Food Sustainability Index Methodology

The Food Sustainability Index (FSI), developed by the Economist Intelligence Unit with the Barilla Center for Food & Nutrition (BCFN), measures the sustainability of food systems in 34 countries around three key issues outlined in the 2015 BCFN Milan Protocol and designed around the Sustainable Development Goals (SDGs): food loss and waste, sustainable agriculture and nutrition. The index looks at policies and outcome around sustainable food systems and diets through a series of key performance indicators that consider environmental, social and economic sustainability.

In this study, sustainability is defined as the ability of a country's food system to be maintained without depletion or exhaustion of its natural assets or compromises to its population's health, and without compromising future generations' access to food.

The index seeks to address three main paradoxes identified in the 2015 BCFN Milan Food Protocol:

▪ **Food loss and waste:** *Almost one billion people suffer from hunger, but a third of food is lost or wasted. Food waste corresponds to four times the amount needed to feed the people suffering from undernutrition worldwide.*
▪ **Sustainable agriculture:** *Climate change impacts on agricultural systems are becoming more visible yet harder to estimate. Although agriculture has the potential to capture carbon emissions and help mitigate the impact of climate change, the ecological footprint of agriculture is growing. The shift away from fossil fuels to renewable sources of energy (e.g. biofuels) reduces the surface of land available to grow food.*
▪ **Nutritional challenges:** *The hungry and the obese coexist, and rising rates of obesity strain healthcare systems to the point of economic unsustainability. For every person suffering from undernutrition there are two who are overweight or obese.*

The Food Sustainability Index research programme aims to raise awareness of governments, institutions and the general public around the need to address food sustainability issues and monitor progress towards addressing these issues. This project is also intended to support global efforts around the SDGs. The index is linked not only to the SDG on hunger but also to those on climate change, life on land, sustainable cities, employment, responsible consumption and production, as well as gender equality, good health, poverty, education and infrastructure.

Scoring criteria and categories

The three primary categories in the index—Food loss and waste, Sustainable agriculture, and Nutritional challenges—were defined in the Milan Protocol. The individual indicators and underlying metrics have been selected on the basis of Economist Intelligence Unit expert knowledge and analysis, consultation with external food sustainability and nutrition experts, and with input from BCFN and their Advisory Board members.

The Index contains 35 indicators, and over 55 sub-indicators, organised across these three categories. Each category receives a score, calculated from a weighted mean of the underlying indicator scores (see "Weights"), and scores are scaled from 0 to 100, where 100 = the highest sustainability and greatest progress towards meeting environmental, societal and economic KPIs.

2017 Overall rankings

Rank	Country	Overall score
1	France	74.8
2	Japan	72.8
3	Germany	70.6
4	Spain	70.4
5	Sweden	69.7
6	Portugal	69.5
7	Italy	69.0
8	South Korea	69.0
9	Hungary	68.4
10	UK	68.0
11	Canada	67.1
12	Ethiopia	65.4
13	Colombia	64.4
14	Australia	63.3
15	Israel	63.1
16	Turkey	62.9
17	Russia	62.1
18	Argentina	62.0
19	South Africa	61.7
20	Greece	61.6
21	US	61.5
22	Mexico	61.2
23	China	59.8
24	Nigeria	59.6
25	Jordan	58.9
26	Saudi Arabia	57.8
27	Egypt	57.1
28	Brazil	56.6
29	Morocco	53.9
30	Tunisia	53.1
31	Lebanon	53.1
32	Indonesia	52.4
33	India	50.8
34	UAE	40.3

Country selection

The FSI evaluates food sustainability in 34 countries that were carefully selected by the Economist Intelligence Unit and BCFN, in consultation with experts. The country choice reflects a mix of high-income, middle-income, and low-income countries, with geographic representation. These countries represent over 85% of global GDP and two-thirds of the global population.

Africa	Asia Pacific	Europe	South America	Middle East	North America
Ethiopia, Morocco, Nigeria, South Africa, Tunisia	Australia, China, India, Indonesia, Japan, South Korea	France, Germany, Greece, Hungary, Italy, Portugal, Russia, Spain, Sweden, Turkey, United Kingdom	Argentina, Brazil, Columbia	Egypt, Jordan, Israel, Lebanon, Saudi Arabia, United Arab Emirates	Canada, Mexico, United States

Weights

The weights assigned to each category and indicator can be changed in the FSI model to reflect different assumptions about their relative importance. Four sets of weights are provided.

Expert-based weightings. The weights defined by the BCFN Advisory Board ("expert based weightings") are the default setting. They are based on extensive discussions between BCFN, the Economist Intelligence Unit and the Advisory Board on the relative value of each indicator and sub-indicator. This option uses expert judgment to assign weights to indicators and brings a real-world perspective to an index, which is important if an index is to guide policy actions.

Uniform weightings. The second weighting option, called uniform or neutral weights, assumes equal importance of all indicators and sub-indicators and evenly distributes weights on that basis. This scheme has the advantage of simplicity and does not involve subjective judgment. A disadvantage of these options is that they assume that all indicators are equally significant.

Policy-driven weightings. The third option, policy-driven weighting, focuses on the importance of those indicators in the model that can be addressed through policy changes. In this scheme, the policy-driven indicators and sub-indicators hold more weight than other metrics in the model, allowing users to identify countries that have adopted the strongest policies to address food sustainability issues.

Outcome-based weightings. The fourth option is outcome-based weightings, which focuses on how countries are doing on each food sustainability pillar, rather than on the policies to improve sustainability. This weighting scheme prioritises metrics that show progress towards meeting food sustainability goals and objectives. It highlights countries that already have minimised food waste and loss, built sustainable agriculture practices, and improved nutrition.

Food Sustainability Index expert-based weightings

CATEGORIES	Weight %
A) FOOD LOSS AND WASTE	33.3%
B) SUSTAINABLE AGRICULTURE	33.3%
C) NUTRITIONAL CHALLENGES	33.3%

INDICATORS	Weight %
A) FOOD LOSS AND WASTE	
1.1) Food loss	28.0%
1.2) Policy response to food loss	24.0%
1.3) Causes of distribution-level loss	26.0%
1.4) Solutions to distribution-level loss	22.0%
2.1) Food waste at end-user level	53.8%
2.2) Policy response to food waste	46.2%
B) SUSTAINABLE AGRICULTURE	
3.1) Environmental impact of agriculture on water	22.4%
3.2) Sustainability of water withdrawal	17.9%
3.3) Water scarcity	14.9%
3.4) Water management	19.4%
3.5) Trade impact	13.4%
3.6) Sustainability of fisheries	11.9%
4.1) Environmental impact of agriculture on land	12.3%
4.2) Land use	8.8%
4.3) Impact on land of animal feed and biofuels	7.0%
4.4) Land ownership	8.8%
4.5) Agricultural subsidies	8.8%
4.6) Animal welfare policies	6.6%
4.7) Diversification of agricultural system	11.0%
4.8) Environmental biodiversity	11.0%
4.9) Agro-economic indicators	8.8%
4.10) Productivity	8.8%
4.11) Land-users	7.9%
5.1) Environmental impact of agriculture on the atmosphere	53.8%
5.2) Climate change mitigation	46.2%
C) NUTRITIONAL CHALLENGES	
6.1) Prevalence of malnourishment	40.0%
6.2) Micronutrient deficiency	31.4%
6.3) Enabling factors	28.6%

7.1) Health life expectancy	26.5%
7.2) Prevalence of over-nourishment	30.1%
7.3) Impact on health	24.1%
7.4) Physical activity	19.3%
8.1) Diet composition	26.9%
8.2) Number of people per fast food restaurant	24.4%
8.3) Economic determinant of dietary patterns	20.5%
8.4) Policy response to dietary patterns	28.2%

SUB-INDICATORS	Weight %
1.1) Food loss	
1.1.1) Food lost (% of country's total food production)	100.0%
1.2) Policy response to food loss	
1.2.1) Quality of policies to address food loss	100.0%
1.3) Causes of distribution-level loss	
1.3.1) Quality of road infrastructure	100.0%
1.4) Solutions to distribution-level loss	
1.4.1) Investment in transport with private participation	100.0%
2.1) Food waste at end-user level	
2.1.1) Food waste per capita (per year)	100.0%
2.2) Policy response to food waste	
2.2.1) Quality of policy response to food waste	100.0%
3.1) Environmental impact of agriculture on water	
3.1.1) Water footprint	100.0%
3.2) Sustainability of water withdrawal	
3.2.1) Agricultural water withdrawals (% of total renewable water resources)	100.0%
3.3) Water scarcity	
3.3.1) Monthly freshwater scarcity	100.0%
3.4) Water management	
3.4.1) Initiatives to recycle water for agricultural use	100.0%
3.5) Trade impact	
3.5.1) Virtual Blue Water Net Imports	100.0%
3.6) Sustainability of fisheries	
3.6.1) Fish stocks	100.0%
4.1) Environmental impact of agriculture on land	
4.1.1) Nitrogen Use Efficiency	31.7%
4.1.2) Agricultural land lost yearly to desertification & pollution (%)	36.5%
4.1.3) Average carbon content of soil (% of weight)	31.7%
4.2) Land use	
4.2.1) Arable land under organic agriculture (% of agricultural land)	29.8%
4.2.2) Utilised agricultural area (% of total agricultural area)	29.8%

4.2.3) Existence of sustainable urban farming initiatives	40.4%
4.3) Impact on land of animal feed and biofuels	
4.3.1) First and second generation biofuel production	31.7%
4.3.2) Land diverted to animal feed and biofuels	36.5%
4.3.3) Biodiesel imports	31.7%
4.4) Land ownership	
4.4.1) Land owned / under concession in foreign countries (% of domestic arable land)	29.9%
4.4.2) Degree of property rights protection	35.1%
4.4.3) Existence of laws to protect smallholders against land grabbing	35.1%
4.5) Agricultural subsidies	
4.5.1) Quality of agricultural subsidies	100.0%
4.6) Animal welfare policies	
4.6.1) Quality of animal welfare regulation	100.0%
4.7) Diversification of agricultural system	
4.7.1) Top 3 crops (% of total agriculture production)	100.0%
4.8) Environmental biodiversity	
4.8.1) Environmental biodiversity	52.6%
4.8.2) Deforestation (ha/year)	47.4%
4.9) Agro-economic indicators	
4.9.1) Average education level of farmers	36.5%
4.9.2) Total private & public agricultural sciences R&D expenditure (as % of GDP)	31.7%
4.9.3) Public support to R&D	31.7%
4.10) Productivity	
4.10.1) Total factor productivity (TFP) growth rate	100.0%
4.11) Land-users	
4.11.1) Participation rate of women in farming	26.0%
4.11.2) Participation rate of youth in farming	26.0%
4.11.3) Average age of farmers	22.1%
4.11.4) Working conditions of agricultural workers along the value chain	26.0%
5.1) Environmental impact of agriculture on the atmosphere	
5.1.1) GHG emissions from agriculture	23.0%
5.1.2) Animal emissions (% total agriculture emissions)	31.0%
5.1.3) Fertilizer emissions (% total agriculture emissions)	26.4%
5.1.4) Land use net emissions/removals (% total, CO2 eq)	19.5%
5.2) Climate change mitigation	
5.2.1) Implementation of agricultural techniques for climate change mitigation and adaptation	100.0%
6.1) Prevalence of malnourishment	
6.1.1) Prevalence of undernourishment (% of population)	26.3%
6.1.2) Prevalence of stunting (% of children under 5, height for age)	23.7%
6.1.3) Prevalence of wasting (% of children under 5, weight for height)	23.7%

6.1.4) Prevalence of underweight (% of children under 5, weight for age)	26.3%
6.2) Micronutrient deficiency	
6.2.1) Vitamin A deficiency (% of general population)	50.0%
6.2.2) Iodine deficiency (% of general population)	50.0%
6.3) Enabling factors	
6.3.1) Babies under 6 months old exclusively breastfed (% total)	50.0%
6.3.2) Access to improved water source	50.0%
7.1) Health life expectancy	
7.1.1) Life expectancy at birth, total (years)	46.0%
7.1.2) Healthy life expectancy (HALE)	54.0%
7.2) Prevalence of over-nourishment	
7.2.1) Prevalence of overweight in children (5-19 years of age)	46.0%
7.2.2) Prevalence of overweight in adults (body mass index >= 25)	54.0%
7.3) Impact on health	
7.3.1) Disability Adjusted Life Years (DALYs) from nutritional deficiencies	100.0%
7.4) Physical activity	
7.4.1) Population reaching recommended physical activity per week (%)	56.7%
7.4.2) Hours of inactivity, fixed screen time per week	43.3%
8.1) Diet composition	
8.1.1) Percentage of sugar in diets	37.5%
8.1.2) Meat consumption levels	25.0%
8.1.3) Saturated fat consumption	16.3%
8.1.4) Salt consumption	21.3%
8.2) Number of people per fast food restaurant	
8.2.1) Number of people per fast food restaurant	100.0%
8.3) Economic determinant of dietary patterns	
8.3.1) Proportion of population living below the national poverty line	46.5%
8.3.2) GINI Coefficient	53.5%
8.4) Policy response to dietary patterns	
8.4.1) Quality of policy response to dietary patterns	50.0%
8.4.2) Nutrition education	50.0%

Data modelling

Indicator scores are normalised and then aggregated across categories to enable a comparison of broader concepts across countries. Normalisation rebases the raw indicator data to a common unit so that it can be aggregated. **All indicators in this model are normalised to a 0 to 100 scale, where 100 indicates the highest sustainability and 0 represents the lowest**.

Most indicators are transformed on the basis of a min/max normalisation, where the minimum and maximum raw data values across the 34 countries are used to bookend the indicator scores. The

indicators for which a higher value indicates a more favourable environment have been normalised on the basis of:

$$x = (x - \text{Min}(x)) / (\text{Max}(x) - \text{Min}(x))$$

where Min(x) and Max(x) are, respectively, the lowest and highest values in the 34 countries for any given indicator. The normalised value is then transformed from a 0-1 value to a 0-100 score to make it directly comparable with other indicators. This in effect means that the country with the highest raw data value will score 100, while the lowest will score 0 for all indicators in the Index.

For the indicators for which a high value indicates an unfavourable environment, the normalisation function takes the form of:

$$x = (x - \text{Max}(x)) / (\text{Max}(x) - \text{Min}(x))$$

where Min(x) and Max(x) are, respectively, the lowest and highest values in the 34 countries for any given indicator. The normalised value is then transformed into a positive number on a scale of 0-100 to make it directly comparable with other indicators.

Data limitations

The Economist Intelligence Unit employed country experts and regional specialists with a wide variety of necessary linguistic skills to undertake the research from its global network of more than 350 analysts and contributors. Researchers were asked to gather data from primary legal texts; government and academic publications; and websites of government authorities, international organisations, and non-governmental organisations. In some cases, the Economist Intelligence Unit research was constrained by data availability.

Investment in sustainable agriculture. Non-government investment in sustainable agriculture is an important component of the FSI framework. The Economist Intelligence Unit undertook an extensive review of existing data sources, including data sets from the FAO, OECD, World Resources Institute, the Conservation Finance Network, Climatescope, the Climate Bonds Initiative, the Climate Policy Initiative, the Sustainable Stock Exchanges Initiative and Bloomberg. Though some indicators captured specific elements of investment in sustainable agriculture (for example, green bonds that are primarily funnelled into renewable energy), there was no indicator that covers the majority of the 34 countries in the FSI and also comprehensively explores the range of investment options for sustainable agriculture. There are a number of studies that look specifically at sustainable agriculture and land use investment in individual countries, but these studies do not cover all of the countries in the FSI and do not allow us to provide like-for-like comparisons across the 34 countries in the index.

We propose to develop a qualitative indicator for the 2018 FSI that allows us to assess the wide-range of financing options for sustainable agriculture and their uptake across the countries included in the FSI scope.

Micronutrients and diet composition. Metrics that measure micronutrient deficiencies and diet composition are not updated frequently. This can make it difficult to measure progress towards addressing nutritional challenges. These indicators have proved particularly challenging, as there are substantial data gaps in many of the data sets that cover micronutrients and diets. Finding robust metrics with complete country coverage has been difficult.

In particular, questions have arisen around measuring salt consumption in diets. The Economist Intelligence Unit intended to use the World Bank's iodized salt consumption (% of households) data in the 2016 FSI. However, there were significant data gaps in the proposed data set. Conversations with a medical doctor helped us identify the most robust micronutrient deficiency indicators that the WHO publishes. These discussions led us to incorporate iodine concentration in urine and a measurement of average grams of sodium consumed per day.

All of the indicators on micronutrient deficiencies included in the Food Sustainability Index were selected with the help of a medical doctor.

Regional nuances. The value of an index is that it produces like for like comparisons across a set of geographies. It is important to note, however, that not all sustainability issues and metrics are equally important in every geography.

For example, climate has an impact on the amount of food loss during harvest. In warmer countries (for example, the Mediterranean), food degradation occurs more rapidly. This rapid degradation and the risk the climate poses to food supply in a country make managing food loss and waste more important in warmer countries. The index cannot distinguish between those countries where climate poses a higher threat to food loss and waste and those where climate is more conducive to minimising degradation.

Furthermore, road infrastructure and investment in transport, though important components of mitigating loss throughout the supply chain, do not fully encompass the set of solutions that countries can employ to address food loss and waste. Data around adoption and development of post-harvest technologies to address food loss and waste issues is needed to fill this gap and create a more robust assessment of food supply chain issues.

It is necessary to interpret the sustainable agriculture category results carefully. For example, water inputs to crops increase with decreasing latitude due to evaporation and poor soil water retention. So in warmer countries, this evaporation and poor retention result in a greater water consumption to obtain the same yields. The same is true with nutrient inputs—poor soil conditions necessitate more inputs to sustain yields. There index does not capture this nuances, which results in many Mediterranean countries where water resources are scare and soil conditions are poor rising to the top of the rankings. In the future, the BCFN and EIU will consider developing an indicator that takes into account water use and GHG emissions per average yield to better capture these nuances.

The FSI model provides an adjustable weightings functionality that allows users to assign more or less importance to themes and indicators that they deem to be more relevant. Using this functionality can help users who are interested in regional analysis better understand country performance across areas of interest.

For those users who are interested in understanding how climate or lack of natural resources impact food sustainability, the FSI data provides a jumping off point. Metrics and data from the FSI can be adjusted based on other factors using simple calculations to create data that takes climate or natural resource factors into account.

Sources and definitions

All of the quantitative and qualitative data in the Food Sustainability Index was collected and analysed by the Economist Intelligence Unit project team. Data was gathered from reputable international, national and industry sources including the Economist Intelligence Unit's internal databases. In cases where data was incomplete or missing, Economist Intelligence Unit analysts developed custom estimation models that aggregate proxy data series and use statistical analysis to estimate data points, where appropriate.

The main sources used in the FSI are the Economist Intelligence Unit, Food and Agriculture Organisation of the United Nations, World Bank Group, Central Intelligence Agency (CIA), World Health Organisation, Eurostat, OECD, the Yale Environmental Performance Index, African Development Bank, BP Statistical Review of World Energy, World Trade Organisation, UN Comtrade, Land Matrix, the Animal Protection Index, USDA, ASTI, ITUC Global Rights Index, journal articles and studies by respected academics.

Detailed indicator list

The indicators and sub-indicators included in the Food Sustainability Index are:

Indicator	Definition	Source	Year*
OVERALL SCORE	Aggregate of the underlying 3 category scores: A) Food loss and waste B) Sustainable agriculture C) Nutritional challenges		
A) FOOD LOSS AND WASTE	Aggregate of the underlying 6 indicator scores: 1.1) Food loss 1.2) Policy response to food loss 1.3) Causes of distribution-level loss 2.1) End-user waste 2.2) Policy response to food waste		
1.1) Food loss	Aggregate of underlying 1 sub-indicator score: 1.1.1) Food lost (% of country's total food production)		
1.1.1) Food lost (% of country's total food production)	Food loss as a percentage of total food production of the country	FAO	2013
1.2) Policy response to food loss	Aggregate of underlying 1 sub-indicator score: 1.2.1) Quality of policies to address food loss		
1.2.1) Quality of policies to address food loss	Composite indicator: If a country has less than 3% food loss (see 1.1.1), it receives the highest score on this indicator, as policies for food loss are not needed in the country. If a country has less than 5% food loss (but more than 3%), it received the second highest score, indicating that some progress still needs to be made. Q1. Is there a national plan/strategy dedicated to reducing food loss? 0 = No 1 = Yes, it's a general plan/law about reducing food loss (pre-consumer level) but doesn't address it at specific stages of the supply chain 2 = Yes, and it addresses specifically the different stages of the supply chain Q2. Is there an NGO or international organisation doing any programme with smallholders to help them reduce food loss at farm level by providing safe storage solutions? 0 = No 1 = Yes	EIU research	-
1.3) Causes of distribution-level loss	Aggregate of underlying 1 sub-indicator score: 1.3.1) Quality of road infrastructure		
1.3.1) Quality of road infrastructure	What is the risk that the road network will prove inadequate to business needs?	EIU Risk Briefing	2017
1.4) Solutions to distribution-level loss	Aggregate of underlying 1 sub-indicator score: 1.4.1) Investment in transport with private participation		

1.4.1) Investment in transport with private participation	Investment in transport with private participation (as a % of GDP)	World Bank; OECD	-
2.1) Food waste at end-user level	Aggregate of underlying 1 sub-indicator score: 2.1.1) Food waste per capita (per year)		
2.1.1) Food waste per capita (per year)	Amount of food wasted per head per year	EIU research	-
2.2) Policy response to food waste	Aggregate of underlying 1 sub-indicator score: 2.2.1) Quality of policy response to food waste		
2.2.1) Quality of policy response to food waste	Composite indicator: Q1. Is there a food waste national strategy in place? 0 = No national plan or strategy 1 = Food waste is included in other national plans or strategies (e.g. in waste management plans) 2 = Food waste has its own national plan/strategy/legislation/regulation Q2. Are there any reduction or prevention quantitative targets or KPIs on end-user level food waste? 0 = No 1 = Somewhat (local or regional level set by the government or national-level if set by charity sector) 2 = Yes (national-level) Q3. Does the country have market-based instruments for end-user level food waste? 0 = No 1 = Pay-per-throw taxation 2 = Tax reductions for food donations 3 = two or more instruments are in place Q4. Does the country have laws, regulations, and regulatory instruments for end-user level food waste? 0 = No 1 = No national level legislation but city-level directives and/or regional directives OR a law preventing food waste from being sent to landfill 2 = National legislation and/or regulations to recycle food waste 3 = Good Samaritan-type of law (reducing liability of supermarkets for donating food) 4 = National legislation preventing supermarkets from throwing away food waste and instead obliging them to donate it Q5. Are there any government institutions to supervise the implementation of food waste solutions? 0 = No 1 = Government institution(s) exist 2 = Government institution(s) actively promote the	EIU research	-

	implementation of solutions via national media campaigns and/or practical projects Q6. Are there any voluntary agreements to deal with food waste (reduction, reuse, recycle)? 0 = No 1 = Informal agreements (i.e. private sector is responding to citizens' actions or takes measures without formal agreement) 2 = Yes (formal agreements) Q7. Are there any private and/or third-sector institutions to deal with food waste? (e.g. food banks, charities, retailers redistributing food or recycling it) 0 = No 1 = Local/regional institutions 2 = National institutions Q8. Is there any research being done by national-level institutions such as universities or think tanks in order to advance knowledge on food waste reduction, prevention, and management? 0 = No 1 = Yes Q9. Does the country respect the food recovery hierarchy? 0 = No 1 = Yes		
B) SUSTAINABLE AGRICULTURE	Aggregate of the underlying 19 indicator scores: 3.1) Environmental impact of agriculture on water 3.2) Sustainability of water withdrawal 3.3) Water scarcity 3.4) Water management 3.5) Trade impact 3.6) Sustainability of fisheries 4.1) Environmental impact of agriculture on land 4.2) Land use 4.3) Impact on land of animal feed and biofuels 4.4) Land ownership 4.5) Agricultural subsidies 4.6) Animal welfare policies 4.7) Diversification of agricultural system 4.8) Environmental biodiversity 4.9) Agro-economic indicators 4.10) Productivity 4.11) Land-users 5.1) Environmental impact of agriculture on the atmosphere 5.2) Climate change mitigation		
3.1) Environmental impact of agriculture on water	Aggregate of underlying 1 sub-indicator score: 3.1.1) Water footprint		
3.1.1) Water footprint	Water footprint of main crops and livestock	Mekonnen, M.M. and Hoekstra, A.Y. (2011)	1996-2005

			http://www.wat erfootprint.org/ Reports/Report 50- NationalWaterF ootprints- Vol1.pdf
3.2) Sustainability of water withdrawal	Aggregate of underlying 1 sub-indicator score: 3.2.1) Agricultural water withdrawals (% of total renewable water resources)		
3.2.1) Agricultural water withdrawals (% of total renewable water resources)	Water withdrawn for irrigation in a given year, expressed in percent of the total renewable water resources (TRWR).	FAO Aquastat	-
3.3) Water scarcity	Aggregate of underlying 1 sub-indicator score: 3.3.1) Monthly freshwater scarcity		
3.3.1) Monthly freshwater scarcity	Monthly Blue water scarcity measured by the number of months per year that a basin faces severe water scarcity	Hoekstra, A.Y. and Mekonnen, M.M. (2011) Global water scarcity: monthly blue water footprint compared to blue water availability for the world's major river basins, Value of Water Research Report Series No. 53, UNESCO-IHE, Delft, the Netherlands. http://www.wat erfootprint.org/ Reports/Report 53- GlobalBlueWat erScarcity.pdf	2011
3.4) Water management	Aggregate of underlying 1 sub-indicator score: 3.4.1) Initiatives to recycle water for agricultural use		
3.4.1) Initiatives to recycle water for agricultural use	Are there any initiatives to recycle water for agricultural use? Initiatives can include the collection of rain water from buildings and using that water to irrigate agricultural lands, or the recycling of runoff water. These projects can take place at the farm level as voluntary initiatives by the farmers or can be government-led actions or programmes by	EIU research	-

	international development organisations encouraging farmers to adopt these practices. 0 = No 1 = Yes		
3.5) Trade impact	Aggregate of underlying 1 sub-indicator score: 3.5.1) Virtual Blue Water Net Imports		
3.5.1) Virtual Blue Water Net Imports	Total net imports of virtual blue water from crop and animal products.	Mekonnen, M.M. and Hoekstra, A.Y. (2011) National water footprint accounts: The green, blue and grey water footprint of production and consumption, Value of Water Research Report Series No. 50, UNESCO-IHE, Delft, the Netherlands. http://www.waterfootprint.org/Reports/Report 50-NationalWaterFootprints-Vol1.pdf	1996-2005
3.6) Sustainability of fisheries	Aggregate of underlying 1 sub-indicator score: 3.6.1) Fish stocks		
3.6.1) Fish stocks	Percentage of fishing stocks overexploited and collapsed from EEZ	Yale Environmental Performance Index 2016	2016
4.1) Environmental impact of agriculture on land	Aggregate of underlying 3 sub-indicator scores: 4.1.1) Nitrogen Use Efficiency 4.1.2) Agricultural land lost yearly to desertification & pollution (%) 4.1.3) Average carbon content of soil (% of weight)		
4.1.1) Nitrogen Use Efficiency	Ratio of nitrogen inputs to outputs	Yale Environmental Performance Index 2016	2010
4.1.2) Agricultural land lost yearly to desertification & pollution (%)	Average land degradation in GLASOD erosion degree	FAO	1991
4.1.3) Average carbon content of soil (% of weight)	Average carbon content in the topsoil as a % in weight	FAO	2008

4.2) Land use	Aggregate of underlying 3 sub-indicator scores: 4.2.1) Arable land under organic agriculture (% of agricultural land) 4.2.2) Utilised agricultural area (% of total agricultural area) 4.2.3) Existence of sustainable urban farming initiatives		
4.2.1) Arable land under organic agriculture (% of agricultural land)	Organic agriculture as % of total agricultural area	FAO	2014
4.2.2) Utilised agricultural area (% of total agricultural area)	% of utilised agricultural area of total agricultural area	FAO	2014
4.2.3) Existence of sustainable urban farming initiatives	Are there any sustainable urban farming initiatives? 0 = No 1 = Yes (only a handful of small cities, not very widespread) 2 = Yes (major cities and widespread)	EIU research	-
4.3) Impact on land of animal feed and biofuels	Aggregate of underlying 3 sub-indicator scores: 4.3.1) First and second generation biofuel production 4.3.2) Land diverted to animal feed and biofuels 4.3.3) Biodiesel imports		
4.3.1) First and second generation biofuel production	Total biofuel production (KBOE/D)	BP Statistical Review of World Energy 2017; African Development Bank; EIU research	2016; 2012
4.3.2) Land diverted to animal feed and biofuels	% of arable land dedicated to cultivating cereals and other crops for animal feed (excluding pastures and grazeland) as measured by the total area of green maize and soybeans divided by the total arable land	FAO; Eurostat	2014; 2015
4.3.3) Biodiesel imports	Imports in US$ of commodity code 382600 (Miscellaneous chemical products // Biodiesel and mixtures thereof, not containing or containing less than 70 % by weight of petroleum oils or oils obtained from bituminous minerals. // Biodiesel and mixtures thereof, not containing or containing less than 70 % by weight of petroleum oils or oils obtained from bituminous minerals) from the world.	UN Comtrade	2015; 2016
4.4) Land ownership	Aggregate of underlying 3 sub-indicator scores: 4.4.1) Land owned / under concession in foreign countries (% of domestic arable land) 4.4.2) Degree of property rights protection 4.4.3) Existence of laws to protect smallholders against land grabbing		
4.4.1) Land	Land owned or under concession in foreign	Land Matrix;	2017;

owned / under concession in foreign countries (% of domestic arable land)	countries as a % of domestic arable land	FAO	2014
4.4.2) Degree of property rights protection	EIUs Business Environment Rankings quantify the attractiveness of the business environment. The degree of property rights protection rating scores countries between 0 and 4, with 0 being very low and 4 being very high.	EIU BER	2017
4.4.3) Existence of laws to protect smallholders against land grabbing	Composite index: Q1. "Are there formal or customary land rights granted to communities or individual smallholders? 0 = No 1 = Yes Q2. "Are there any laws to protect smallholders against land grabbing (also called land acquisition)? 0 = No 1 = Somewhat 2 = Yes	EIU research	-
4.5) Agricultural subsidies	Aggregate of underlying 1 sub-indicator score: 4.5.1) Quality of agricultural subsidies		
4.5.1) Quality of agricultural subsidies	Composite indicator: Q1. IF the country has agricultural subsidies, are these subsidies permanent? 0 = Yes 1 = No or the country doesn't have subsidies Q2. IF the country has agricultural subsidies, are these subsidies capped at a maximum of $300,000 per farmer? 0 = No 1 = Yes (under €300,000 per farmer or the country doesn't have subsidies) Q3. IF the country has agricultural subsidies, are these subsidies regressive after 30ha? 0 = No 1 = Yes or the country doesn't have subsidies	EIU research	-
4.6) Animal welfare policies	Aggregate of underlying 1 sub-indicator score: 4.6.1) Quality of animal welfare regulation		
4.6.1) Quality of animal welfare regulation	Overall alphabetical score from API (A representing the highest scoring and G the most room for improvement) converted into numerical scores.	Animal Protection Index	2014
4.7) Diversification of agricultural system	Aggregate of underlying 1 sub-indicator score: 4.7.1) Top 3 crops (% of total agriculture production)		
4.7.1) Top 3 crops (% of total agriculture production)	Share of top 3 crops of total agriculture production	FAO	2014
4.8) Environmental biodiversity	Aggregate of underlying 2 sub-indicator scores: 4.8.1) Environmental biodiversity 4.8.2) Deforestation (ha/year)		

4.8.1) Environmental biodiversity	Proportion of local breeds classified as being at risk of extinction	UN	2017
4.8.2) Deforestation (ha/year)	Hectares of tree cover loss by country from 2001-2015 (10% canopy cover)	WRI	2001-15
4.9) Agro-economic indicators	Aggregate of underlying 3 sub-indicator scores: 4.9.1) Average education level of farmers 4.9.2) Total private & public agricultural sciences R&D expenditure (as % of GDP) 4.9.3) Public support to R&D		
4.9.1) Average education level of farmers	Education level: 0 = no education at all 1 = primary school 2 = secondary school 3 = above secondary school	EIU research	-
4.9.2) Total private & public agricultural sciences R&D expenditure (as % of GDP)	Public spending on R&D	ASTI; OECD; EIU	-
4.9.3) Public support to R&D	Public support to R&D: Q1. Public sector support: are there any public agencies for research and technical assistance for producers? 0 = No 1 = Yes Q2. Financing: is there any financing available for agricultural innovation? 0 = No 1 = Yes Q3. Is there a public institution for financing agricultural innovation? 0 = No 1 = Yes, sub-national 2 = Yes, national Q4. Training: are there any national or semi-national training programmes for new farmers in sustainable agricultural practices? 0 = No 1 = Yes, sub-national 2 = Yes, national	EIU research	-
4.10) Productivity	Aggregate of underlying 1 sub-indicator score: 4.10.1) Total factor productivity (TFP) growth rate		
4.10.1) Total factor productivity (TFP) growth rate	Total factor productivity (TFP) growth rate between 2001-2013	USDA	2001-2013
4.11) Land-users	Aggregate of underlying 4 sub-indicator scores: 4.11.1) Participation rate of women in farming 4.11.2) Participation rate of youth in farming 4.11.3) Average age of farmers 4.11.4) Working conditions of agricultural workers along the value chain		

4.11.1) Participation rate of women in farming	Employment distribution, agriculture, female	FAO	2013
4.11.2) Participation rate of youth in farming	% of youth in farming (aged 15-24)	EIU research	-
4.11.3) Average age of farmers	Average age of farmers (years)	EIU research	-
4.11.4) Working conditions of agricultural workers along the value chain	Overall score	ITUC Global Rights Index	2014
5.1) Environmental impact of agriculture on the atmosphere	Aggregate of underlying 4 sub-indicator scores: 5.1.1) GHG emissions from agriculture 5.1.2) Animal emissions (% total agriculture emissions) 5.1.3) Fertilizer emissions (% total agriculture emissions) 5.1.4) Land use net emissions/removals (% total, CO2 eq)		
5.1.1) GHG emissions from agriculture	Emissions (CO2eq), agriculture total	FAO	2014
5.1.2) Animal emissions (% total agriculture emissions)	Emissions (CO2eq) from CH4/GHG emissions from agriculture	FAO	2014
5.1.3) Fertilizer emissions (% total agriculture emissions)	Emissions (CO2eq) from N2O/GHG emissions from agriculture	FAO	2014
5.1.4) Land use net emissions/removals (% total, CO2 eq)	Net emissions/removals (CO2eq) from land use total. A negative figure shows that the land use acts as a carbon sink, i.e. it capture greenhouse gas emissions	FAO	2015
5.2) Climate change mitigation	Aggregate of underlying 1 sub-indicator score: 5.2.1) Implementation of agricultural techniques for climate change mitigation and adaptation		
5.2.1) Implementation of agricultural techniques for climate change mitigation and adaptation	Does the country have any initiatives of agricultural techniques for climate change mitigation and adaptation? 0 = No 1 = Yes	EIU research	-
C) NUTRITIONAL CHALLENGES	Aggregate of the underlying 11 indicator scores: 6.1) Prevalence of malnourishment 6.2) Micronutrient deficiency 6.3) Enabling factors 7.1) Health life expectancy 7.2) Prevalence of over-nourishment 7.3) Impact on health		

	7.4) Physical activity 8.1) Diet composition 8.2) Number of people per fast food restaurant 8.3) Economic determinant of dietary patterns 8.4) Policy response to dietary patterns		
6.1) Prevalence of malnourishment	Aggregate of underlying 4 sub-indicator scores: 6.1.1) Prevalence of undernourishment (% of population) 6.1.2) Prevalence of stunting (% of children under 5, height for age) 6.1.3) Prevalence of wasting (% of children under 5, weight for height) 6.1.4) Prevalence of underweight (% of children under 5, weight for age)		
6.1.1) Prevalence of undernourishment (% of population)	Population below minimum level of dietary energy consumption (also referred to as prevalence of undernourishment) shows the percentage of the population whose food intake is insufficient to meet dietary energy requirements continuously. Data showing as 2.5 is used as an estimate for high-income countries where figures are not reported.	World Bank	2015
6.1.2) Prevalence of stunting (% of children under 5, height for age)	Prevalence of stunting is the percentage of children under age 5 whose height for age is more than two standard deviations below the median for the international reference population ages 0-59 months. For children up to two years old height is measured by recumbent length. For older children height is measured by stature while standing. The data are based on the WHO's new child growth standards released in 2006.	World Bank; EIU estimates	-
6.1.3) Prevalence of wasting (% of children under 5, weight for height)	Prevalence of wasting is the proportion of children under age 5 whose weight for height is more than two standard deviations below the median for the international reference population ages 0-59.	World Bank; EIU estimates	-
6.1.4) Prevalence of underweight (% of children under 5, weight for age)	Prevalence of underweight children is the percentage of children under age 5 whose weight for age is more than two standard deviations below the median for the international reference population ages 0-59 months. The data are based on the WHO's new child growth standards released in 2006.	World Bank; EIU estimates	-
6.2) Micronutrient deficiency	Aggregate of underlying 2 sub-indicator scores: 6.2.1) Vitamin A deficiency (% of general population) 6.2.2) Iodine deficiency (% of general population)		
6.2.1) Vitamin A deficiency (% of general population)	Prevalence of retinol <0.70 µmol/L. National, both sexes, National: Pre-SAC: Total.	WHO	2014
6.2.2) Iodine deficiency (% of general population)	Prevalence of urinary iodine < 100 ug/L. Local, both sexes, Buenos Aires city: SAC.	WHO	-
6.3) Enabling	Aggregate of underlying 2 sub-indicator scores:		

factors	6.3.1) Babies under 6 months old exclusively breastfed (% total) 6.3.2) Access to improved water source		
6.3.1) Babies under 6 months old exclusively breastfed (% total)	Percentage of babies under 6 months old exclusively breastfed	World Bank; WHO; UNICEF; EIU estimate	-
6.3.2) Access to improved water source	Access to an improved water source refers to the percentage of the population using an improved drinking water source. The improved drinking water source includes piped water on premises (piped household water connection located inside the user's dwelling, plot or yard), and other improved drinking water sources (public taps or standpipes, tube wells or boreholes, protected dug wells, protected springs, and rainwater collection).	World Bank	2015
7.1) Health life expectancy	Aggregate of underlying 2 sub-indicator scores: 7.1.1) Life expectancy at birth, total (years) 7.1.2) Healthy life expectancy (HALE)		
7.1.1) Life expectancy at birth, total (years)	Life expectancy at birth indicates the number of years a new-born infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life.	World Bank	2015
7.1.2) Healthy life expectancy (HALE)	Healthy life expectancy (HALE)	WHO	2015
7.2) Prevalence of over-nourishment	Aggregate of underlying 2 sub-indicator scores: 7.2.1) Prevalence of overweight in children (5-19 years of age) 7.2.2) Prevalence of overweight in adults (body mass index >= 25)		
7.2.1) Prevalence of overweight in children (5-19 years of age)	Prevalence of overweight among children and adolescents, BMI > +1 standard deviations above the median (crude estimate) (%) (5-19 years of age)	WHO	2016
7.2.2) Prevalence of overweight in adults (body mass index >= 25)	Prevalence of overweight among adults, BMI & Greater Equal; 25 (age-standardized estimate) (%) (18+)	WHO	2016
7.3) Impact on health	Aggregate of underlying 1 sub-indicator score: 7.3.1) Disability Adjusted Life Years (DALYs) from nutritional deficiencies		
7.3.1) Disability Adjusted Life Years (DALYs) from nutritional deficiencies	Disability Adjusted Life Year (DALY) due to nutritional deficiencies. DALYs from nutritional deficiencies overall and from diabetes and cardiovascular issues.	WHO	2012
7.4) Physical activity	Aggregate of underlying 2 sub-indicator scores: 7.4.1) Population reaching recommended physical activity per week (%) 7.4.2) Hours of inactivity, fixed screen time per week		

7.4.1) Population reaching recommended physical activity per week (%)	Percentage of population reaching recommended physical activity per week	EIU research	-
7.4.2) Hours of inactivity, fixed screen time per week	Hours spent in front of TV, PC, and tablet	Millward and Brown, AdReaction 2014 report; EIU research	2014
8.1) Diet composition	Aggregate of underlying 4 sub-indicator scores: 8.1.1) Percentage of sugar in diets 8.1.2) Meat consumption levels 8.1.3) Saturated fat consumption 8.1.4) Salt consumption		
8.1.1) Percentage of sugar in diets	% of sugar in diets	National Geographic "What the world eats"; FAO	2011; 2013
8.1.2) Meat consumption levels	Difference in meat supply quantity (g/capita/day) from recommended intake	FAO; McMichael, AJ et al. "Food, livestock production, energy, climate change, and health."	2013
8.1.3) Saturated fat consumption	Difference in fat supply quantity (g/capita/day) from recommended intake. Total animal fats.	FAO; National Health Service	2013
8.1.4) Salt consumption	Average g/day sodium consumption	Powles, John, et al. "Global, regional and national sodium intakes in 1990 and 2010: a systematic analysis of 24 h urinary sodium excretion and dietary surveys worldwide."	2010
8.2) Number of people per fast food restaurant	Aggregate of underlying 1 sub-indicator score: 8.2.1) Number of people per fast food restaurant		
8.2.1) Number of people per fast food restaurant	Population size in 2015 divided by the total number of fast food restaurants from the global top 3 brands (McDonald's, KFC, and Burger King). Shows penetration rate of fast food restaurants, as a proxy of change towards unhealthy diets. A higher figure means that there penetration rate of fast food restaurants is relatively low (i.e. there aren't many fast-food restaurants in the country)	EIU research	2015

8.3) Economic determinant of dietary patterns	Aggregate of underlying 2 sub-indicator scores: 8.3.1) Proportion of population living below the national poverty line 8.3.2) GINI Coefficient		
8.3.1) Proportion of population living below the national poverty line	% of population under the national poverty threshold (minimum level of income deemed adequate in a particular country) (varies by country)	UN; CIA World Factbook; EIU research	-
8.3.2) GINI Coefficient	Statistical measure of the degree of variation or inequality represented in a set of values, used especially in analysing income inequality. Higher = more unequal	World Bank	-
8.4) Policy response to dietary patterns	Aggregate of underlying 2 sub-indicator scores: 8.4.1) Quality of policy response to dietary patterns 8.4.2) Nutrition education		
8.4.1) Quality of policy response to dietary patterns	Composite indicator: Q1. Are there any policies and/or programmes to promote healthy eating patterns (national and city level) 0 = No 1 = City-level, local or regional 2 = national level Q2. Are there any healthy eating regularly updated (every 5 years at least) guidelines at national level? 0 = No 1 = Less often than every 5 years OR no specified frequency but the latest update is less than 5 years 2 = intervals of 5 years or more often Q3. Are there any taxes of processed food? 0 = No 1 = Yes Q4. Are there any subsidies on inputs (sugar, corn syrup, palm oil, etc.) for processed food? 0 = Yes 1 = No	EIU research	-
8.4.2) Nutrition education	Is nutrition education included (NE) in the national curriculum (compulsory) for primary and/or secondary schools? 0= No (NE is not included in the compulsory national curriculum OR there are only a few local initiatives to include NE in schools) 1 = Partially (NE is included in the national curriculum in theory but in practice, most schools don't have NE OR NE is not included in the compulsory curriculum but in practice some schools have NE OR NE is included in the curriculum but is not compulsory) 2 = Yes (NE is included in the national curriculum and is effectively implemented in practice)	EIU research	-
BACKGROUND INDICATORS			
BG1) PUBLIC AND PRIVATE	Total health expenditure is the sum of public and private health expenditures as a ratio of total	World Bank	2014

HEALTHCARE EXPENDITURE (PER CAPITAL, CURRENT US$)	population. It covers the provision of health services (preventive and curative), family planning activities, nutrition activities, and emergency aid designated for health but does not include provision of water and sanitation. Data are in current U.S. dollars.		
BG2) NEF HAPPY PLANET INDEX	The Happy Planet Index (HPI) is a measure of sustainable wellbeing. It compares how efficiently residents of different countries are using natural resources to achieve long, high wellbeing lives.	NEF Happy Planet Index	2016
BG3) 2027 Population	Total population (both sexes combined) by country, annually for 2027 (thousands), medium fertility variant.	UN Population	2017
BG4) POPULATION GROWTH (2017-2027)	Change in total population (both sexes combined) by country, annually from 2017 to 2027, medium fertility variant.	UN Population	2017
BG5) GROWTH IN POPULATION AS A PERCENTAGE OF GLOBAL POPULATION (2017-2027)	Change in total population (both sexes combined) by country, annually from 2017 to 2027, medium fertility variant, as a percentage of the total global population.	UN Population	2017
BG6) GDP	Gross domestic product (GDP) at purchasing power parity (PPP) in US$.	EIU	2017
BG7) GDP PER HEAD	GDP at purchasing power parity (PPP) IS US$, divided by population.	EIU	2017
BG8) HUMAN DEVELOPMENT INDEX	The Human Development Index (HDI) is a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and have a decent standard of living. The HDI is the geometric mean of normalized indices for each of the three dimensions.	UNDP	2016

* In cases where a consistent data year is not available for all 34 countries in the FSI, a "-" has been used.