incpen

Table for one

the energy cost to feed one person

Contents

Introduction

We lose about a fifth of our food supply between the field and the checkout (Chatham House[1]) and then a third of that which is taken home (WRAP[2]).

Much effort has been spent reducing packaging waste, both by reducing packaging at the design stage and also by increasing the amount of used packaging that is recovered and recycled. This will continue but it needs to be done in the context of the role that packaging plays in protecting food and other goods and preventing them going to waste.

This publication provides the background data from an extensive piece of research carried out by Dr Jan Kooijman, a leading Dutch expert on food supply systems in 1995[3]. It was commissioned by INCPEN to understand the material and energy requirements along the food supply chain; in particular, how those needs vary across the supply chain.

The main source of information is the UK government's National Food Survey[4] which has reported household weekly food consumption since 1940. All figures are shown per person.

The world has changed since 1995 but our diet has changed very little (see page 24). On average we still eat roughly 10 times our body weight of food in a year. The relative proportions of energy needed to provide our typical weekly food intake also remains roughly the same.

Today there is a lot more interest in understanding our use of energy in general and particularly in how to reduce our impact on global climate change.

This is why we are now publishing the details of the 18 different groups of food that were studied for the original report. It shows where energy use is greatest and therefore the "hotspots" where we should focus to reduce energy use.

To put our numbers in perspective we have included data from a source that also uses personal units. In his recent book: *Sustainable Energy – without the hot air*[5], David Mackay shows UK energy use for different aspects of daily life (see page 3).

Note that figures are for energy, not carbon dioxide equivalents and that waste treatment and disposal are not included. This means that some figures will differ from carbon footprint data.

We would be interested in receiving your views on this and in discussing what additional research we need today.

INCPEN the Industry Council for Packaging and the Environment
July 2009

Energy Perspectives

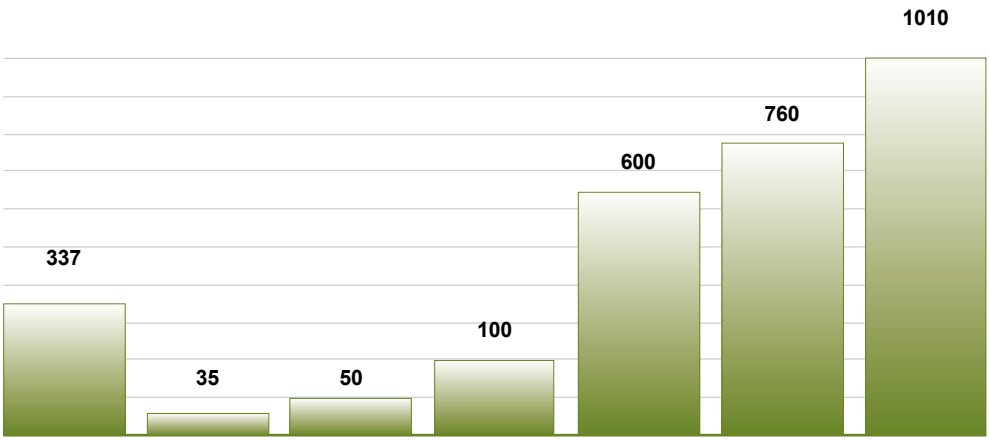
The energy figures throughout this book are shown using a common personal metric (per person) of megajoules per week (MJ/wk). A megajoule is roughly the energy a new 'energy saving' lightbulb would use if left on for a whole day (or five hours for the equivalent 'old-style' lightbulb).

1 Megajoule (MJ) ≈ 

≈ 

To provide some context for the figures in this report, we have compared them to MacKay's estimates in his recent book '*Sustainable Energy – without the hot air*[5]'.

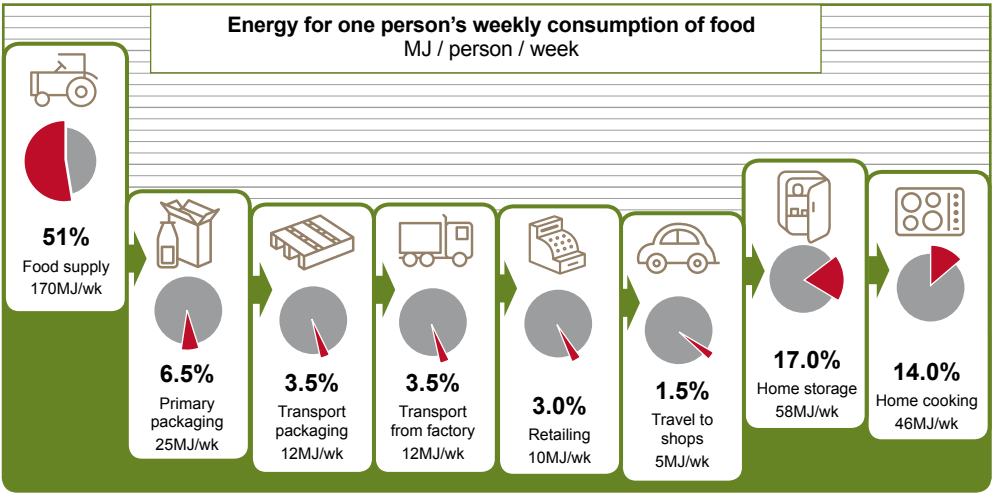
UK energy consumption
MJ / person / week



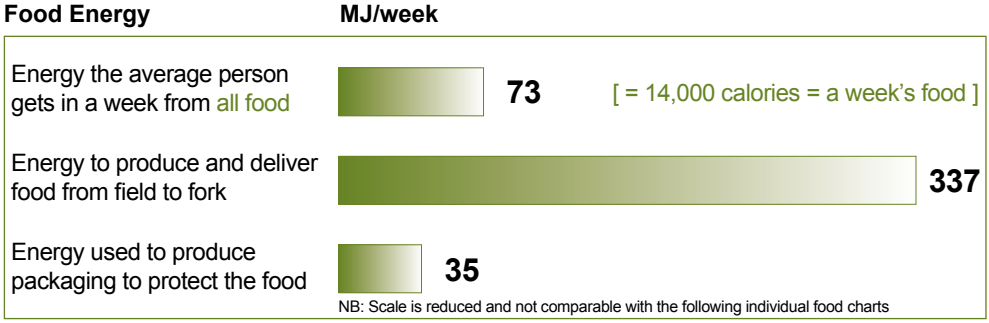
Source
Table for one

Source
Sustainable Energy – without the hot air

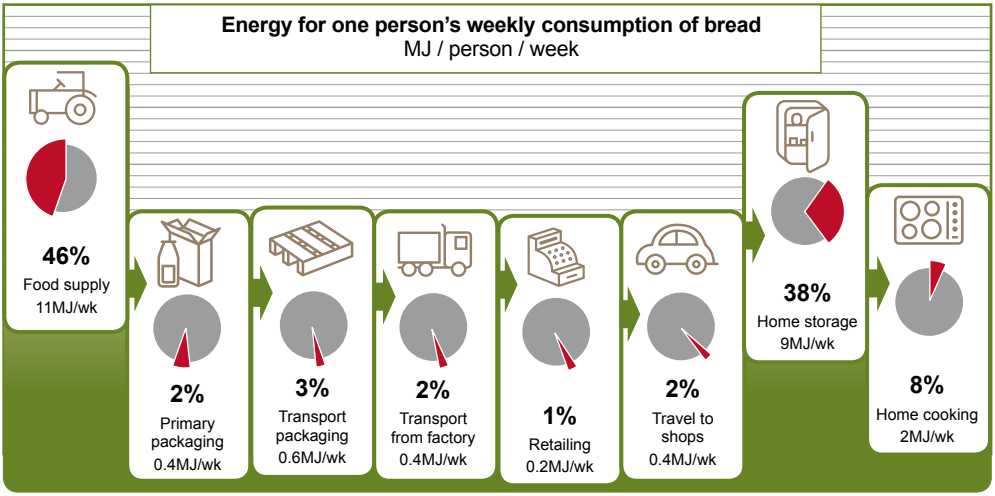
Total Food



- Packaging is the "insurance" to make sure that the energy invested in producing, growing and processing food is protected. It also ensures that the additional energy used to get that food to us –in transport, retailing, shopping, storing and cooking – does not go to waste.
- Energy to make the packaging is 10% of the supply chain energy.
- The energy used to produce, protect, distribute, store and prepare food is 5 times greater than its nutritional energy ie the average number of calories (14,000 per week) that we take in from the food we eat.



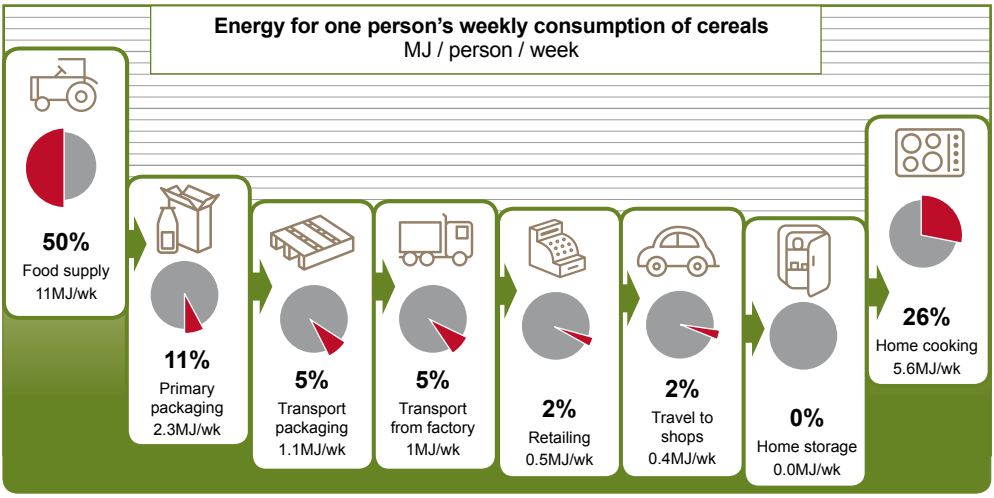
Bread



- Growing wheat to make flour to produce bread accounts for 46% of the energy in the supply chain.
- Home storage and cooking uses 46% .
- Packaging is 5%.
- Bread provides us with 16% of our calorie intake.

Food Energy	MJ/week	
Energy the average person gets in a week from bread	10	[= 2,300 calories = a white loaf]
Energy to produce and deliver food from field to fork	24	
Energy used to produce packaging to protect the food	1	

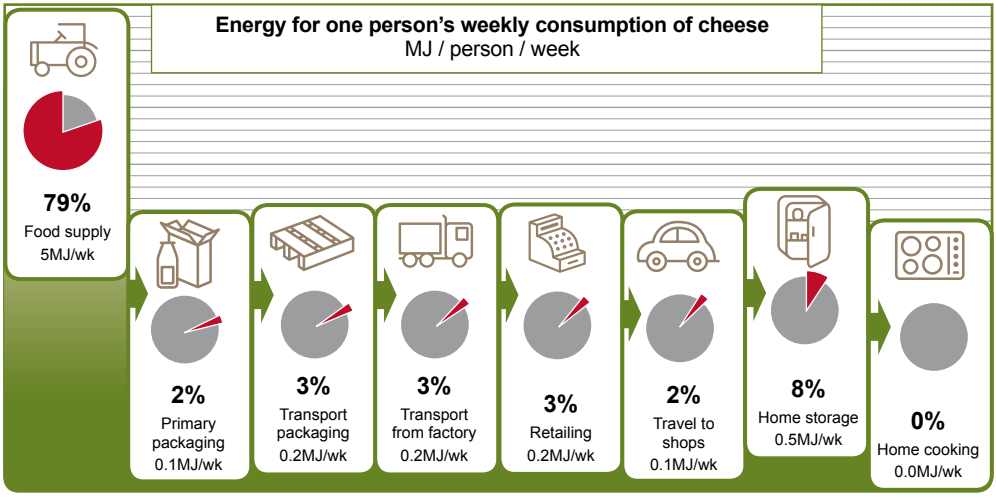
Cereals



- Growing and processing cereals accounts for 50% of supply chain energy.
- Home cooking is 26%.
- Packaging is 16%.
- Cereals provide us with 10% of our calorie intake.

Food Energy	MJ/week	
Energy the average person gets in a week from cereal products	6	[= 1,400 calories = 7 bowls cereal exc. milk / sugar]
Energy to produce and deliver food from field to fork	21.9	
Energy used to produce packaging to protect the food	3.4	

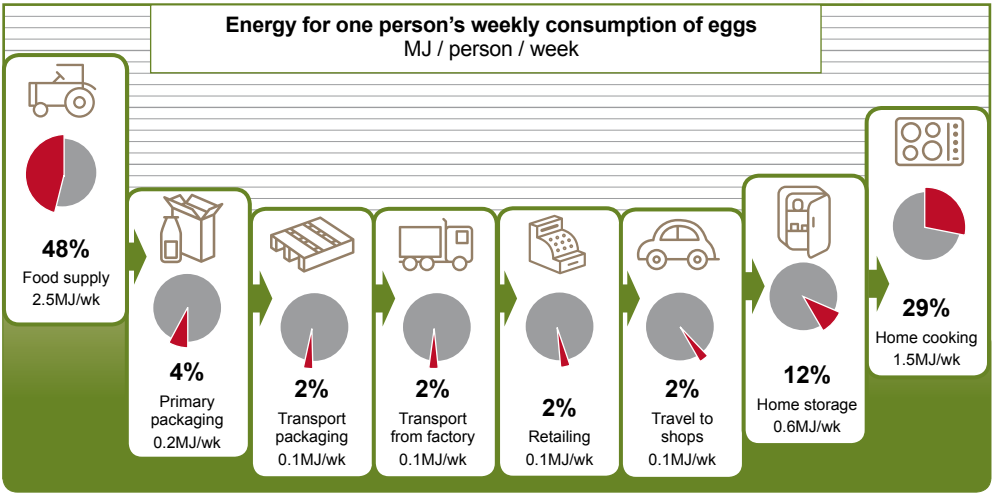
Cheese



- Producing and processing cheese accounts for 79% of supply chain energy.
- Storing it in the fridge at home for 8%.
- Packaging is 5%.
- Cheese provides us with 3% of our calorie intake.

Food Energy	MJ/week	
Energy the average person gets in a week from cheese	1.8	[= 440 calories = half a medium block cheddar]
Energy to produce and deliver food from field to fork	6.3	
Energy used to produce packaging to protect the food	0.3	

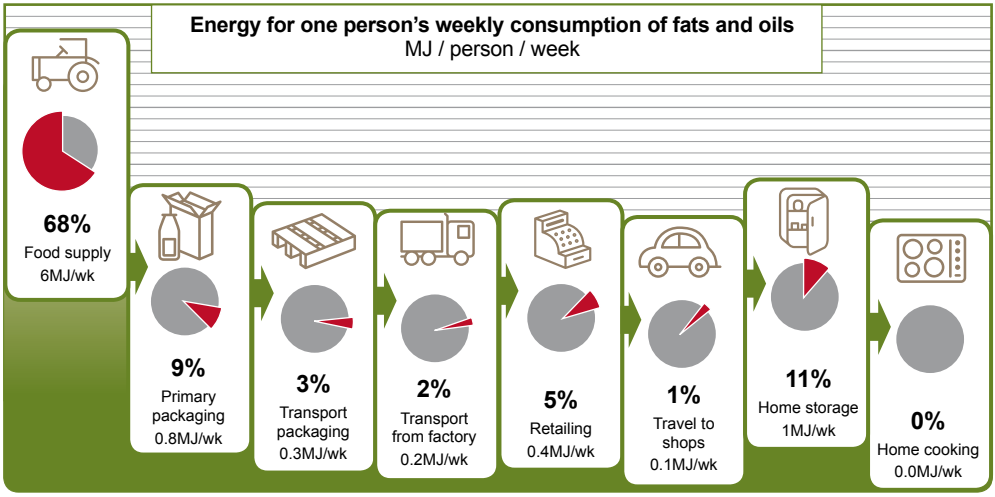
Eggs



- Producing eggs accounts for almost half of the energy (48%) in the supply chain.
- Cooking them at home uses just under a third.
- Packaging is 6%.
- Eggs provide us with 1% of our calorie intake.

Food Energy	MJ/week	
Energy the average person gets in a week from eggs	0.6	[= 150 calories = 2 small eggs]
Energy to produce and deliver food from field to fork	5.2	
Energy used to produce packaging to protect the food	0.3	

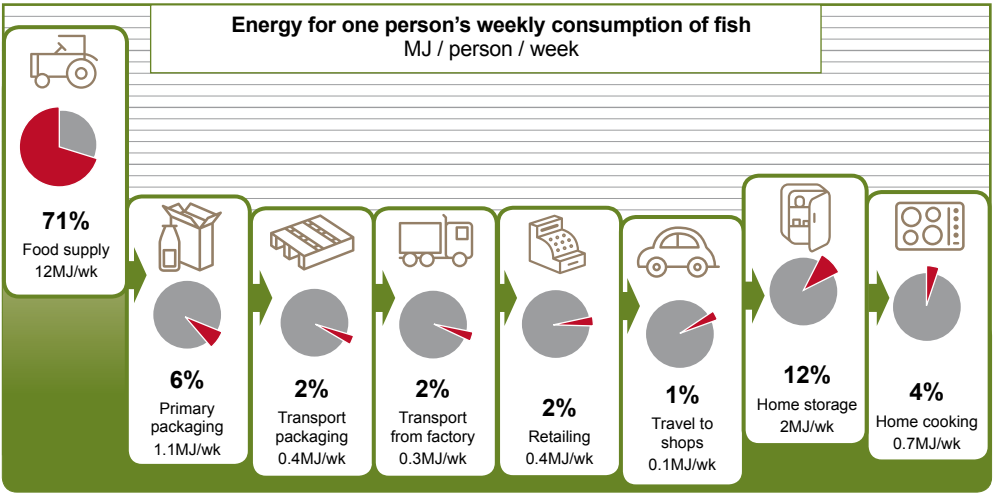
Fats and oils



- Growing and processing fats and oils accounts for 68% of supply chain energy.
- Home storage for fats is 11%.
- Packaging is 12%.
- Fats and oils provide us with 12% of our calorie intake.

Food Energy	MJ/week	
Energy the average person gets in a week from fats and oils	6.9	[= 1,700 calories = a block of margarine]
Energy to produce and deliver food from field to fork	8.8	
Energy used to produce packaging to protect the food	1.1	

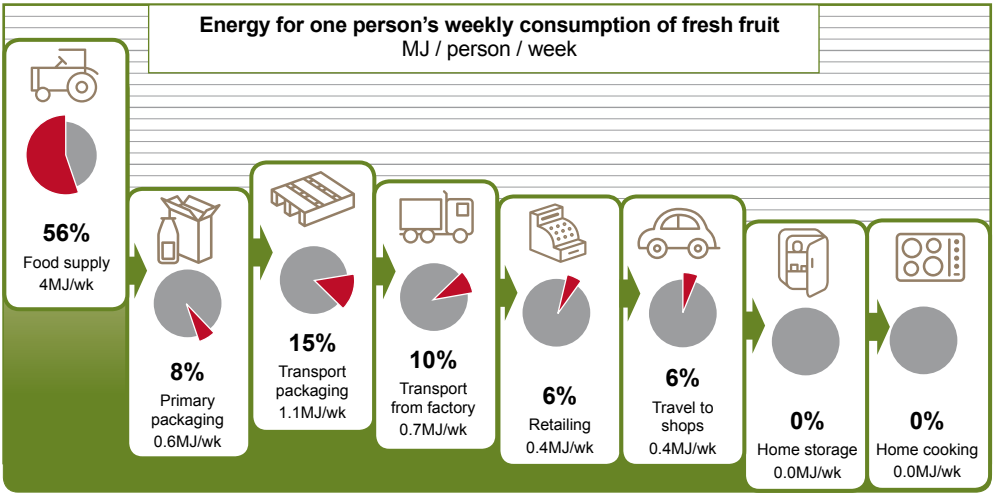
Fish



- Sourcing fish accounts for 71% of the supply chain energy.
- Packaging is 8%.
- Fish provides us with 1% of our calorie intake.

Food Energy	MJ/week	
Energy the average person gets in a week from fish	0.6	[= 150 calories = a salmon steak]
Energy to produce and deliver food from field to fork	17	
Energy used to produce packaging to protect the food	1.5	

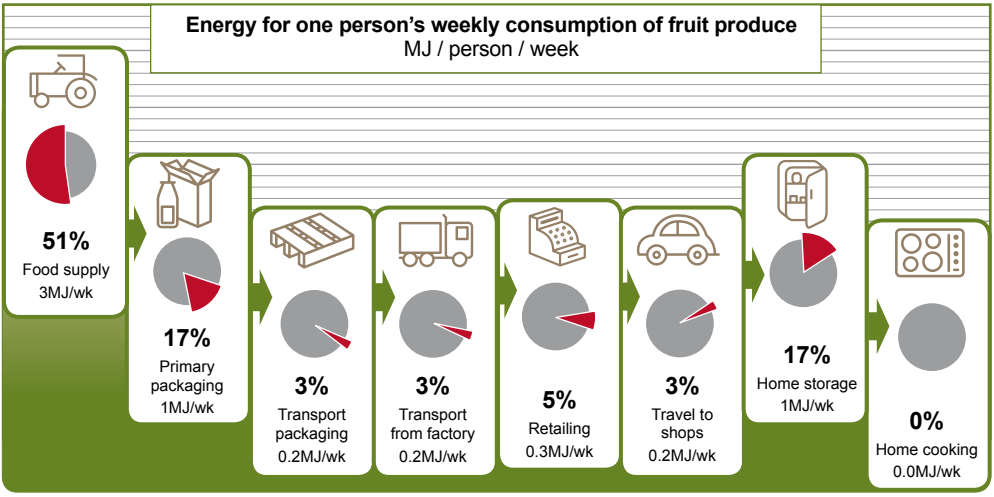
Fruit (fresh)



- Growing fruit accounts for 56% of the energy in the supply chain.
- Transport packaging accounts for 15% and primary, sales packaging 8%.
- Fresh fruit provides us with 2% of our calorie intake.

Food Energy	MJ/week	
Energy the average person gets in a week from fruit (fresh)	1.3	[= 300 calories = 10 apples]
Energy to produce and deliver food from field to fork	7.2	
Energy used to produce packaging to protect the food	1.7	

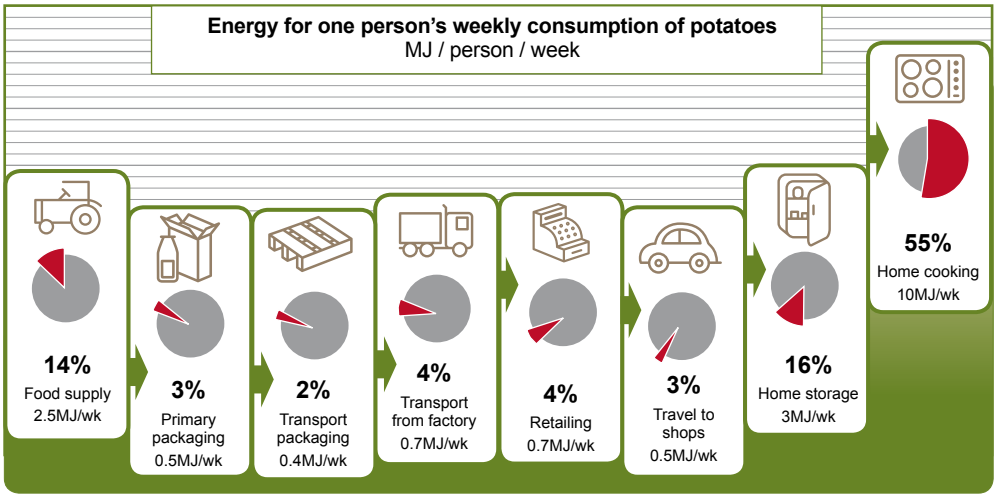
Fruit (produce)



- Growing and processing fruit produce accounts for 51% of supply chain energy.
- Home storage is 17%.
- Packaging is 20%.
- Fruit produce provides us with 1.5% of our calorie intake.

Food Energy	MJ/week	
Energy the average person gets in a week from fruit produce	0.9	[= 200 calories = a large tin of peaches in syrup]
Energy to produce and deliver food from field to fork	5.9	
Energy used to produce packaging to protect the food	1.2	

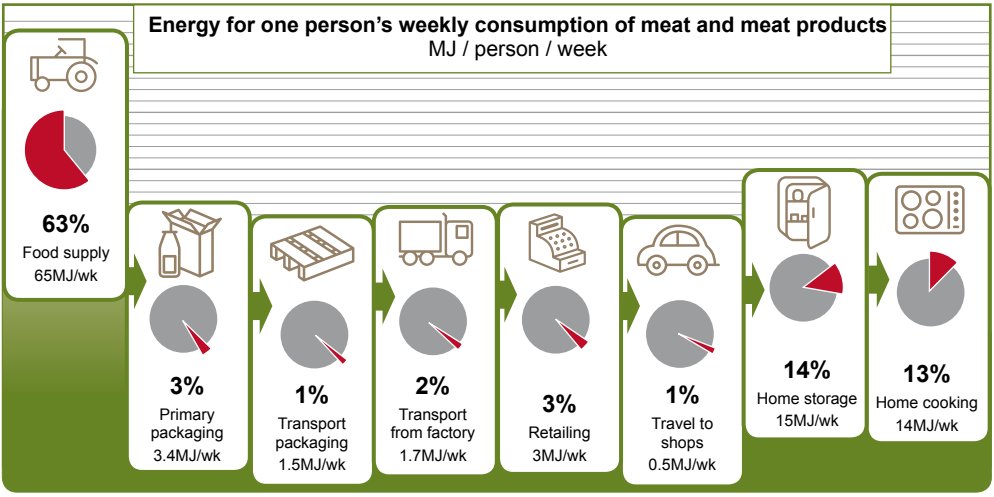
Potatoes (includes potato products)



- Growing and processing potatoes accounts for 14% of supply chain energy.
- The largest energy use (55%) is cooking potatoes at home. That is why is makes sense to cook them in a microwave or keep the lid on the pan when boiling them.
- Packaging is 5%.
- Potatoes provide us with 6% of our calorie intake.

Food Energy	**MJ/week**	
Energy the average person gets in a week from potatoes	**3.3**	[= 800 calories = 4 large jacket potatoes]
Energy to produce and deliver food from field to fork	**18.3**	
Energy used to produce packaging to protect the food	**0.9**	

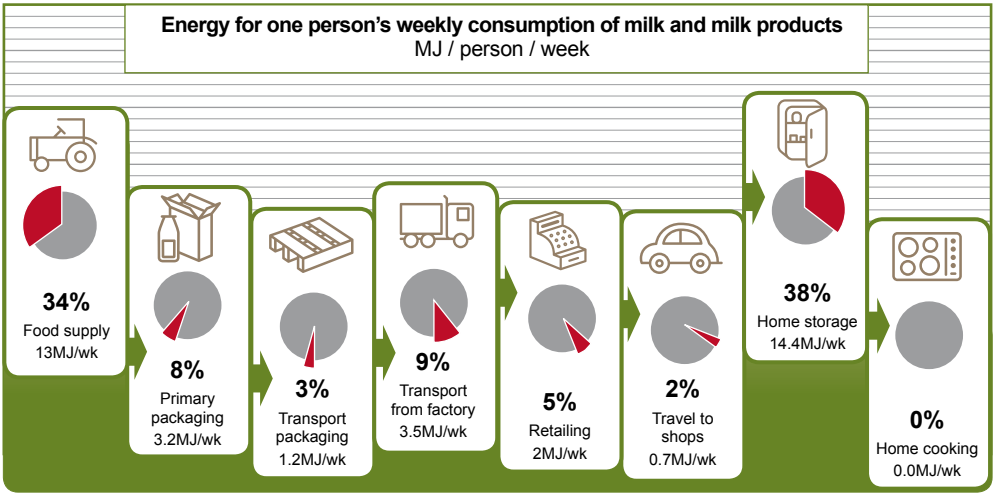
Meat (includes meat products)



- Rearing and processing meat accounts for more than half (63%) of the energy in the supply chain.
- Storing and cooking food at home uses just under a third.
- Packaging is 4%.
- Meat provides us with 12% of our calorie intake.

Food Energy	**MJ/week**
Energy the average person gets in a week from meat	**7** [= 1,700 calories = 24 rashers of bacon]
Energy to produce and deliver food from field to fork	**104**
Energy used to produce packaging to protect the food	**4.9**

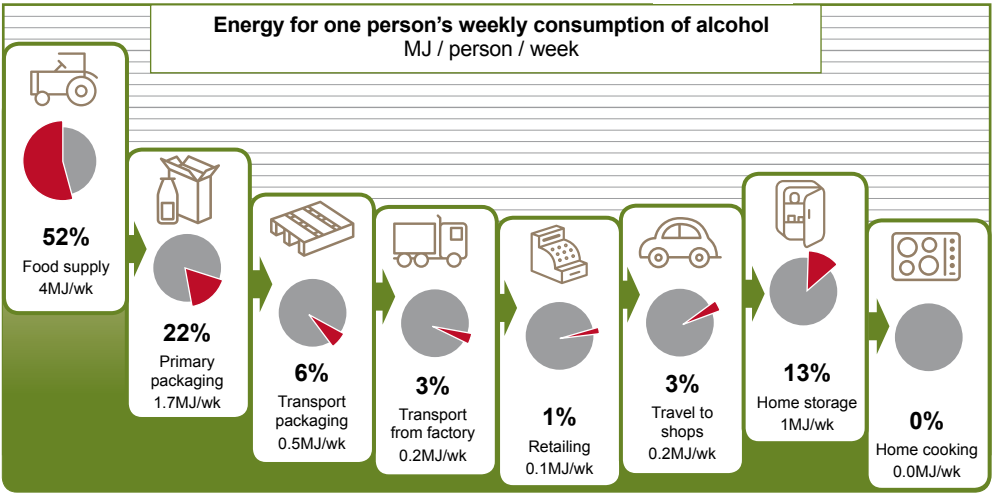
Milk (includes milk products)



- Storing milk at home is the largest single energy requirement (38%) in milk supply.
- Packaging is 11%.
- Milk and milk products provide us with 8% of our calorie intake.

Food Energy	**MJ/week**	
Energy the average person gets in a week from milk	**4.4**	[= 1,100 calories = 4 pints of semi-skimmed]
Energy to produce and deliver food from field to fork	**38**	
Energy used to produce packaging to protect the food	**4.4**	

Alcohol

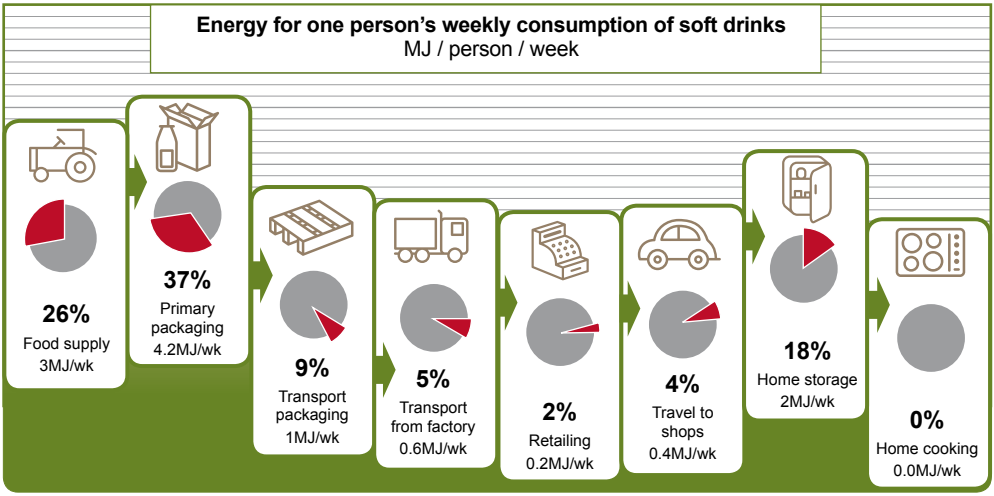


- Producing the raw materials for alcoholic drinks and processing them accounts for over half the supply chain energy.
- Packaging is 28%. Like soft drinks these containers are the most widely recycled which offsets much of the energy invested in packaging production.
- Alcohol provides us with 1% of our calorie intake.

Food Energy	MJ/week	
Energy the average person gets in a week from alcohol	0.7	[= 160 calories = 1 pint of lager]
Energy to produce and deliver food from field to fork	7.7	
Energy used to produce packaging to protect the food	2.2	

NB: This is in-home consumption of alcohol only.

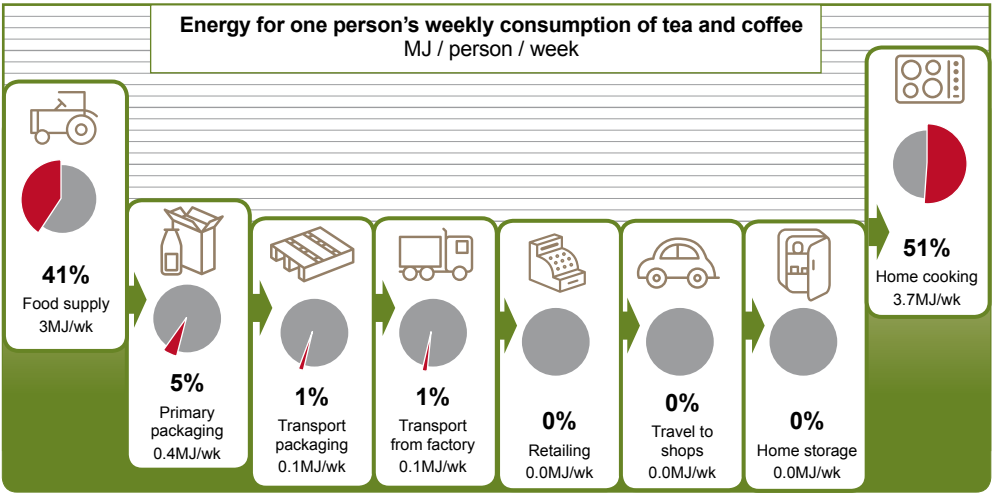
Soft drinks



- Soft drinks are the only food group where it takes more energy to make the packaging (46%) than the product (26%).
- However, as well as containing and preserving the drinks, the packaging also has to retain the carbonation. The materials used for drinks packaging typically have a high scrap value and it is no coincidence that drinks containers are the most widely recycled type of packaging. Roughly 60% are recycled in the UK which significantly offsets the energy use.
- Soft drinks provide us with 4% of our calorie intake.

Food Energy	MJ/week	
Energy the average person gets in a week from soft drinks	2.6	[= 600 calories = 5 cans of cola]
Energy to produce and deliver food from field to fork	11.4	
Energy used to produce packaging to protect the food	5.2	

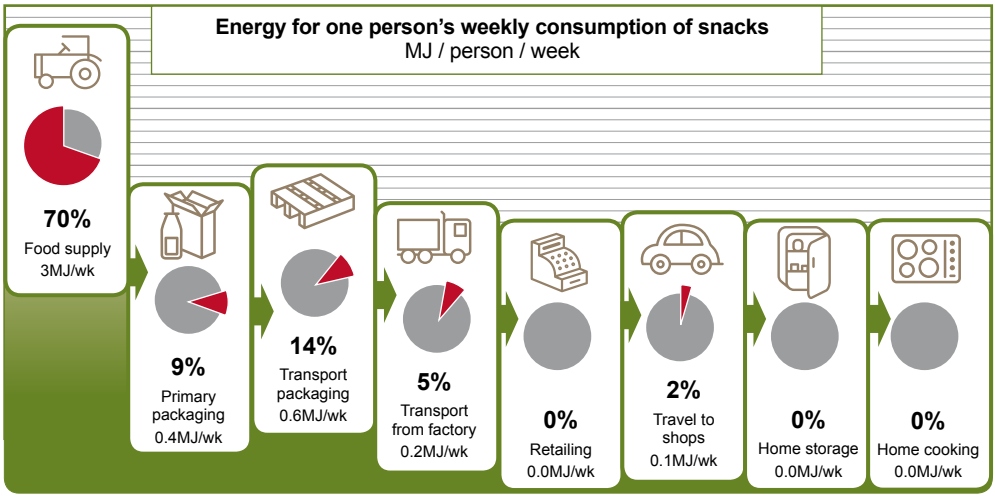
Tea and coffee



- Boiling water at home to make a cup of tea or coffee accounts for more than half (51%) of the energy used in the supply chain. That is why it is important not to boil more water than is needed at any one time.
- Growing and processing tea and coffee accounts for 41% of the energy in the supply chain.
- Packaging is 6%.
- Tea and coffee provide us with less than 1% of our calorie intake.

Food Energy	MJ/week	
Energy the average person gets in a week from tea/coffee	0.01	[= < 10 calories = 15–20 cups excluding milk and sugar]
Energy to produce and deliver food from field to fork	7.3	
Energy used to produce packaging to protect the food	0.5	

Snacks

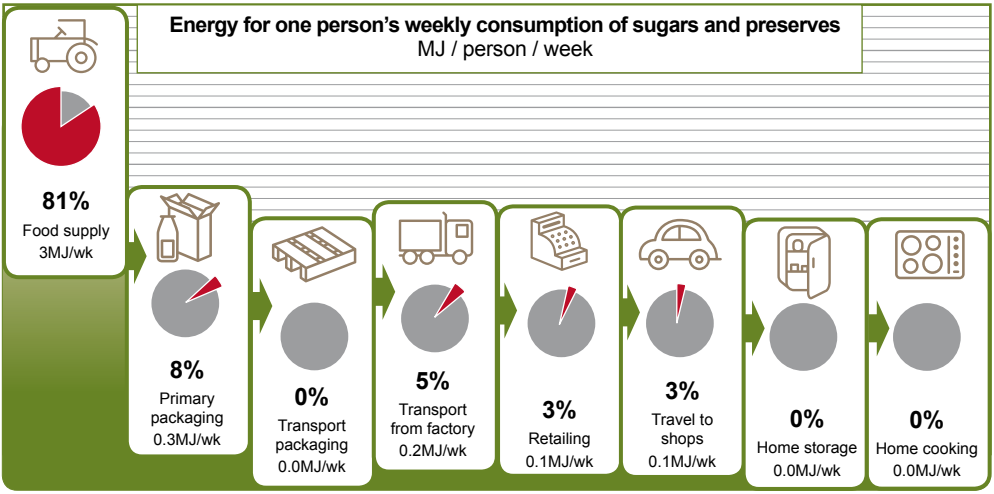


- Producing the raw materials for snacks and processing them accounts for 70% of supply chain energy.
- Packaging is 23%.
- Snacks provide us with 11% of our calorie intake.

Food Energy	MJ/week	
Energy the average person gets in a week from snacks	6.8	[= 1,600 calories = 4 chocolate bars]
Energy to produce and deliver food from field to fork	4.3	
Energy used to produce packaging to protect the food	1	

NB: Snacks include a wide variety of products (nuts, crisps & chocolate) with very different calorific values and supply chain energy.

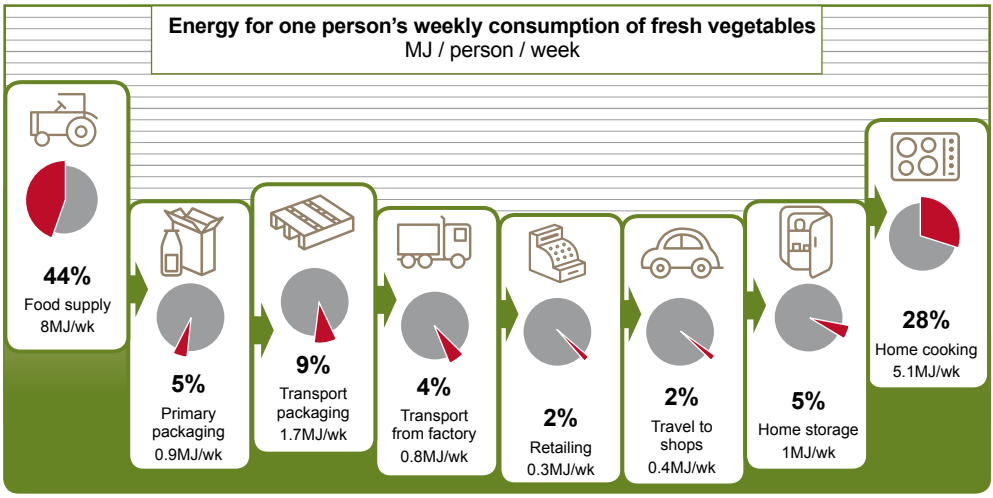
Sugar (includes preserves)



- Growing and processing sugar accounts for 81% of supply chain energy.
- Packaging is 8%.
- Sugar provides us with 6% of our calorie intake.

Food Energy	**MJ/week**	
Energy the average person gets in a week from sugar	**3.8**	[= 900 calories = 30 heaped teaspoons sugar]
Energy to produce and deliver food from field to fork	**3.7**	
Energy used to produce packaging to protect the food	**0.3**	

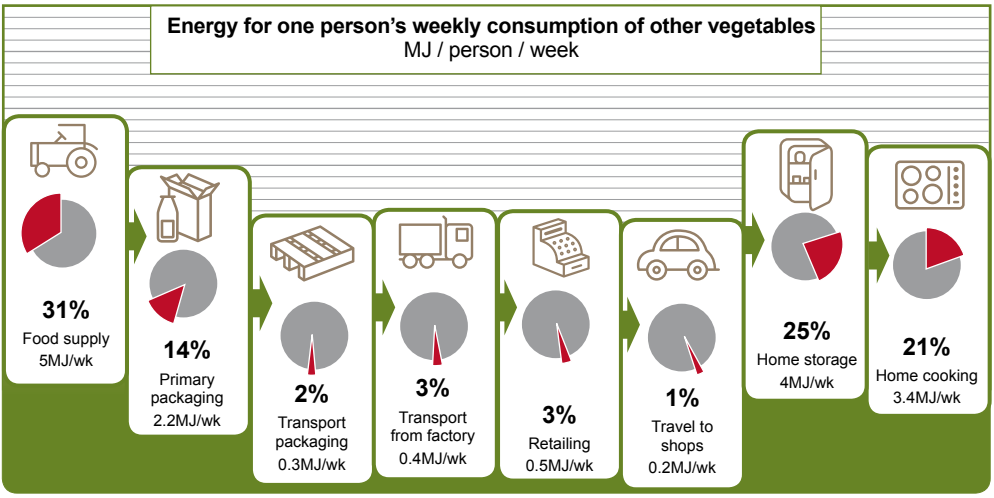
Vegetables (fresh)



- Growing vegetables accounts for 44% of the energy in the supply chain.
- Cooking them at home uses just under a third.
- Packaging is 14%.
- Fresh vegetables provide us with 1% of our calorie intake.

Food Energy	MJ/week	
Energy the average person gets in a week from fresh vegetables	0.4	[= 100 calories = 10 large carrots]
Energy to produce and deliver food from field to fork	18.2	
Energy used to produce packaging to protect the food	2.6	

Vegetables (other)

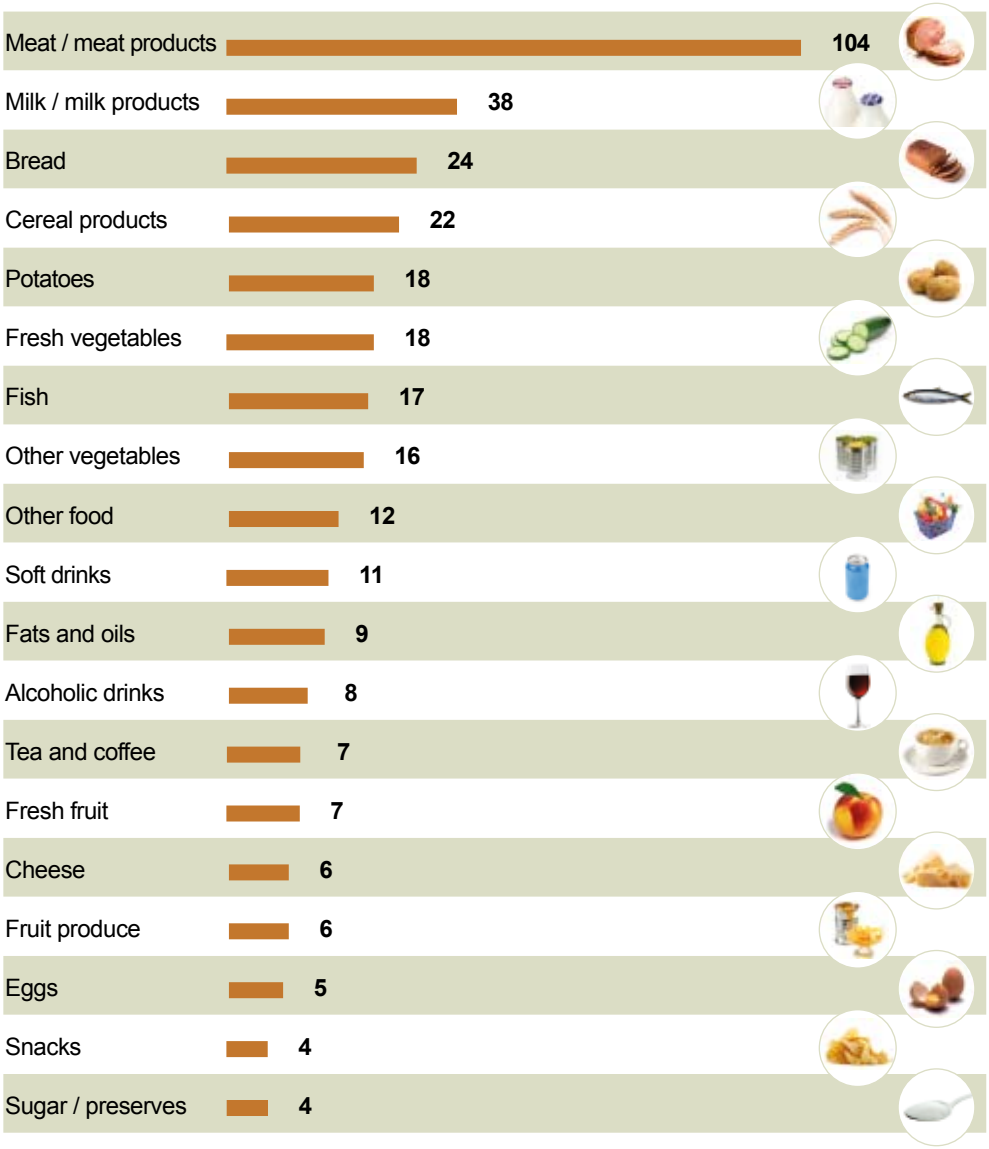


- Growing and processing other vegetables accounts for 31% of supply chain energy.
- Home storage and cooking is nearly half (46%).
- Packaging is 16%.
- Other vegetables provide us with 3% of our calorie intake.

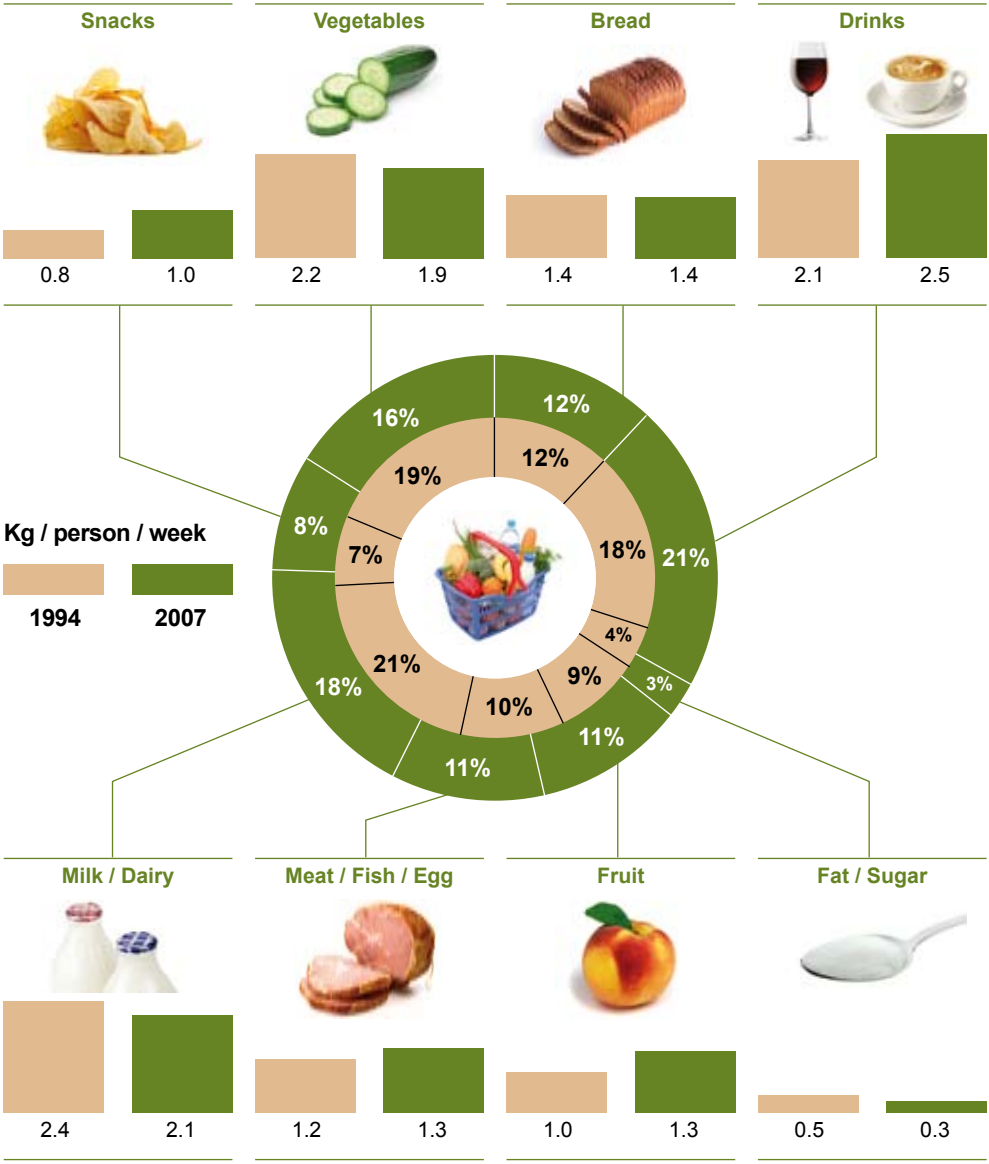
Food Energy	MJ/week	
Energy the average person gets in a week from other vegetables	1.9	[= 450 calories = a large can of baked beans]
Energy to produce and deliver food from field to fork	16	
Energy used to produce packaging to protect the food	2.5	

Overview

Energy (MJ) for a week's supply of food for one person



Weekly food consumption 1994 / 2007



Tables

UK household purchased quantities of food and drink in 1994 and 2007.
Averages per person per week (pp/pw) showing approximate energy content.

Sector	Total chain MJ pp/pw	1994 grams pp/pw	2007 grams pp/pw	1994 MJ	2007 MJ
Alcoholic drinks	7.7	552	772	0.7	0.9
Bread	24	1060	890	9.9	8.3
Cereal products	21.9	376	536	6.0	8.6
Cheese	6.3	106	119	1.8	2.1
Eggs	5.2	102	96	0.6	0.6
Fats and oils	8.8	235	181	6.9	5.3
Fish	17	148	165	0.6	0.7
Fresh fruit	7.2	665	855	1.3	1.7
Fresh vegetables	18.2	734	790	0.4	0.5
Fruit products	5.9	374	426	0.9	1.0
Meat / meat prod.	104.1	981	1029	7.1	7.5
Milk / milk prod.	38	2265	1984	4.4	3.9
Non-alc. drinks	11.4	1513	1656	2.6	2.9
Other foods	11.7	462	721	3.6	5.6
Other vegetables	16	427	350	1.9	1.6
Potato products	18.3	1084	781	3.3	2.4
Snacks / confect.	4.3	324	319	6.8	6.7
Sugar / presverves	3.7	225	125	3.8	2.1
Tea, coffee etc	7.3	75	56	0.0	0.0

Source: Food Standards Agency: Adjusted National Food Survey Figures 1994, Expenditure and Food Survey Figures 2007

Estimated food energy levels by food sector, using representative foods.

Sector	Representative example used for energy calculations			
	Food code	Description	kcal per 100g	KJ per 100g
Alcoholc drinks	17-211	Lager	29	121
Bread	11-468	White bread, sliced	219	931
Cereal products	11-490	Cornflakes	376	1601
Cheese	12-346	Cheese, cheddar, English	416	1725
Eggs	12-918	Eggs, chicken, whole, raw	151	627
Fats and oils	17-018	Margarine, hard, animal and vegetable fats	719	2954
Fish	16-339	Tuna, canned in brine, drained	99	422
Fresh fruit	14-102	Apples, eating, average, raw	47	199
Fresh vegetables	13-453	Lettuce, average, raw	14	59
Fruit products	14-189	Peaches, canned in syrup	55	233
Meat / meat prod.	18-325	Chicken breast, grilled, meat and skin	173	728
Milk / milk prod.	12-419	Semi-skimmed milk, pasteurised, winter	47	196
Non-alc. drinks	17-175	Cola	41	174
Other foods	17-328	Sandwich spread	186	778
Other vegetables	13-044	Baked beans, canned in tomato sauce	84	355
Potato products	13-476	Old potatoes, boiled in salted water	72	306
Snacks / confect.	17-493	KitKat	500	2098
Sugar / presverves	17-063	Sugar, white	394	1680
Tea, coffee etc	17-152	Coffee, infusion, average	2	8

Tables and references

Energy requirements along the food supply chain, MJ / person / week

Product	Food Supply	Primary Packaging	Transport Packaging	Transport from factory	Retailing	Travel to shops	Home storage	Home cooking	Total
Bread	11.0	0.4	0.6	0.4	0.2	0.4	9.0	2.0	24
Cereal products	11.0	2.3	1.1	1.0	0.5	0.4	0.0	5.6	21.9
Cheese	5.0	0.1	0.2	0.2	0.2	0.1	0.5	0.0	6.3
Eggs	2.5	0.2	0.1	0.1	0.1	0.1	0.6	1.5	5.2
Fats and oil	6.0	0.8	0.3	0.2	0.4	0.1	1.0	0.0	8.8
Fish	12.0	1.1	0.4	0.3	0.4	0.1	2.0	0.7	17
Fresh fruit	4.0	0.6	1.1	0.7	0.4	0.4	0.0	0.0	7.2
Fruit products	3.0	1.0	0.2	0.2	0.3	0.2	1.0	0.0	5.9
Fresh vegetables	8.0	0.9	1.7	0.8	0.3	0.4	1.0	5.1	18.2
Other vegetables	5.0	2.2	0.3	0.4	0.5	0.2	4.0	3.4	16
Potato products	2.5	0.5	0.4	0.7	0.7	0.5	3.0	10.0	18.3
Meat / meat products	65.0	3.4	1.5	1.7	3.0	0.5	15.0	14.0	104.1
Milk / milk products	13.0	3.2	1.2	3.5	2.0	0.7	14.4	0.0	38
Alcoholic drinks	4.0	1.7	0.5	0.2	0.1	0.2	1.0	0.0	7.7
Soft drinks	3.0	4.2	1.0	0.6	0.2	0.4	2.0	0.0	11.4
Tea, coffee etc	3.0	0.4	0.1	0.1	0.0	0.0	0.0	3.7	7.3
Snacks / confectionary	3.0	0.4	0.6	0.2	0.0	0.1	0.0	0.0	4.3
Sugar / preserves	3.0	0.3	0.0	0.2	0.1	0.1	0.0	0.0	3.7
Other foods	6.0	1.1	0.3	0.3	0.4	0.2	3.0	0.4	11.7
Total	**170**	**24.8**	**11.6**	**11.8**	**9.8**	**5.1**	**57.5**	**46.4**	**337**

Where the energy is below 0.1 MJ it is shown as zero. Source: INCPEN, Environmental Impact of Packaging - Performance in the food supply chain. 1995

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INCPEN is a research organisation, which draws together an influential group of companies who share a vision of the future where all production, distribution, and consumption are sustainable. It aims to:

- ensure that policy on packaging makes a positive contribution to sustainability
- encourage industry to minimise the environmental impact of packaging and packaged goods and continuously improve packaging
- explain the role of packaging in society.

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