



SUPPORTING INFORMATION FOR:

Usubiaga, A., I. Butnar, and P. Schepelmann. 2017. Wasting food, wasting resources: Potential environmental savings through food waste reductions. *Journal of Industrial Ecology*.

Summary

This supporting information includes a table showing correspondence between the products in the Food Balance Sheets, EXIOBASE and the grouping used in this article; and a table showing correspondence between food-related services and other services, and EXIOBASE products. It also includes information about processing food waste data in food-related services and final consumers. Lastly, it includes additional results information.

Methods

Correspondence tables

Table S1: Correspondence between the products in the Food Balance Sheets, EXIOBASE and the grouping used in this article

This paper	EXIO Code	EXIOBASE	FAO_FBS
Other processed products	p15.i	Food products nec	Wheat and products
Cereals - Excluding Beer	p01.c	Cereal grains nec	Barley and products
Cereals - Excluding Beer	p01.c	Cereal grains nec	Maize and products
Cereals - Excluding Beer	p01.c	Cereal grains nec	Rye and products
Cereals - Excluding Beer	p01.c	Cereal grains nec	Oats
Cereals - Excluding Beer	p01.c	Cereal grains nec	Millet and products
Cereals - Excluding Beer	p01.c	Cereal grains nec	Sorghum and products
Cereals - Excluding Beer	p01.c	Cereal grains nec	Cereals, Other
Vegetables, fruit, nuts	p01.d	Vegetables, fruit, nuts	Potatoes and products
Vegetables, fruit, nuts	p01.d	Vegetables, fruit, nuts	Cassava and products
Vegetables, fruit, nuts	p01.d	Vegetables, fruit, nuts	Sweet potatoes
Vegetables, fruit, nuts	p01.d	Vegetables, fruit, nuts	Roots, Other
Vegetables, fruit, nuts	p01.d	Vegetables, fruit, nuts	Yams
Other crops	p01.f	Sugar cane, sugar beet	Sugar cane
Other crops	p01.f	Sugar cane, sugar beet	Sugar beet
Other processed products	p15.h	Sugar	Sugar non-centrifugal
Other processed products	p15.h	Sugar	Sugar (Raw Equivalent)
Other processed products	p15.h	Sugar	Sweeteners, Other
Vegetables, fruit, nuts	p01.d	Vegetables, fruit, nuts	Beans
Vegetables, fruit, nuts	p01.d	Vegetables, fruit, nuts	Peas
Vegetables, fruit, nuts	p01.d	Vegetables, fruit, nuts	Pulses, Other and products
Vegetables, fruit, nuts	p01.d	Vegetables, fruit, nuts	Nuts and products
Other crops	p01.e	Oil seeds	Soyabeans
Other crops	p01.e	Oil seeds	Groundnuts (Shelled Eq)
Other crops	p01.e	Oil seeds	Sunflower seed
Other crops	p01.e	Oil seeds	Rape and Mustardseed
Other crops	p01.e	Oil seeds	Cottonseed
Vegetables, fruit, nuts	p01.d	Vegetables, fruit, nuts	Coconuts - Incl Copra
Other crops	p01.e	Oil seeds	Sesame seed

This paper	EXIO Code	EXIOBASE	FAO_FBS
Other crops	p01.e	Oil seeds	Palm kernels
Vegetables, fruit, nuts	p01.d	Vegetables, fruit, nuts	Olives (including preserved)
Other crops	p01.e	Oil seeds	Oilcrops, Other
Other processed products	p15.e	Products of vegetable oils and fats	Soyabean Oil
Other processed products	p15.e	Products of vegetable oils and fats	Groundnut Oil
Other processed products	p15.e	Products of vegetable oils and fats	Sunflowerseed Oil
Other processed products	p15.e	Products of vegetable oils and fats	Rape and Mustard Oil
Other processed products	p15.e	Products of vegetable oils and fats	Cottonseed Oil
Other processed products	p15.e	Products of vegetable oils and fats	Palmkernel Oil
Other processed products	p15.e	Products of vegetable oils and fats	Palm Oil
Other processed products	p15.e	Products of vegetable oils and fats	Coconut Oil
Other processed products	p15.e	Products of vegetable oils and fats	Sesameseed Oil
Other processed products	p15.e	Products of vegetable oils and fats	Olive Oil
Other processed products	p15.e	Products of vegetable oils and fats	Ricebran Oil
Other processed products	p15.e	Products of vegetable oils and fats	Maize Germ Oil
Other processed products	p15.e	Products of vegetable oils and fats	Oilcrops Oil, Other
Vegetables, fruit, nuts	p01.d	Vegetables, fruit, nuts	Tomatoes and products
Vegetables, fruit, nuts	p01.d	Vegetables, fruit, nuts	Onions
Vegetables, fruit, nuts	p01.d	Vegetables, fruit, nuts	Vegetables, Other
Vegetables, fruit, nuts	p01.d	Vegetables, fruit, nuts	Oranges, Mandarines
Vegetables, fruit, nuts	p01.d	Vegetables, fruit, nuts	Lemons, Limes and products
Vegetables, fruit, nuts	p01.d	Vegetables, fruit, nuts	Grapefruit and products
Vegetables, fruit, nuts	p01.d	Vegetables, fruit, nuts	Citrus, Other
Vegetables, fruit, nuts	p01.d	Vegetables, fruit, nuts	Bananas
Vegetables, fruit, nuts	p01.d	Vegetables, fruit, nuts	Plantains
Vegetables, fruit, nuts	p01.d	Vegetables, fruit, nuts	Apples and products
Vegetables, fruit, nuts	p01.d	Vegetables, fruit, nuts	Pineapples and products
Vegetables, fruit, nuts	p01.d	Vegetables, fruit, nuts	Dates
Vegetables, fruit, nuts	p01.d	Vegetables, fruit, nuts	Grapes and products (excl wine)
Vegetables, fruit, nuts	p01.d	Vegetables, fruit, nuts	Fruits, Other
Other crops	p01.h	Crops nec	Coffee and products
Other crops	p01.h	Crops nec	Cocoa Beans and products
Other crops	p01.h	Crops nec	Tea (including mate)

This paper	EXIO Code	EXIOBASE	FAO_FBS
Other crops	p01.h	Crops nec	Pepper
Other crops	p01.h	Crops nec	Pimento
Other crops	p01.h	Crops nec	Cloves
Other crops	p01.h	Crops nec	Spices, Other
Beverages	p15.j	Beverages	Wine
Beverages	p15.j	Beverages	Beer
Beverages	p15.j	Beverages	Beverages, Fermented
Beverages	p15.j	Beverages	Beverages, Alcoholic
Beverages	p15.j	Beverages	Alcohol, Non-Food
Other processed products	p15.i	Food products nec	Infant food
Meat	p15.a	Products of meat cattle	Bovine Meat
Meat	p15.d	Meat products nec	Mutton & Goat Meat
Meat	p15.b	Products of meat pigs	Pigmeat
Meat	p15.c	Products of meat poultry	Poultry Meat
Meat	p15.d	Meat products nec	Meat, Other
Meat	p15.d	Meat products nec	Offals, Edible
Other processed products	p15.i	Food products nec	Fats, Animals, Raw
Dairy (inc. Milk)	p15.f	Dairy products	Butter, Ghee
Dairy (inc. Milk)	p15.f	Dairy products	Cream
Other animal products	p01.k	Poultry	Eggs
Other animal products	p01.m	Animal products nec	Honey
Fish and fish products	p15.k	Fish products	Freshwater Fish
Fish and fish products	p15.k	Fish products	Demersal Fish
Fish and fish products	p15.k	Fish products	Pelagic Fish
Fish and fish products	p15.k	Fish products	Marine Fish, Other
Fish and fish products	p15.k	Fish products	Crustaceans
Fish and fish products	p15.k	Fish products	Cephalopods
Fish and fish products	p15.k	Fish products	Molluscs, Other
Fish and fish products	p15.k	Fish products	Meat, Aquatic Mammals
Fish and fish products	p15.k	Fish products	Aquatic Animals, Others
Fish and fish products	p15.k	Fish products	Aquatic Plants
Fish and fish products	p15.k	Fish products	Fish, Body Oil
Fish and fish products	p15.k	Fish products	Fish, Liver Oil
Other processed products	p15.g	Processed rice	Rice (Milled Equivalent)
Dairy (inc. Milk)	p15.f	Dairy products	Milk - Excluding Butter
Other processed products	p15.i	Food products nec	Miscellaneous

Table S2: Correspondence between food-related services and other services, and EXIOBASE products

This paper	EXIO Code	EXIOBASE
Other services	p45	Construction work
Other services	p45.w	Secondary construction material for treatment, Re-processing of secondary construction material into aggregates
Other services	p50.a	Sale, maintenance, repair of motor vehicles, motor vehicles parts, motorcycles, motor cycles parts and accessories
Other services	p50.b	Retail trade services of motor fuel
Other services	p51	Wholesale trade and commission trade services, except of motor vehicles and motorcycles
Other services	p52	Retail trade services, except of motor vehicles and motorcycles; repair services of personal and household goods
Food-related services	p55	Hotel and restaurant services
Food-related services	p60.1	Railway transportation services
Other services	p60.2	Other land transportation services
Other services	p60.3	Transportation services via pipelines
Food-related services	p61.1	Sea and coastal water transportation services
Food-related services	p61.2	Inland water transportation services
Food-related services	p62	Air transport services
Other services	p63	Supporting and auxiliary transport services; travel agency services
Other services	p64	Post and telecommunication services
Other services	p65	Financial intermediation services, except insurance and pension funding services
Other services	p66	Insurance and pension funding services, except compulsory social security services
Other services	p67	Services auxiliary to financial intermediation
Other services	p70	Real estate services
Other services	p71	Renting services of machinery and equipment without operator and of personal and household goods
Other services	p72	Computer and related services
Other services	p73	Research and development services
Other services	p74	Other business services
Food-related services	p75	Public administration and defence services; compulsory social security services
Food-related services	p80	Education services
Food-related services	p85	Health and social work services
Other services	p90.1.a	Food waste for treatment: incineration
Other services	p90.1.b	Paper waste for treatment: incineration
Other services	p90.1.c	Plastic waste for treatment: incineration
Other services	p90.1.d	Inert/metal waste for treatment: incineration
Other services	p90.1.e	Textiles waste for treatment: incineration

This paper	EXIO Code	EXIOBASE
Other services	p90.1.f	Wood waste for treatment: incineration
Other services	p90.1.g	Oil/hazardous waste for treatment: incineration
Other services	p90.2.a	Food waste for treatment: biogasification and land application
Other services	p90.2.b	Paper waste for treatment: biogasification and land application
Other services	p90.2.c	Sewage sludge for treatment: biogasification and land application
Other services	p90.3.a	Food waste for treatment: composting and land application
Other services	p90.3.b	Paper and wood waste for treatment: composting and land application
Other services	p90.4.a	Food waste for treatment: waste water treatment
Other services	p90.4.b	Other waste for treatment: waste water treatment
Other services	p90.5.a	Food waste for treatment: landfill
Other services	p90.5.b	Paper for treatment: landfill
Other services	p90.5.c	Plastic waste for treatment: landfill
Other services	p90.5.d	Inert/metal/hazardous waste for treatment: landfill
Other services	p90.5.e	Textiles waste for treatment: landfill
Other services	p90.5.f	Wood waste for treatment: landfill
Food-related services	p91	Membership organisation services n.e.c.
Food-related services	p92	Recreational, cultural and sporting services
Food-related services	p93	Other services
Food-related services	p95	Private households with employed persons
Food-related services	p99	Extra-territorial organizations and bodies

Table S3: Geographic aggregation used

This paper	GEO_EXIO	GEO
EU28	AT	Austria
EU28	BE	Belgium
EU28	BG	Bulgaria
EU28	CY	Cyprus
EU28	CZ	Czech Republic
EU28	DE	Germany
EU28	DK	Denmark
EU28	EE	Estonia
EU28	ES	Spain
EU28	FI	Finland
EU28	FR	France
EU28	GR	Greece
EU28	HR	Croatia
EU28	HU	Hungary
EU28	IE	Ireland

This paper	GEO_EXIO	GEO
EU28	IT	Italy
EU28	LT	Lithuania
EU28	LU	Luxemburg
EU28	LV	Latvia
EU28	MT	Malta
EU28	NL	Netherlands
EU28	PL	Poland
EU28	PT	Portugal
EU28	RO	Romania
EU28	SE	Sweden
EU28	SI	Slovenia
EU28	SK	Slovakia
EU28	GB	United Kingdom
US	US	United States
WA	JP	Japan
CN	CN	China
WL	CA	Canada
WA	KR	Korea
BR	BR	Brazil
IN	IN	India
WL	MX	Mexico
RU	RU	Russia
AU	AU	Australia
WE	CH	Switzerland
WM	TR	Turkey
WA	TW	Taiwan
WE	NO	Norway
WA	ID	Indonesia
WF	ZA	South Africa
WA	WA	Rest of the world Asia and Pacific
WL	WL	Rest of the world America
WE	WE	Rest of the world Europe
WF	WF	Rest of the world Africa
WM	WM	Rest of the world Middle East

Processing food waste data

Food-related services

WRAP (2013) provides sector-specific data on food purchases and food waste (excluding beverages). According to the study, around 16% of the food is wasted, 4% of which is unavoidable and 12% avoidable or possibly avoidable. The composition of food waste though is given for the hospitality sector as a whole and

includes products whose composition is well-known (e.g. potato-based products, fruit and vegetables, meat and fish) and others that are more difficult to identify (e.g. inseparable plate scrapings, whole servings, etc.) (see Table S4).

Table S4: Composition of food waste in UK hospitality sector

Product	Avoidable	Possibly avoidable and avoidable
Potato and potato product	2%	21%
Fruit and vegetables	15%	15%
Bread and bakery	0%	12%
Pasta and rice	0%	7%
Meat and fish	0%	6%
Inseparable plate scrapings	0%	7%
Whole servings	0%	2%
Category <2%	3%	4%
Other food waste	6%	0%
Other food waste	6%	0%
<i>Total</i>	<i>26%</i>	<i>74%</i>

Source: WRAP (2013)

The nature of some of the food waste products in the WRAP study hampers an accurate mapping to the foodstuffs represented in FAO's Food Balance Sheets (FBS). We have used a crude correspondence table to assign preliminary waste fractions to FBS products. These waste fractions have been multiplied by the total food supplied by the service industry, which has been estimated after splitting the food supply data from FBS into food-related services and final consumers using monetary shares available in the MRIO table, and constraint so that total unavoidable and avoidable food waste represents 4% and 12% of the food supplied by food-related services (i.e. the original values in the WRAP study). The final waste fractions obtained through this procedure are shown in Table S6. The waste fraction for beverages has been assumed to be the same as for households.

Final consumers

We have used the waste shares available from (WRAP 2009) (see Table S5) and assigned them to FBS products. As in the previous case, these have been then mapped to the EXIOBASE classification and finally to the product grouping used to represent the results. The food final waste fractions are available in Table S6.

Table S5: Household food waste in UK

Product	Unavoidable	Possibly avoidable	Avoidable
Fresh vegetables and salads	6%	19%	20%
Drink	4%	0%	8%
Fresh fruit	19%	3%	17%
Meat and fish	9%	3%	11%
Bakery	0%	6%	32%
Dairy and eggs	1%	0%	8%
Meals (home-made and pre-prepared)	0%	1%	35%
Processed vegetables and salad	0%	0%	14%
Cake and desserts	0%	0%	14%
Staple foods	0%	0%	15%
Condiments, sauces, herbs & spices	0%	1%	20%
Oil and fat	1%	12%	4%
Confectionery and snacks	0%	0%	6%
Processed fruit	0%	0%	16%
Other	0%	92%	8%

Source: Based on WRAP (2009)

Table S6: Avoidable and possibly avoidable food waste fractions used for food-related services and final consumers

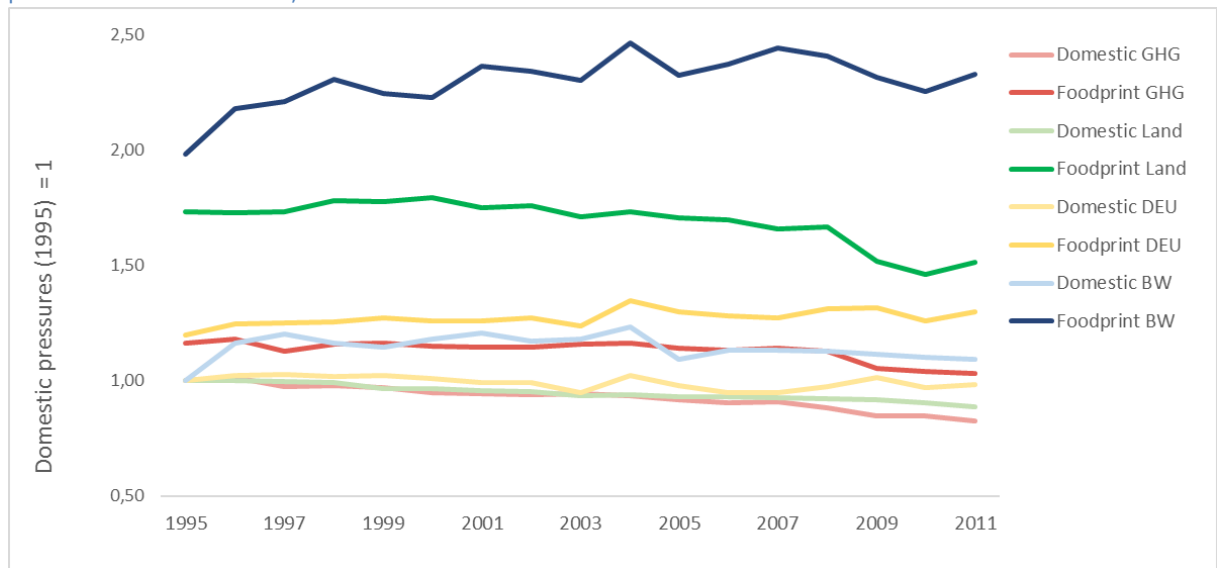
Product	Food-related services (%)	Final consumers (%)
Beverages	8%	8%
Cereals - Excluding Beer	20%	15%
Dairy (inc. Milk)	8%	8%
Fish and fish products	12%	20%
Meat	4%	14%
Other animal products	13%	9%
Other crops	11%	12%
Other processed products	9%	29%
Vegetables, fruit, nuts	23%	28%

Limitations

The food waste shares used here are considered quite uncertain due to the diverging product classifications in the different databases used, which hampers an accurate mapping. More details on the limitations of the food waste data used here are provided in the main text.

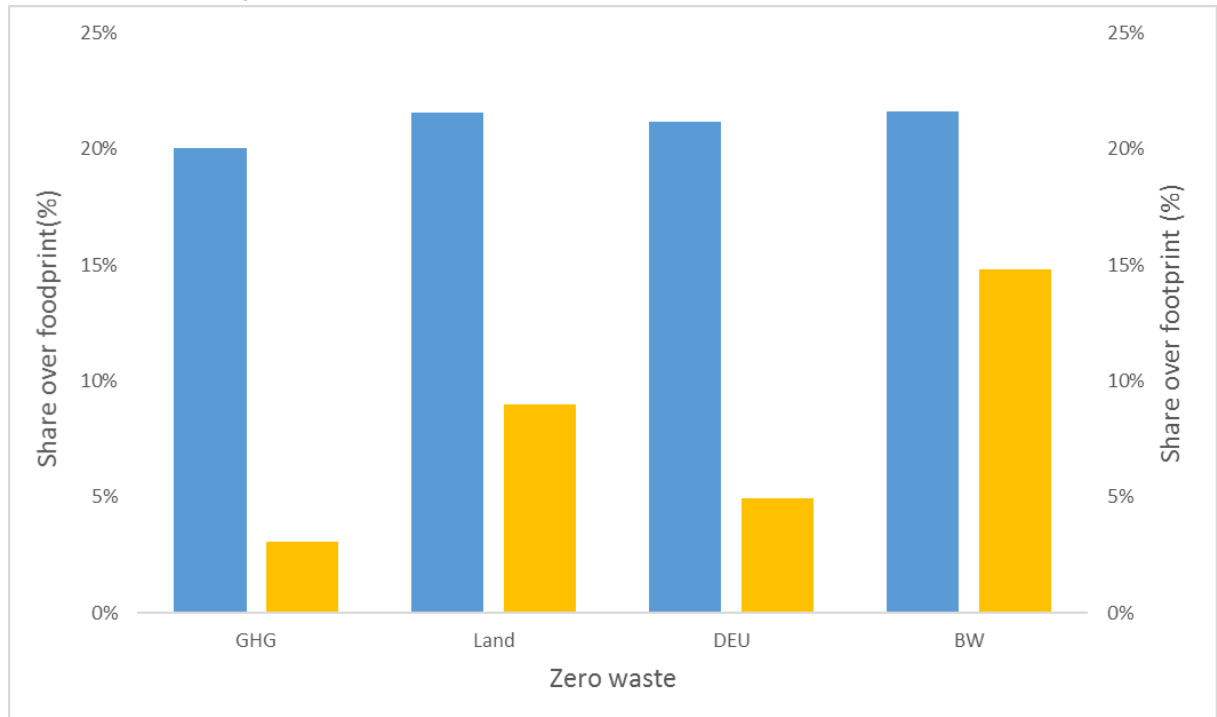
Results

Figure S1: Evolution of domestic environmental pressures and foodprints relative to domestic pressures in 1995 in EU28, 1995-2011



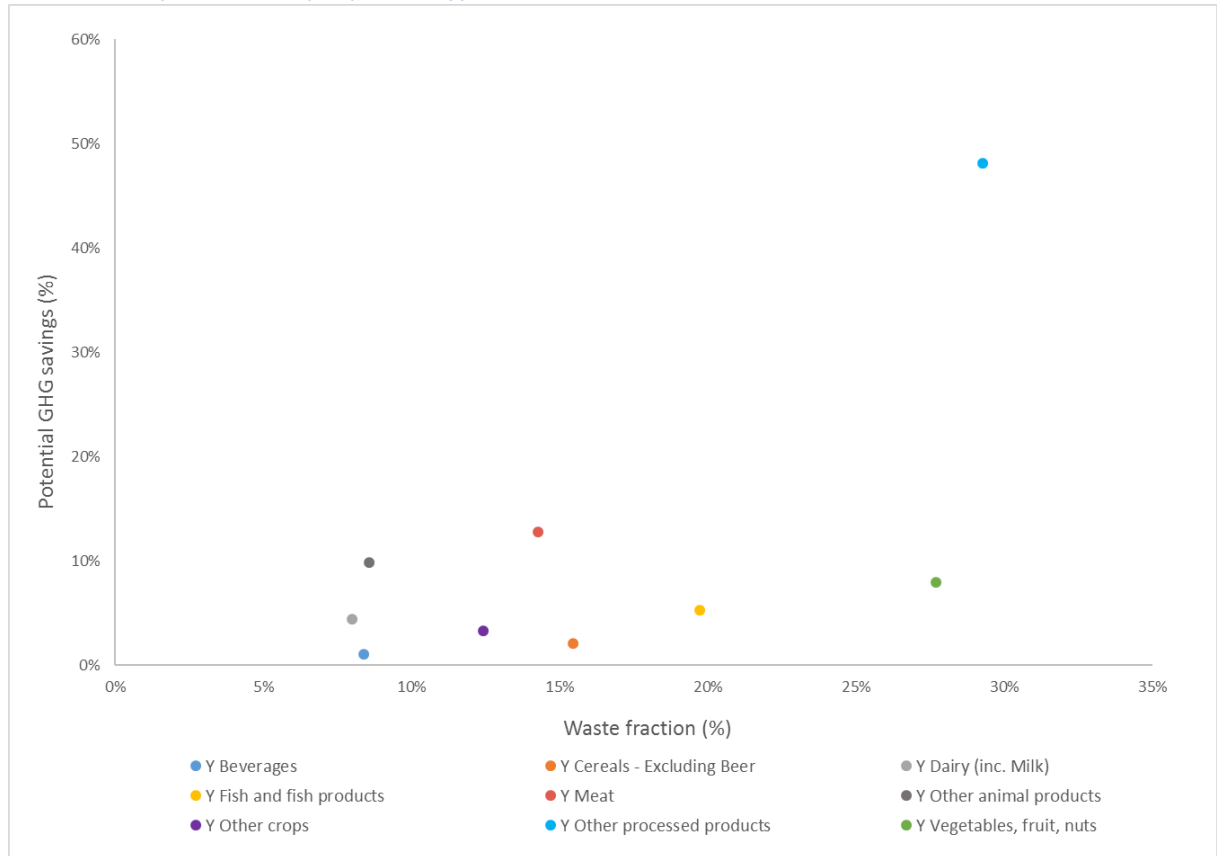
Note: DEU Domestic extraction used, BW Blue water consumption
 Source: own calculations using EXIOBASE v3.3

Figure S2: Environmental savings from reducing avoidable and possibly avoidable consumer food waste to zero in EU28, 2011



Note: DEU Domestic extraction used, BW Blue water consumption
 Source: own calculations using EXIOBASE v3.3 and WRAP (2009, 2013)

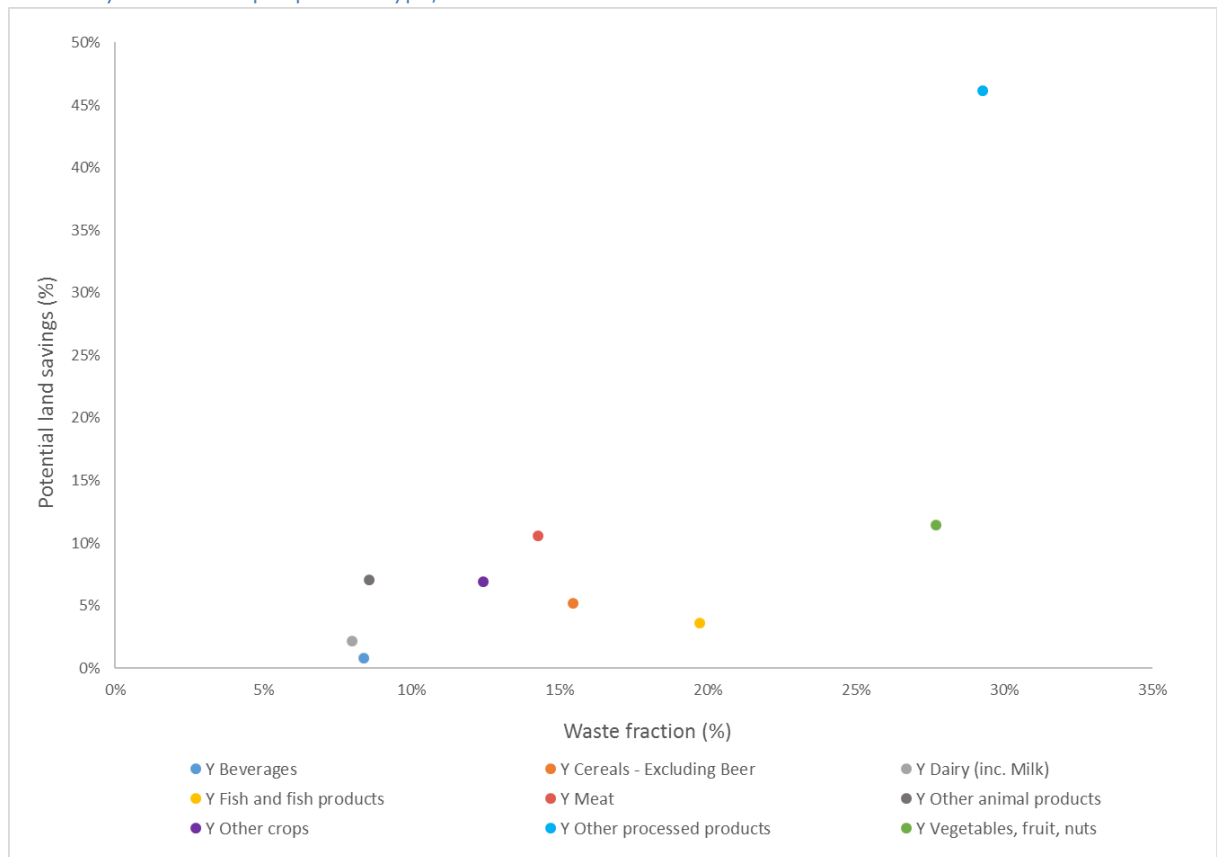
Figure S3: Environmental relevance (GHG emissions) and fraction of avoidable and possibly avoidable food wasted by households per product type, 2011



Note: The Y prefix in the legend refers to final consumers (mainly households).

Source: own calculations using EXIOBASE v3.3 and WRAP (2009, 2013)

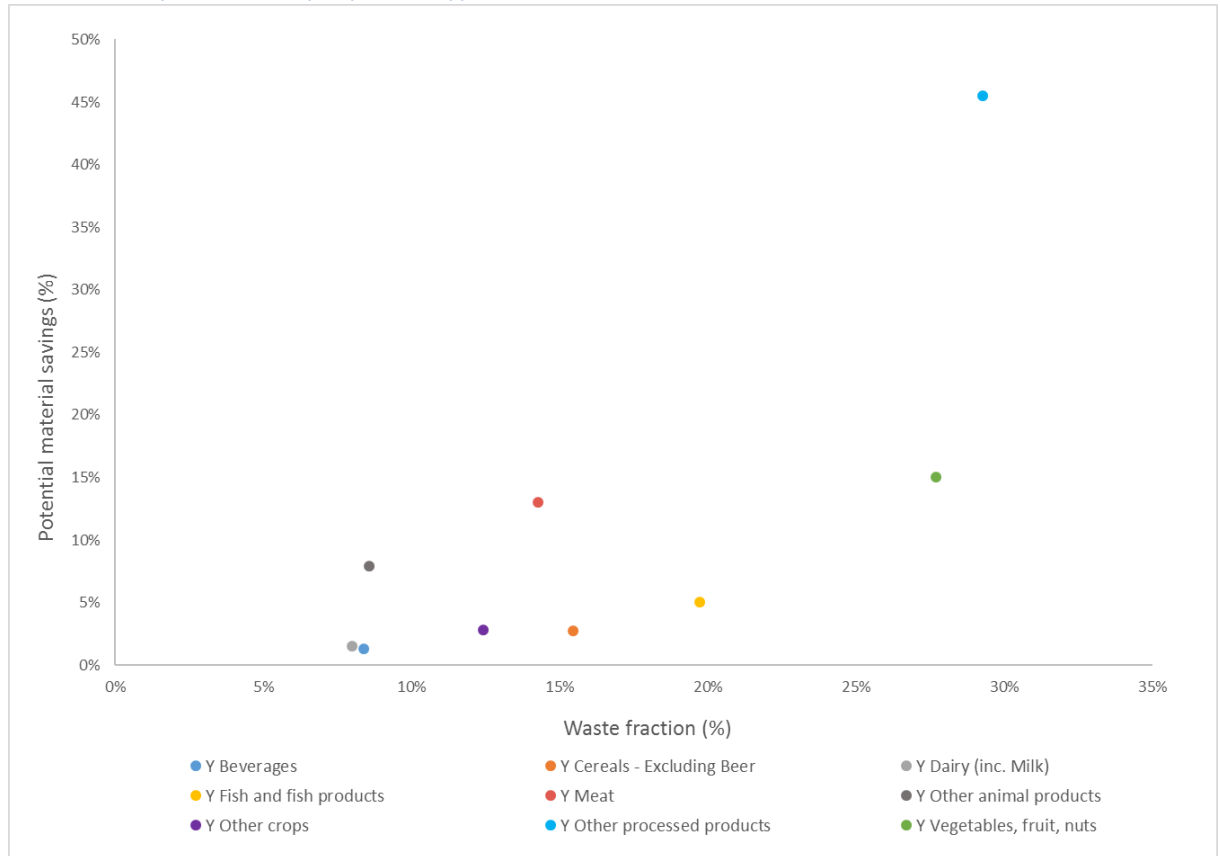
Figure S4: Environmental relevance (land use) and fraction of avoidable and possibly avoidable food wasted by households per product type, 2011



Note: The Y prefix in the legend refers to final consumers (mainly households).

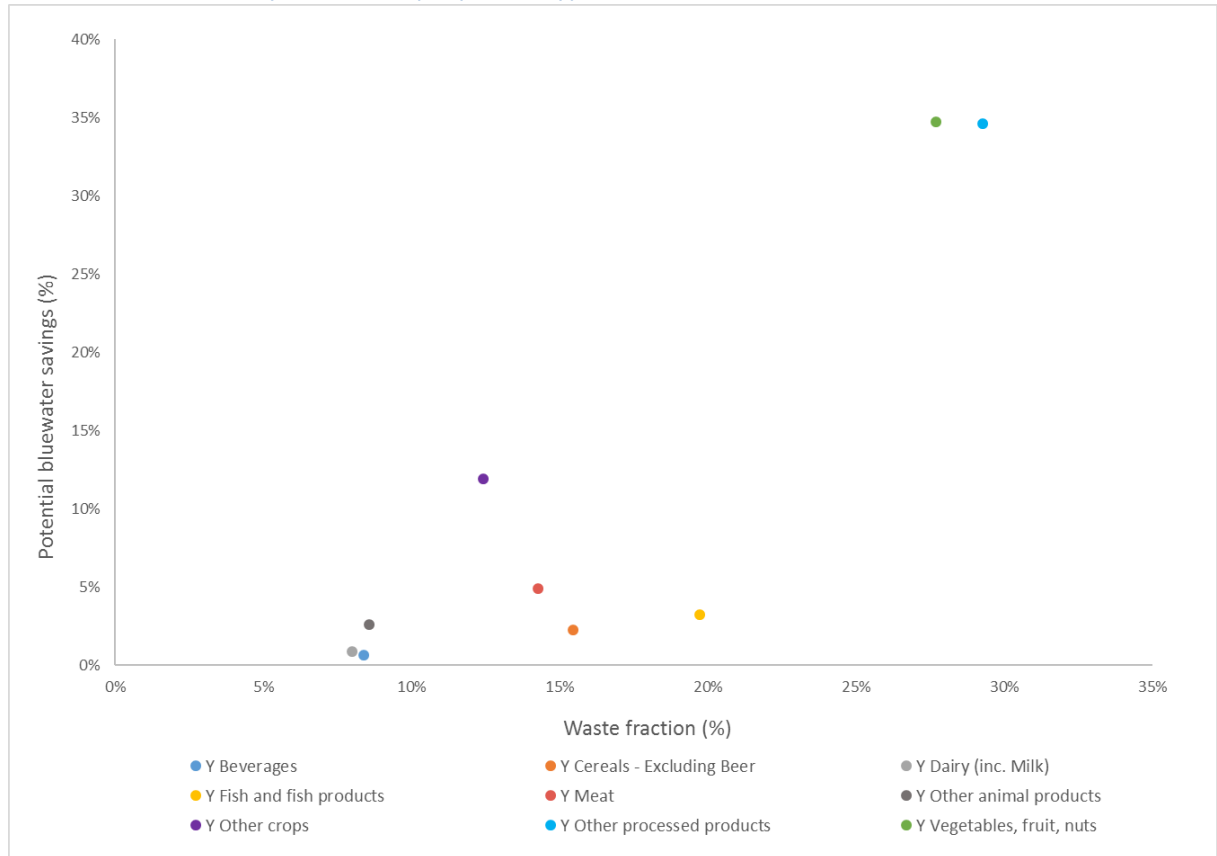
Source: own calculations using EXIOBASE v3.3 and WRAP (2009, 2013)

Figure S5: Environmental relevance (material use) and fraction of avoidable and possibly avoidable food wasted by households per product type, 2011



Note: The Y prefix in the legend refers to final consumers (mainly households).
Source: own calculations using EXIOBASE v3.3 and WRAP (2009, 2013)

Figure S6: Environmental relevance (blue water consumption) and fraction of avoidable and possibly avoidable food wasted by households per product type, 2011



Note: The Y prefix in the legend refers to final consumers (mainly households).
Source: own calculations using EXIOBASE v3.3 and WRAP (2009, 2013)

References

- WRAP. 2009. *Household Food and Drink Waste in the UK*. Banbury: Waste & Resources Action Programme.
- WRAP. 2013. *Waste in the UK Hospitality and Food Service Sector - Full Technical Report*. Banbury: Waste & Resources Action Programme.