_Veg (2,600 kcal vegetarian diet)
	kg/household/year	kg/household/year	kg/household/year	kg/household/year	kg/household/year
Vegetables	180	291	408	291	408
Fruit and Juices	134	342	342	342	342
Milk and Dairy	201	397	397	397	397
Grains	153	121	182	121	182
Red meat	87.5	46.6	56.9	0	0
Beef	51.3	27.5	33.6	0	0
Pork	35.4	18.8	23.0	0	0
Lamb/Veal	0.22	0.12	0.39	0	0
Poultry	63.5	38.8	46.6	0	0
Eggs	21.4	18.2	19.6	27.4	34.2
Fish and Seafood	11.0	29.6	37.0	0	0
Beans and Peas	6.59	14.4	24.1	14.4	24.1
Nuts and Seeds	10.6	7.58	9.47	47.4	56.8
Fats and Oils	72.2	47.3	59.4	38.5	52.3
Sweeteners	96.5	29.2	41.1	29.2	36.0
Total	1,036	1,383	1,622	1,308	1,531

Section S1. Calculation of total food loss using USDA ERS loss-adjusted food availability (LAFA) database.

Food loss at consumer level:

$$Consumer\ loss = \frac{Consumption}{(100\% - \%\ loss\ at\ consumer\ level)} - Consumption$$

Food loss at retail level:

$$Retail\ loss = \frac{(Consumption + consumer\ loss)}{(100\% - \%\ loss\ at\ retail\ level)} - (Consumption + consumer\ loss)$$

Food loss at primary level:

$$Primary\ loss = \frac{(Consumption + consumer\ loss + retail\ loss)}{(100\% - \%\ loss\ at\ primary\ level)} - (Consumption + consumer\ loss + retail\ loss)$$

$$Total\ food\ loss = consumer\ loss + retail\ loss + primary\ loss$$

Table S4. Percent of food loss at each supply chain using USDA ERS loss-adjusted food availability database.

Food Group	4-year average food loss (2007-2010)			
	Primary loss (%)	Retail loss (%)	Consumer loss (%)	Total loss (%)
Vegetables	31.9	8.48	34.8	59.3
Fruit and Juices	19.8	9.25	36.6	53.9
Milk and Dairy	0.110	11.1	22.5	31.2
Grains	0	12.0	21.8	31.2
Red meat	30.6 *	4.47	23.9	49.6
Poultry	37.0 *	3.88	18.8	50.8
Eggs	1.50	9.00	35.0	41.7
Fish and Seafood	0	8.18	34.1	39.5
Beans and Peas	0	6.00	10.0	15.4
Nuts and Seeds	0	6.00	9.18	14.6
Fats and Oils	0.139	19.2	20.7	36.0
Sweeteners	0	11.0	32.6	40.0

* Loss rate of carcass-weight to boneless-weight.

Table S5. The allocation fraction between primary and secondary product (by-product) by NAICS revenue data [2] and USDA ERS data [3].

Food Group	Fraction of primary product (%)	Fraction of by-product (%)
Vegetables	92.0	8.0
Fruit and Juices	92.0	8.0
Milk and Dairy	87.1	12.9
Grains	92.7	7.3
Beef	88.6 *	11.4 *
Pork	92.5 *	7.5 *
Other meat	92.3	7.7
Poultry	98.3	1.7
Eggs	97.0	3.0
Fish and Seafood	98.0	2.0
Beans and Peas	87.9	12.1
Nuts and Seeds	96.1	3.9
Fats and Oils	90.3	9.7
Sweeteners	88.4	11.6

* USDA ERS data was used because NAICS does not report disaggregated revenue data for each red meat.

Table S6. Food group allocation fraction for the estimation of space share of each food group at a typical supermarket and environmental burdens at retail phase and consumer phase.

Food Group	Supermarket cooling plus refrigeration	Supermarket overhead or Passenger car	Home refrigerator[1]	Food preparation or Dish washer[1]
Vegetables	10.2%	5.30%	14.0%	11.6%
Fruit and Juices	10.8%	5.63%	14.8%	12.3%
Milk and Dairy	13.0%	6.76%	17.8%	14.8%
Grains	2.31%	4.12%	-	9.02%
Red meat	16.0%	8.30%	21.9%	18.2%
Poultry	4.81%	2.50%	6.60%	5.48%
Eggs	1.49%	0.78%	2.05%	1.70%
Fish and Seafood	4.07%	2.12%	5.58%	4.64%
Beans and Peas	0.11%	0.19%	-	0.42%
Nuts and Seeds	0.21%	0.38%	-	0.84%
Fats and Oils	2.10%	1.69%	2.22%	3.69%
Sweeteners	1.24%	2.22%	-	4.86%
Total	66.4%	40.0%	85.0%	87.6%

[1] Nonalcoholic and alcoholic beverages represent the remainders of cumulative total.

Table S7. Store counts by grocery channels.

Channels	Number of stores	Area per store (m^2)	Supermarket equivalent area weighted number of stores
Supermarket	32,030	4,270	32,030
Mass Merchandiser	7,270	3,900	6,640
Convenience	185,980	430	18,870
Total	225,280	4,270	57,540

Section S2 presents a representative calculation of retail burdens for the vegetables group as an example at a typical supermarket outlet. Non-refrigerated food groups have similar reference data except for refrigeration burden. The electricity consumption per kg of vegetables was calculated based on a national average supermarket store area [4] (**Table S7**) along with the average quantity of vegetables displayed per year (estimated from LAFA data of consumer purchases plus retail losses). Similar procedures were applied to calculate refrigerant loss, natural gas, and water usage burdens. There is a typical load of 1,590 kg of refrigerant and an average annual leak rate of 20% [5]. Stand-alone refrigeration equipment has a relatively small refrigerant charge and leak rate, thus it was not accounted [6]. The estimated burdens for other food groups are presented in **Table S8**.

Section S2. Calculation of retail burdens for the vegetables group at a typical supermarket outlet.

Composition	Symbol	Composition	Symbol
Total grocery store area	$A_{G,T}$	Annual electricity burden	$V_{E,G}$
Natural gas usage	$C_{N,A}$	Electricity burden per kg displayed	$V_{E,M}$
Water consumption	$C_{W,A}$	Annual natural gas burden	$V_{N,G}$
Natural gas overhead demand	$D_{N,O}$	Natural gas burden per kg displayed	$V_{N,M}$
Annual refrigerant leak rate	$LR_{R,A}$	Annual refrigerant burden	$V_{R,G}$
Fractional total space share	$FS_{V,T}$	Refrigerant burden per kg displayed	$V_{R,M}$
Annual natural gas burden	$V_{N,G}$	Annual water usage	$V_{W,G}$
Annual water usage	$V_{W,G}$	Water usage per kg displayed	$V_{W,M}$

Electricity burden in a typical supermarket:

$$V_{E,G} = C_{E,A} \times A_{G,T} \times \left(D_{E,O} \times FS_{V,T} + D_{E,R} \times FS_{V,R}\right)$$

Refrigerant loss burden in a typical supermarket:

$$V_{R,G} = L_{R,T} \times LR_{R,A} \times FS_{V,R}$$

Natural gas burden in a typical supermarket:

$$V_{N,G} = C_{N,A} \times A_{G,T} \times D_{N,O} \times FS_{V,T}$$

Water usage burden in a typical supermarket:

$$V_{W,G} = C_{W,A} \times A_{G,T} \times FS_{V,T}$$

Electricity burden per kg of vegetables displayed:

$$V_{E,M}(\frac{kWh}{kg}) = V_{E,G}(\frac{kWh}{year}) \times \frac{Supermarket\ equivalent\ area\ weighted\ number\ of\ stores}{Total\ vegetables\ displayed\ (kg)/year}$$

Natural gas burden per kg of vegetables displayed:

$$V_{N,M}(\frac{m^3}{kg}) = V_{N,G}(\frac{m^3}{year}) \times \frac{Supermarket\ equivalent\ area\ weighted\ number\ of\ stores}{Total\ vegetables\ displayed\ (kg)/year}$$

Refrigerant burden per kg of vegetables displayed:

$$V_{R,M}(\frac{kg}{kg}) = V_{R,G}(\frac{kg}{year}) \times \frac{Supermarket\ equivalent\ area\ weighted\ number\ of\ stores}{Total\ vegetables\ displayed\ (kg)/year}$$

Water usage per kg of vegetables displayed:

$$V_{W,M}(\frac{liter}{kg}) = V_{W,G}(\frac{liter}{year}) \times \frac{Supermarket\ equivalent\ area\ weighted\ number\ of\ stores}{Total\ vegetables\ displayed\ (kg)/year}$$

Table S8. Allocated burdens in a typical supermarket and allocated burdens per kg displayed across all other food groups.

Food Group	Input	Annual burden in a typical supermarket		Burden per kg displayed	
Fruit and Juices	Electricity	184,446	kWh/year	3.52e-01	kWh/kg
	Natural gas	3,202	m^3/year	6.11e-03	m^3/kg
	Refrigerant	34.5	kg/year	6.75e-05	kg/kg
	Water	6.92e+05	liter/year	1.319	liter/kg
Milk and Dairy	Electricity	221,612	kWh/year	3.44e-01	kWh/kg
	Natural gas	3,848	m^3/year	5.97e-03	m^3/kg
	Refrigerant	41.4	kg/year	6.43e-05	kg/kg
	Water	8.31e+05	liter/year	1.291	liter/kg
Grains	Electricity	77,506	kWh/year	1.58e-01	kWh/kg
	Natural gas	2,345	m^3/year	4.79e-03	m^3/kg
	Refrigerant	7.3	kg/year	1.50e-05	kg/kg
	Water	5.07e+05	liter/year	1.034	liter/kg
Red meat	Electricity	272,041	kWh/year	1.05e+00	kWh/kg
	Natural gas	4,724	m^3/year	1.82e-02	m^3/kg
	Refrigerant	50.8	kg/year	1.96e-04	kg/kg
	Water	1.02e+06	liter/year	3.929	liter/kg
Poultry	Electricity	81,930	kWh/year	4.70e-01	kWh/kg
	Natural gas	1,423	m^3/year	8.16e-03	m^3/kg
	Refrigerant	15.3	kg/year	8.78e-05	kg/kg
	Water	3.07e+05	liter/year	1.763	liter/kg
Eggs	Electricity	25,422	kWh/year	3.13e-01	kWh/kg
	Natural gas	441	m^3/year	5.43e-03	m^3/kg
	Refrigerant	4.75	kg/year	5.84e-05	kg/kg
	Water	9.54e+04	liter/year	1.173	liter/kg
Fish and Seafood	Electricity	69,357	kWh/year	1.72e+00	kWh/kg
	Natural gas	1,204	m^3/year	2.99e-02	m^3/kg
	Refrigerant	13.0	kg/year	3.22e-04	kg/kg
	Water	2.60e+05	liter/year	6.458	liter/kg
Beans and Peas	Electricity	3,640	kWh/year	2.18e-01	kWh/kg
	Natural gas	110	m^3/year	6.61e-03	m^3/kg
	Refrigerant	0.35	kg/year	2.07e-05	kg/kg
	Water	2.38e+04	liter/year	1.427	liter/kg
Nuts and Seeds	Electricity	7,202	kWh/year	2.72e-01	kWh/kg
	Natural gas	218	m^3/year	8.24e-03	m^3/kg
	Refrigerant	0.68	kg/year	2.58e-05	kg/kg
	Water	4.71e+04	liter/year	1.780	liter/kg
Fats and Oils	Electricity	26,612	kWh/year	1.04e-01	kWh/kg
	Natural gas	225	m^3/year	8.83e-04	m^3/kg
	Refrigerant	6.66	kg/year	2.61e-05	kg/kg
	Water	4.87e+04	liter/year	0.191	liter/kg
Sweeteners	Electricity	41,715	kWh/year	1.15e-01	kWh/kg
	Natural gas	1,262	m^3/year	3.47e-03	m^3/kg
	Refrigerant	3.95	kg/year	1.09e-05	kg/kg
	Water	2.73e+05	liter/year	0.750	liter/kg

Section S3. Calculation of consumer phase for the vegetables group as an example.

Passenger car distance traveled:

$$Travel\ distance\ (\frac{km}{kg}) = 104(\frac{trip}{year}) \times 10.3(\frac{km}{trip}) \times \frac{Allocation\ fraction\ of\ vegetables\ group}{Retail\ purchased\ (kg)\ per\ household/year}$$

Home refrigerator electricity usage:

$$Electricity\ usage\ (\frac{kWh}{kg}) = 1{,}250(\frac{kWh}{year}) \times \frac{Refrigeration\ fraction\ of\ vegetables\ group}{Retail\ purchased\ (kg)\ per\ household/year}$$

Table S9. Energy consumption per kilogram of commodities in the consumer phase across all food groups.

Food Group	Passenger car distance traveled for shopping in km per kg	Home refrigeration in kWh per kg	Food preparation appliances in kWh per kg
Vegetables	0.179	0.552	1.31
Fruit and Juices	0.244	0.752	0.207
Milk and Dairy	0.239	0.736	0.482
Grains	0.192	-	1.56
Red meat	0.744	2.29	2.39
Poultry	0.326	1.01	2.52
Eggs	0.217	0.669	0.514
Fish and Seafood	1.20	3.68	1.88
Beans and Peas	0.264	-	0.562
Nuts and Seeds	0.330	-	0.568
Fats and Oils	0.150	0.232	2.58
Sweeteners	0.139	-	0.485

Table S10. Electricity consumption of food preparation appliances for each food group per household per year. The allocation was based on the household expenditure data.

Food Preparation	kWh/year per household	Vegetables	Fruit and Juices	Milk and Dairy	Grains	Red Meat	Poultry	Eggs	Fish and Seafood	Beans and Peas	Nuts and Seeds	Fats and Oils	Sweeteners
Blender	1	0.574	0.426										
Broiler	85					46.0	33.3		5.75				
Carving Knife	8	3.03	2.25			1.47	1.07		0.184				
Coffee Maker	140											140	
Deep Fryer	83	36.1				17.6	12.7		2.20			14.5	
Dishwasher	225	39.1	29.0	43.7	33.1	19.0	13.8	4.65	2.38	1.43	2.29	15.7	20.9
Egg Cooker	0.14							0.140					
Frying Pan	100	33.8				14.5	11.9	4.03	2.06			13.6	18.1
Hot Plate	90	15.6	11.6	17.5	13.3	7.60	5.51	1.86	0.951	0.572	0.916	6.27	8.38
Mixer	2		0.457	0.689	0.523								0.330
Microwave	280	55.8		62.4	47.3	17.1	19.7	6.64	3.40	2.04	3.27	22.4	29.9
Range with Oven	700	222			189	108	78.4		13.5			89.2	
Roaster	60					32.4	23.5		4.06				
Sandwich Grill	33			10.9	8.27	4.74	3.44	1.16	0.593			3.91	
Toaster	39				39.0								
Trash Compactor	50	8.68	6.44	9.71	7.36	4.22	3.06	1.03	0.528	0.318	0.509	3.48	4.65
Waffle Iron	20				20.0								
Waste Dispenser	7	1.22	0.902	1.36	1.03	0.591	0.429	0.145	0.074	0.044	0.071	0.488	0.652
Total	1,923	416	51.1	146	359	285	207	19.7	35.7	4.41	7.06	309	83.0

Table S11. Type of packaging materials used for each food group.

Food Group	Type of packaging material*
Vegetables	Flexible plastics, metal cans[7]
Fruit and Juices	Paperboard cartons, rigid and flexible plastics, metal cans[7]
Milk and Dairy	Paperboard cartons, rigid and flexible plastics, glass, aluminum, metal cans[7]
Grains	Paper bags, rigid and flexible plastics[7]
Red meat	Rigid and flexible plastics, foam, paper bags, metal cans[8]
Poultry	Rigid and flexible plastics, foam, paper bags[8]
Eggs	Paperboard carton, wood pulp, filler tray[9]
Fish and Seafood	Rigid and flexible plastics, paper bags, metal cans[8]
Beans and Peas	Flexible plastics, metal cans[7]
Nuts and Seeds	Rigid and flexible plastics, metal cans[7]
Fats and Oils	Paper bags, rigid and flexible plastics, glass[7]
Sweeteners	Rigid and flexible plastics[7]

* Corrugated box, plastic bag, wood pallet, and aluminum (foil) usage is distributed to all of each food group.

Table S12. Food packaging types and estimated amount of packaging materials used for each food group in million tons.

	Corrugated boxes	paperboard carton	Kraft paper	Rigid plastic	Flexible plastic	Glass	Wood pallet	Aluminum	Metals
Vegetables	4.51	-	-	-	1.11	-	1.08	0.051	0.432
Fruits & Juices	3.51	1.40	-	0.388	0.867	-	0.837	0.039	0.336
Milk and dairy	1.15*	2.12	-	0.476	1.86	1.00	1.03	0.048	0.413
Grains	3.28	-	0.720	0.362	0.810	-	0.782	0.037	-
Red meat	1.74	-	0.382	0.192	0.429	-	0.415	0.020	0.166
Poultry	1.17	-	0.256	0.129	0.288	-	0.278	0.013	-
Eggs	0.544	0.217	-	-	0.134	-	0.130	0.006	-
Fish/Seafood	0.270	-	-	0.030	0.067	-	0.064	0.003	0.026
Beans/Peas	0.112	-	-	0.012	0.028	-	0.027	0.001	0.011
Nuts/Seeds	0.177	-	-	0.020	0.044	-	0.042	0.002	0.017
Fats/Oils	1.71	-	0.375	0.189	0.422	0.397	0.408	0.019	-
Sweeteners	2.43	-	-	0.269	0.601	-	0.580	0.027	-
Total	20.6	3.73	1.73	2.07	6.67	1.40	5.67	0.267	1.40

* Corrugated box was not assigned to fluid milk portion (69.2%) in milk/dairy group. Fluid milk uses HDPE crate for transportation.

Table S13. Relative contribution of the food groups to the environmental impact, e.g. GHGEs per household per year across the different dietary scenarios.

Food Groups / Scenarios	CFP 2547 kcal	RFP 2000 kcal	RFP 2600 kcal	RFP 2000 kcal Veg	RFP 2600 kcal Veg
Total vegetables	0.97	1.57	2.20	1.57	2.20
Fruit and Juices	0.72	1.85	1.85	1.85	1.85
Milk and Dairy	1.17	2.31	2.31	2.31	2.31
Grains	0.45	0.35	0.53	0.35	0.53
Total red meat	3.65	1.94	2.37	0.00	0.00
Poultry	0.68	0.41	0.50	0.00	0.00
Eggs	0.16	0.14	0.15	0.21	0.26
Fish/Seafood	0.22	0.58	0.73	0.00	0.00
Beans and Peas	0.03	0.06	0.10	0.06	0.10
Nuts/Seeds/Soy	0.04	0.03	0.03	0.16	0.20
Fats and Oils	0.37	0.24	0.30	0.20	0.27
Sweeteners	0.35	0.11	0.15	0.11	0.13
Total	8.80	9.61	11.23	6.83	7.85

Table S14. Relative contribution of each food group to environmental impacts associated with dietary patterns.

CFP 2,547 kcal

Impact category	Unit	Vegeta-bles	Fruit/ Juices	Milk/ Dairy	Grains	Red meat	Poultry	Eggs	Fish/ Seafood	Beans/ Peas	Nuts/ Seeds	Fats/ Oils	Sweet-eners
Ozone depletion	kg CFC-11 eq	17.0%	16.4%	11.8%	4.20%	26.5%	7.08%	2.32%	2.16%	0.84%	1.10%	5.84%	4.78%
Global warming	kg CO_2 eq	11.04%	8.23%	13.3%	5.07%	41.5%	7.69%	1.86%	2.45%	0.31%	0.42%	4.17%	3.99%
Smog	kg O^3 eq	4.32%	3.37%	11.6%	1.43%	54.1%	13.9%	5.47%	1.29%	0.30%	0.21%	2.34%	1.72%
Acidification	kg SO_2 eq	4.84%	3.68%	11.5%	1.69%	52.5%	13.5%	5.26%	1.32%	0.33%	0.24%	2.68%	2.49%
Eutrophication	kg N eq	9.16%	5.71%	7.12%	4.74%	21.9%	30.8%	12.4%	1.52%	0.31%	0.22%	4.36%	1.72%
Carcinogenics	CTUh	17.9%	11.1%	12.9%	8.86%	23.4%	9.89%	1.72%	3.58%	0.23%	0.39%	7.06%	3.04%
Non carcinogenics	CTUh	23.1%	14.0%	8.33%	7.69%	23.2%	8.27%	1.98%	2.01%	0.24%	0.36%	5.34%	5.55%
Respiratory effects	kg PM2.5 eq	13.2%	7.87%	13.2%	7.24%	31.6%	11.1%	2.74%	3.24%	0.26%	0.32%	6.55%	2.68%
Ecotoxicity	CTUe	24.1%	13.6%	5.67%	8.49%	23.2%	7.66%	2.32%	1.27%	0.39%	0.37%	6.37%	6.68%
Fossil fuel depletion	MJ surplus	11.68%	9.60%	12.1%	5.28%	34.8%	8.92%	2.18%	4.70%	0.44%	0.63%	4.36%	5.29%

RFP 2,000 kcal

Impact category	Unit	Vegeta-bles	Fruit/ Juices	Milk/ Dairy	Grains	Red meat	Poultry	Eggs	Fish/ Seafood	Beans/ Peas	Nuts/ Seeds	Fats/ Oils	Sweet-eners
Ozone depletion	kg CFC-11 eq	21.1%	32.3%	17.9%	2.56%	10.8%	3.33%	1.52%	4.48%	1.40%	0.61%	2.94%	1.11%
Global warming	kg CO_2 eq	16.4%	19.3%	24.1%	3.68%	20.2%	4.31%	1.45%	6.07%	0.61%	0.27%	2.51%	1.11%
Smog	kg O^3 eq	7.96%	9.80%	26.1%	1.29%	32.7%	9.64%	5.29%	3.97%	0.75%	0.17%	1.74%	0.59%
Acidification	kg SO_2 eq	8.82%	10.60%	25.5%	1.51%	31.4%	9.27%	5.03%	4.02%	0.82%	0.19%	1.97%	0.85%
Eutrophication	kg N eq	15.4%	15.1%	14.5%	3.89%	12.1%	19.5%	10.9%	4.24%	0.71%	0.17%	2.96%	0.54%
Carcinogenics	CTUh	23.1%	22.5%	20.2%	5.59%	9.9%	4.81%	1.17%	7.7%	0.40%	0.22%	3.68%	0.73%
Non carcinogenics	CTUh	29.6%	28.3%	13.0%	4.83%	9.8%	4.01%	1.33%	4.30%	0.42%	0.21%	2.77%	1.33%
Respiratory effects	kg PM2.5 eq	18.8%	17.7%	22.9%	5.05%	14.8%	5.96%	2.05%	7.7%	0.49%	0.20%	3.77%	0.71%
Ecotoxicity	CTUe	32.1%	28.6%	9.2%	5.55%	10.2%	3.86%	1.63%	2.82%	0.71%	0.22%	3.44%	1.67%
Fossil fuel depletion	MJ surplus	16.3%	21.2%	20.6%	3.61%	15.9%	4.70%	1.60%	10.9%	0.84%	0.39%	2.46%	1.38%

RFP 2,600 kcal

Impact category	Unit	Vegeta-bles	Fruit/ Juices	Milk/ Dairy	Grains	Red meat	Poultry	Eggs	Fish/ Seafood	Beans/ Peas	Nuts/ Seeds	Fats/ Oils	Sweet-eners
Ozone depletion	kg CFC-11 eq	25.4%	27.7%	15.4%	3.30%	11.4%	3.43%	1.40%	4.81%	2.01%	0.65%	3.17%	1.34%
Global warming	kg CO_2 eq	19.6%	16.5%	20.6%	4.73%	21.1%	4.42%	1.34%	6.49%	0.88%	0.29%	2.69%	1.33%
Smog	kg O^3 eq	9.64%	8.47%	22.6%	1.67%	34.6%	10.00%	4.92%	4.29%	1.08%	0.19%	1.89%	0.72%
Acidification	kg SO_2 eq	10.65%	9.14%	22.0%	1.95%	33.1%	9.60%	4.67%	4.34%	1.18%	0.21%	2.14%	1.03%
Eutrophication	kg N eq	18.2%	12.8%	12.3%	4.94%	12.5%	19.8%	9.92%	4.49%	1.01%	0.18%	3.15%	0.64%
Carcinogenics	CTUh	27.2%	18.9%	17.0%	7.06%	10.2%	4.86%	1.06%	8.1%	0.57%	0.24%	3.89%	0.87%
Non carcinogenics	CTUh	34.6%	23.6%	10.9%	6.04%	10.0%	4.01%	1.20%	4.48%	0.58%	0.21%	2.90%	1.56%
Respiratory effects	kg PM2.5 eq	22.2%	15.0%	19.3%	6.40%	15.3%	6.05%	1.86%	8.1%	0.70%	0.21%	4.00%	0.85%
Ecotoxicity	CTUe	37.0%	23.5%	7.60%	6.85%	10.2%	3.81%	1.44%	2.90%	0.98%	0.22%	3.56%	1.93%
Fossil fuel depletion	MJ surplus	19.4%	18.0%	17.6%	4.61%	16.6%	4.80%	1.46%	11.6%	1.19%	0.42%	2.63%	1.65%

RFP 2,000 kcal_Veg

Impact category	Unit	Vegeta-bles	Fruit/ Juices	Milk/ Dairy	Grains	Red meat	Poultry	Eggs	Fish/ Seafood	Beans/ Peas	Nuts/ Seeds	Fats/ Oils	Sweet-eners
Ozone depletion	kg CFC-11 eq	24.9%	38.1%	21.1%	3.02%	0.0%	0.0%	2.68%	0.0%	1.66%	4.47%	2.82%	1.31%
Global warming	kg CO_2 eq	23.1%	27.1%	33.9%	5.18%	0.0%	0.0%	3.07%	0.0%	0.86%	2.41%	2.87%	1.56%
Smog	kg O^3 eq	14.0%	17.2%	45.8%	2.27%	0.0%	0.0%	13.9%	0.0%	1.31%	1.91%	2.49%	1.04%
Acidification	kg SO_2 eq	15.1%	18.1%	43.6%	2.58%	0.0%	0.0%	12.9%	0.0%	1.40%	2.08%	2.74%	1.45%
Eutrophication	kg N eq	22.0%	21.6%	20.8%	5.56%	0.0%	0.0%	23.4%	0.0%	1.02%	1.48%	3.44%	0.77%
Carcinogenics	CTUh	29.4%	28.6%	25.7%	7.11%	0.0%	0.0%	2.23%	0.0%	0.51%	1.79%	3.81%	0.93%
Non carcinogenics	CTUh	35.6%	34.1%	15.7%	5.82%	0.0%	0.0%	2.41%	0.0%	0.50%	1.54%	2.71%	1.60%
Respiratory effects	kg PM2.5 eq	25.7%	24.2%	31.3%	6.92%	0.0%	0.0%	4.21%	0.0%	0.68%	1.71%	4.20%	0.98%
Ecotoxicity	CTUe	38.0%	33.9%	10.9%	6.57%	0.0%	0.0%	2.89%	0.0%	0.84%	1.61%	3.32%	1.97%
Fossil fuel depletion	MJ surplus	23.0%	29.9%	29.1%	5.10%	0.0%	0.0%	3.39%	0.0%	1.19%	3.46%	2.83%	1.95%

RFP 2,600 kcal_Veg

Impact category	Unit	Vegeta-bles	Fruit/ Juices	Milk/ Dairy	Grains	Red meat	Poultry	Eggs	Fish/ Seafood	Beans/ Peas	Nuts/ Seeds	Fats/ Oils	Sweet-eners
Ozone depletion	kg CFC-11 eq	30.2%	33.0%	18.3%	3.92%	0.0%	0.0%	2.90%	0.0%	2.39%	4.65%	3.31%	1.40%
Global warming	kg CO_2 eq	28.1%	23.6%	29.4%	6.76%	0.0%	0.0%	3.33%	0.0%	1.25%	2.51%	3.39%	1.67%
Smog	kg O^3 eq	17.4%	15.3%	40.7%	3.02%	0.0%	0.0%	15.5%	0.0%	1.94%	2.03%	3.00%	1.14%
Acidification	kg SO_2 eq	18.6%	16.0%	38.6%	3.42%	0.0%	0.0%	14.2%	0.0%	2.06%	2.20%	3.29%	1.58%
Eutrophication	kg N eq	25.7%	18.0%	17.4%	6.96%	0.0%	0.0%	24.4%	0.0%	1.42%	1.48%	3.90%	0.79%
Carcinogenics	CTUh	34.8%	24.2%	21.7%	9.03%	0.0%	0.0%	2.36%	0.0%	0.7%	1.81%	4.38%	0.97%
Non carcinogenics	CTUh	41.7%	28.5%	13.1%	7.28%	0.0%	0.0%	2.51%	0.0%	0.70%	1.55%	3.08%	1.65%
Respiratory effects	kg PM2.5 eq	30.7%	20.7%	26.7%	8.84%	0.0%	0.0%	4.49%	0.0%	1.0%	1.75%	4.86%	1.03%
Ecotoxicity	CTUe	43.7%	27.8%	9.0%	8.09%	0.0%	0.0%	2.97%	0.0%	1.15%	1.59%	3.70%	2.00%
Fossil fuel depletion	MJ surplus	27.9%	25.9%	25.2%	6.62%	0.0%	0.0%	3.67%	0.0%	1.71%	3.59%	3.32%	2.08%

Table S15. Results of 1,000 Monte Carlo runs for uncertainty analysis associated with dietary patterns.

CFP 2,547 kcal

Impact category	Unit	Mean	Median	SD	CV	2.5%	97.5%
Ozone depletion	kg CFC-11 eq	1.08E-02	1.07E-02	7.50E-04	6.95E+00	9.45E-03	1.24E-02
Global warming	kg CO_2 eq	8.81E+03	8.76E+03	5.24E+02	5.95E+00	7.89E+03	9.95E+03
Smog	kg O^3 eq	7.88E+02	7.83E+02	6.12E+01	7.77E+00	6.76E+02	9.18E+02
Acidification	kg SO_2 eq	8.73E+01	8.67E+01	6.64E+00	7.60E+00	7.49E+01	1.02E+02
Eutrophication	kg N eq	5.42E+01	5.19E+01	1.02E+01	1.89E+01	4.08E+01	8.13E+01
Carcinogenics	CTUh	1.68E-04	8.94E-05	3.07E-04	1.83E+02	4.77E-05	7.68E-04
Non carcinogenics	CTUh	2.19E-03	1.86E-03	1.24E-03	5.68E+01	1.03E-03	5.22E-03
Respiratory effects	kg PM2.5 eq	8.25E+00	8.19E+00	8.47E-01	1.03E+01	6.81E+00	1.02E+01
Ecotoxicity	CTUe	1.21E+05	1.05E+05	6.46E+04	5.35E+01	5.49E+04	2.89E+05
Fossil fuel depletion	MJ surplus	1.28E+04	1.27E+04	7.37E+02	5.77E+00	1.14E+04	1.44E+04

RFP 2,000 kcal

Impact category	Unit	Mean	Median	SD	CV	2.5%	97.5%
Ozone depletion	kg CFC-11 eq	1.41E-02	1.40E-02	1.09E-03	7.76E+00	1.21E-02	1.63E-02
Global warming	kg CO_2 eq	9.61E+03	9.59E+03	4.64E+02	4.83E+00	8.79E+03	1.06E+04
Smog	kg O^3 eq	6.93E+02	6.91E+02	4.07E+01	5.88E+00	6.19E+02	7.78E+02
Acidification	kg SO_2 eq	7.77E+01	7.76E+01	4.57E+00	5.88E+00	6.93E+01	8.74E+01
Eutrophication	kg N eq	5.24E+01	4.91E+01	1.25E+01	2.39E+01	3.72E+01	8.58E+01
Carcinogenics	CTUh	2.11E-04	1.13E-04	3.86E-04	1.83E+02	5.99E-05	9.70E-04
Non carcinogenics	CTUh	2.75E-03	2.35E-03	1.54E-03	5.58E+01	1.35E-03	6.60E-03
Respiratory effects	kg PM2.5 eq	9.39E+00	9.29E+00	1.05E+00	1.11E+01	7.64E+00	1.17E+01
Ecotoxicity	CTUe	1.46E+05	1.27E+05	7.97E+04	5.44E+01	6.55E+04	3.53E+05
Fossil fuel depletion	MJ surplus	1.48E+04	1.48E+04	7.87E+02	5.31E+00	1.34E+04	1.65E+04

RFP 2,600 kcal

Impact category	Unit	Mean	Median	SD	CV	2.5%	97.5%
Ozone depletion	kg CFC-11 eq	1.64E-02	1.63E-02	1.24E-03	7.58E+00	1.42E-02	1.89E-02
Global warming	kg CO_2 eq	1.12E+04	1.12E+04	5.38E+02	4.79E+00	1.03E+04	1.24E+04
Smog	kg O^3 eq	8.01E+02	7.99E+02	4.71E+01	5.88E+00	7.17E+02	8.99E+02
Acidification	kg SO_2 eq	9.01E+01	9.00E+01	5.31E+00	5.89E+00	8.00E+01	1.01E+02
Eutrophication	kg N eq	6.18E+01	5.80E+01	1.49E+01	2.41E+01	4.36E+01	1.03E+02
Carcinogenics	CTUh	2.51E-04	1.34E-04	4.61E-04	1.84E+02	7.03E-05	1.15E-03
Non carcinogenics	CTUh	3.31E-03	2.81E-03	1.89E-03	5.70E+01	1.60E-03	8.01E-03
Respiratory effects	kg PM2.5 eq	1.11E+01	1.10E+01	1.24E+00	1.12E+01	9.02E+00	1.38E+01
Ecotoxicity	CTUe	1.78E+05	1.54E+05	9.78E+04	5.49E+01	7.91E+04	4.34E+05
Fossil fuel depletion	MJ surplus	1.74E+04	1.74E+04	9.05E+02	5.19E+00	1.58E+04	1.93E+04

RFP 2,000 kcal_Veg

Impact category	Unit	Mean	Median	SD	CV	2.5%	97.5%
Ozone depletion	kg CFC-11 eq	1.19E-02	1.18E-02	8.88E-04	7.47E+00	1.03E-02	1.38E-02
Global warming	kg CO_2 eq	6.81E+03	6.81E+03	3.48E+02	5.11E+00	6.17E+03	7.53E+03
Smog	kg O^3 eq	3.94E+02	3.93E+02	2.50E+01	6.36E+00	3.47E+02	4.47E+02
Acidification	kg SO_2 eq	4.54E+01	4.52E+01	2.86E+00	6.31E+00	4.01E+01	5.15E+01
Eutrophication	kg N eq	3.72E+01	3.48E+01	1.08E+01	2.91E+01	2.48E+01	6.56E+01
Carcinogenics	CTUh	1.80E-04	8.82E-05	5.95E-04	3.30E+02	4.60E-05	7.39E-04
Non carcinogenics	CTUh	2.20E-03	1.93E-03	1.07E-03	4.86E+01	1.08E-03	5.16E-03
Respiratory effects	kg PM2.5 eq	6.88E+00	6.77E+00	8.30E-01	1.21E+01	5.47E+00	8.79E+00
Ecotoxicity	CTUe	1.23E+05	1.07E+05	6.83E+04	5.57E+01	5.14E+04	2.95E+05
Fossil fuel depletion	MJ surplus	1.05E+04	1.04E+04	6.01E+02	5.75E+00	9.29E+03	1.17E+04

RFP 2,600 kcal_Veg

Impact category	Unit	Mean	Median	SD	CV	2.5%	97.5%
Ozone depletion	kg CFC-11 eq	1.37E-02	1.37E-02	9.96E-04	7.25E+00	1.19E-02	1.58E-02
Global warming	kg CO_2 eq	7.84E+03	7.83E+03	3.92E+02	4.99E+00	7.13E+03	8.66E+03
Smog	kg O^3 eq	4.44E+02	4.42E+02	2.63E+01	5.92E+00	3.94E+02	4.98E+02
Acidification	kg SO_2 eq	5.14E+01	5.12E+01	3.06E+00	5.96E+00	4.55E+01	5.78E+01
Eutrophication	kg N eq	4.45E+01	4.17E+01	1.29E+01	2.89E+01	2.98E+01	7.84E+01
Carcinogenics	CTUh	2.12E-04	1.04E-04	7.04E-04	3.31E+02	5.38E-05	8.91E-04
Non carcinogenics	CTUh	2.63E-03	2.29E-03	1.31E-03	4.97E+01	1.26E-03	6.25E-03
Respiratory effects	kg PM2.5 eq	8.07E+00	7.94E+00	9.79E-01	1.21E+01	6.45E+00	1.02E+01
Ecotoxicity	CTUe	1.49E+05	1.30E+05	8.39E+04	5.62E+01	6.18E+04	3.61E+05
Fossil fuel depletion	MJ surplus	1.21E+04	1.21E+04	6.71E+02	5.55E+00	1.08E+04	1.35E+04

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