

# Beyond calories: a holistic assessment of the global food system

## Supplementary Information

**Supplementary Table 1**

<b>Commodity Group</b>	<b>Commodities</b>	
<b>Cereals</b>	Wheat and products Barley and products Rye and products Millet and products Cereals, other	Rice (milled equivalent) Maize and products Oats Sorghum and products
<b>Roots and Tubers</b>	Cassava and products Sweet potatoes Roots, other Sugar beet	Potatoes and products Yams Sugar cane
<b>Pulses</b>	Beans Pulses, other and products	Peas
<b>Treenuts</b>	Nuts and products	
<b>Oilcrops</b>	Groundnuts (Shelled Eq) Rape and Mustardseed Coconuts - Incl Copra Palm kernels Oilcrops, Other	Soyabeans Sunflower seed Sesame seed Olives (including preserved)
<b>Fruits &amp; Vegetables</b>	Tomatoes and products Vegetables, other Lemons, Limes and products Citrus, other Plantains Pineapples and products Grapes and products (excl. wine)	Onions Oranges, Mandarines Grapefruit and products Bananas Apples and products Dates Fruits, other
<b>Stimulants</b>	Tea (including mate) Cocoa beans and products	Coffee and products
<b>Meat and products</b>	Bovine meat Pigmeat Meat, other Butter, ghee Fats, Animals, Raw Milk – excluding butter	Mutton & goat meat Poultry meat Offals, edible Cream Eggs
<b>Fish, Seafood</b>	Freshwater fish Pelagic fish Crustaceans Molluscs, other Fish, body oil	Demersal fish Marine fish, other Cephalopods Aquatic animals, others Fish, liver oil
<b>Alcoholic beverages</b>	Wine Beverages, fermented	Beer Beverages, alcoholic
<b>Miscellaneous</b>	Oilcakes	

**Supplementary Table 1:** Food commodities included in this analysis, based on food items within the UN Food and Agriculture Organization (FAO) Statistical Database (<http://www.fao.org/faostat/en/>).

## Supplementary Table 2

<b>Europe (inc. Russia)</b>	<b>Agricultural production</b>	<b>Postharvest handling and storage</b>	<b>Processing and packaging</b>	<b>Distribution</b>	<b>Consumption</b>
Cereals	2%	4%	0.5%, 10%	2%	25%
Roots and tubers	20%	9%	15%	7%	17%
Oilseeds and pulses	10%	1%	5%	1%	4%
Fruits and vegetables	20%	5%	2%	10%	19%
Meat	3.1%	0.7%	5%	4%	11%
Fish and seafood	9.4%	0.5%	6%	9%	11%
Milk	3.5%	0.5%	1.2%	0.5%	7%
<b>North America and Oceania</b>	<b>Agricultural production</b>	<b>Postharvest handling and storage</b>	<b>Processing and packaging</b>	<b>Distribution</b>	<b>Consumption</b>
Cereals	2%	2%	0.5%, 10%	2%	27%
Roots and tubers	20%	10%	15%	7%	30%
Oilseeds and pulses	12%	0%	5%	1%	4%
Fruits and vegetables	20%	4%	2%	12%	28%
Meat	3.5%	1.0%	5%	4%	11%
Fish and seafood	12%	0.5%	6%	9%	33%
Milk	3.5%	0.5%	1.2%	0.5%	15%
<b>Latin America</b>	<b>Agricultural production</b>	<b>Postharvest handling and storage</b>	<b>Processing and packaging</b>	<b>Distribution</b>	<b>Consumption</b>
Cereals	6%	4%	2%, 7%	4%	10%
Roots and tubers	14%	14%	12%	3%	4%
Oilseeds and pulses	6%	3%	8%	2%	2%
Fruits and vegetables	20%	10%	20%	12%	10%
Meat	5.3%	1.1%	5%	5%	6%
Fish and seafood	5.7%	5%	9%	10%	4%
Milk	3.5%	6%	2%	8%	4%
<b>South and Southeast Asia</b>	<b>Agricultural production</b>	<b>Postharvest handling and storage</b>	<b>Processing and packaging</b>	<b>Distribution</b>	<b>Consumption</b>
Cereals	6%	7%	3.5%	2%	3%
Roots and tubers	6%	19%	10%	11%	3%
Oilseeds and pulses	7%	12%	8%	2%	1%
Fruits and vegetables	15%	9%	25%	10%	7%
Meat	5.1%	0.3%	5%	7%	4%
Fish and seafood	8.2%	6%	9%	15%	2%
Milk	3.5%	6%	2%	10%	1%

<b>North Africa, West and Central Asia</b>	<b>Agricultural production</b>	<b>Postharvest handling and storage</b>	<b>Processing and packaging</b>	<b>Distribution</b>	<b>Consumption</b>
Cereals	6%	8%	2%, 7%	4%	12%
Roots and tubers	6%	10%	12%	4%	6%
Oilseeds and pulses	15%	6%	8%	2%	2%
Fruits and vegetables	17%	10%	20%	15%	12%
Meat	6.6%	0.2%	5%	5%	8%
Fish and seafood	6.6%	5%	9%	10%	4%
Milk	3.5%	6%	2%	8%	2%
<b>Sub-Saharan Africa</b>	<b>Agricultural production</b>	<b>Postharvest handling and storage</b>	<b>Processing and packaging</b>	<b>Distribution</b>	<b>Consumption</b>
Cereals	6%	8%	3.5%	2%	1%
Roots and tubers	14%	18%	15%	5%	2%
Oilseeds and pulses	12%	8%	8%	2%	1%
Fruits and vegetables	10%	9%	25%	17%	5%
Meat	15%	0.7%	5%	7%	2%
Fish and seafood	5.7%	6%	9%	15%	2%
Milk	6%	11%	0.1%	10%	0.1%

**Supplementary Table 2: Loss and waste percentages by food chain stage and commodity group by region.** Due to poor data availability on food loss figures at the national level, regional average figures from the FAO<sup>2</sup> were applied to derive estimates of macronutrient losses at each stage in the global commodity chain.

Supplementary Table 3

	Infants		Children			Men		Women					
	0-12 months	1-3 years	4-6 years	7-9 years	10-18 years	19-65 years	65+ years	10-18 years	19-50 years	51-65 years	65+ years	Pregnancy	Lactation
Percentage of population	3.7%	5.4%	5.3%	6.8%	7.0%	28.3%	3.3%	6.6%	19.1%	6.4%	4.2%	1.9%	1.9%
Weighted for population >1 year	0.00%	5.6%	5.5%	7.1%	7.3%	29.4%	3.5%	6.8%	19.9%	6.7%	4.3%	2.0%	2.0%

**Supplementary Table 3: Global population gender and age demographics.** Percentages of the global population within each age and gender grouping<sup>1</sup>. This study excludes infants <1 year old, hence percentages have also been normalised to those >1 year, to give a total percentage of 100%.

Supplementary Table 4

	Infants		Children			Men			Women					Weighted EAR
	0-12 months	1-3 years	4-6 years	7-9 years	10-18 years	19-65 years	65+ years	10-18 years	19-50 years	51-65 years	65+ years	Pregnancy	Lactation	
Iron absorption assumed (%) <sup>1</sup>	-	5	5	5	5	5	5	5	8	8	8	8	8	
Iron (mg/day) <sup>1</sup>	-	6.4	9.3	11.4	22.9	13.1	13.1	16.9	13.1	13.1	13.1	29.2	17.9	13.8
Calcium (mg/day)	-	500	800	800	1100	800	1100	1100	800	1100	1100	1000	1000	877
Zinc (mg/day)	-	2.5	4	7	8.5	9.4	9.4	7.3	6.8	6.8	6.8	10.5	10.9	9.6
Vitamin A (µg/day)	-	286	321	357	429	429	429	429	357	357	429	571	607	397
Vitamin B <sub>6</sub> (mg/day)	-	0.4	0.5	0.8	1.1	1.1	1.4	1	1.1	1.1	1.3	1.6	1.7	1.0
Vitamin B <sub>12</sub> (µg/day)	-	0.7	1	1.5	2	2	2	1.5	2	2	2	2.2	2.4	1.8
Folate (mg/day)	-	120	160	250	330	320	320	250	330	320	320	520	450	299
Vitamin C (mg/day)	-	13	22	22	63	75	75	56	60	60	60	70	100	58.4

**Supplementary Table 4: Daily Estimated Average Requirements (EAR) of key dietary vitamins and minerals.** Estimated Average Requirements (EAR) of key vitamins and minerals by age and gender demographics<sup>3</sup>. Weighted EAR values for the population are derived from global population distribution figures in Supplementary Table 3.

Supplementary Table 5

	Infants		Children			Men		Women						
	0-12 months	1-3 years	4-6 years	7-9 years	10-18 years	19-65 years	65+ years	10-18 years	19-50 years	51-65 years	65+ years	Pregnancy	Lactation	Weighted p
Isoleucine (mg/g protein)	-	31	31	30	30	30	30	30	30	30	30	30	30	30.1
Leucine (mg/g protein)	-	63	61	60	60	59	59	60	59	59	59	59	59	59.5
Lysine (mg/g protein)	-	52	48	48	47	45	45	47	45	45	45	45	45	46.1
Methionine +Cysteine (mg/g protein)	-	26	24	23	23	22	22	23	22	22	22	22	22	22.5
Phenylalanine +Tyrosine (mg/g protein)	-	46	41	41	40	38	38	40	38	38	38	38	38	39.1
Threonine (mg/g protein)	-	27	25	25	24	23	23	24	23	23	23	23	23	23.6
Tryptophan (mg/g protein)	-	7.4	6.6	6.5	6.3	6	6	6.3	6	6	6	6	6	6.2
Valine (mg/g protein)	-	42	40	40	40	39	39	40	39	39	39	39	39	39.4
Histidine (mg/g protein)	-	18	16	16	16	15	15	16	15	15	15	15	15	15.4

**Supplementary Table 5: Daily relative requirements of essential amino acids per unit of protein.** Relative requirements of all essential amino acids (AA) per unit protein by age and gender demographics<sup>2</sup>. Weighted EAR values for the population are derived from global population distribution figures in Supplementary Table 3.

## Supplementary References

1. United Nations: Department of Social and Economic Affairs. *World population prospects: The 2012 revision, DVD edition*. Population Division 2013 (2013).
2. WHO/FAO/UNU Expert Consultation. *Protein and amino acid requirements in human nutrition*. World Health Organization Technical Report Series (2007). doi:ISBN 92 4 120935 6
3. World Health Organization. *Vitamin and mineral requirements in human nutrition*. World Health Organization (2005). doi:92 4 154612 3
4. FAO. *Global food losses and food waste – Extent, causes and prevention*. (2011)