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Unit

A report from The Economist Intelligence Unit

# Global food security index 2015



An annual measure of the  
state of global food security

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# Contents

Preface	2
Acknowledgements	3
Executive summary	4
Key findings	7
Overall 2015 GFSI rankings table	10
Score changes	11
Rankings by income classification	12
Affordability	13
Availability	16
Quality & safety	19
Regional comparisons	22
Rankings by regional classification	25
Regional overview	26
Global Food Security Index 2015: Key Trends, 2012–2015	31
Appendix: Methodology	40
Scoring criteria and categories	40
Country selection	42
Weightings	43
Data modelling	43
Food price adjustment factor	43
Sources and definitions	45



# Preface

*The Global Food Security Index 2015: An annual measure of the state of global food security* is the fourth edition of an Economist Intelligence Unit (EIU) study, commissioned by DuPont. This report discusses the key findings from the research and the benchmarking index. It also includes a special report on innovation—an important topic for food security. Lucy Hurst, associate director of custom research for the Americas, was the research director for this project. Katherine Stewart, research associate, was the project manager. Anil

Sarda, research associate, and Myya McGregory, intern, provided research and analytical support. Leo Abruzzese, global forecasting director and global director of public policy, served as senior adviser. William Shallcross designed and constructed the benchmarking model, Janet Sullivan Cross and Peter Ouvry provided editorial support and Mike Kenny was responsible for layout and design. We would like to extend thanks to the many researchers who lent their expertise to this project. A full list of acknowledgements follows. ■

Note: The findings, interpretations and conclusions expressed in this study are those of the author(s) and do not necessarily reflect the views of the sponsor.

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# Acknowledgements

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## **Peer panel members**

The following experts on food security and agricultural policy contributed significantly to shaping the index methodology and vetting the indicators. Their diverse backgrounds and extensive experience ensured that a wide variety of views were considered. The panel met as a group in February 2012 in Washington, DC to review an initial indicator list. The panel has also provided

ongoing support, as needed, throughout all three editions of the index, as well as advising on the selection of weightings.

Ademola Braimoh (World Bank); Margaret Enis (US Agency for International Development); Craig Gundersen (National Soybean Research Laboratory, University of Illinois at Urbana-Champaign); Eileen Kennedy (Friedman School of Nutrition Science and Policy, Tufts University); Samarendu Mohanty (International Rice Research Institute); Prabhu Pingali (Gates Foundation); Pedro Sanchez (Earth Institute, Columbia University); David Spielman (International Food Policy Research Institute); Robert Thompson (Chicago Council on Global Affairs); Patrick Westhoff (Food and Agricultural Policy Research Institute, University of Missouri-Columbia). ■

# Executive summary

Global food security has made a rapid improvement over the past year. We see this in the increased efficiency of food systems and improvements in the nutritional quality of the food to which populations have access. We also see it in the outcomes: 805m people were estimated to be chronically undernourished in 2012-14, down by 4.4% from 842m in 2011-13. Of these 805m, around 791m live in developing countries, despite marked food security improvements in emerging markets and low-income countries over the past decades. The United Nations Food and Agricultural Organisation (FAO) states that since the early 1990s the number of people in developing countries suffering from undernourishment has fallen by more than 200m; nevertheless, about one in eight people in these regions remains chronically undernourished.<sup>1</sup>

Improvement is evident in almost all regions across the globe, but particularly in emerging markets (which have more food-insecure environments), as macroeconomic improvements enable more countries to establish the structures necessary to enable food systems to operate effectively. The 2015 Global Food Security Index (GFSI) displays these developments, revealing improvements in every region except Europe. Low-income and lower-middle-income countries around the world have led the way, recording the greatest overall increases in their scores and

narrowing the gap between the most food-secure and least food-secure countries.

Such progress notwithstanding, global food insecurity remains a challenge. In particular, increased volatility of agricultural production, and also lower urban absorption capacity (as urban migration in many countries continues to rise and as GDP growth slows in over half the countries included in the index), are constraints on food security progress in almost every region. An overwhelmingly positive factor has been the fact that overall economic growth in the developing world over the past few years has led to improvements in the structural areas that are essential to improving people's access to a wider range of affordable, nutritious foods, including more extensive food safety-net programmes, expanded crop storage capacity and dietary diversity.

Food security challenges for developed and developing countries differ considerably. Investment in infrastructure and food systems in low-income and lower-middle income countries is the key to narrowing the gap. Developing countries often lack basic infrastructure, including storage, road and port facilities, while smaller incomes inhibit access to and affordability of nutritious food. Political risk and corruption frequently compound structural difficulties in these countries.

Advanced, rich-world countries generally outperform developing countries, but they too experience food security challenges. Lower

<sup>1</sup> *The State of Food Insecurity in the World: Strengthening the enabling environment for food security and nutrition*, UN Food and Agricultural Organisation (FAO), 2014 <http://www.fao.org/3/a-i4030e.pdf>

economic growth rates in rich-world countries than in emerging markets have eroded affordability and have created challenges in adapting to urbanisation. At the same time, a subsection of the developed world, notably Europe, has recently faced increased political stability risk. Additionally, although advanced economies have more diverse diets and higher consumption of high-quality protein and micronutrients, they also have higher obesity levels. Obesity is a form of malnutrition, which is defined as the excessive consumption of macronutrients and/or micronutrients, and a food security concern.<sup>2</sup>

*Topline results: Global food security improves as the gap between the most and least food-secure countries narrows*

Food security improved in most countries in the 2015 index. Although developed Western countries continued to have the highest levels of food security and Sub-Saharan African countries remained at the bottom of the rankings, the gap between the best and worst performers narrowed. In regional terms, Sub-Saharan Africa's score improved by 1.5 points, while North America's score improved by just 0.1 points and Europe's score deteriorated by 0.5 points. The Middle East & North Africa (MENA) experienced the largest regional increase in food security, with its score rising by 2.4 points, putting it further ahead of Central & South America (+1.5 points) and Asia & Pacific (+1.8 points).

Although food Availability improved across the globe, Europe lost ground in terms of its overall score and also in the Quality & Safety category, while both Europe and North America suffered decreased food Affordability. Weakness in GDP per capita, particularly in high-income countries, was the main factor behind falls in scores in the Affordability category, while less diverse diets, a reduction in consumption of high-quality protein and the weakened presence of the formal grocery sector hurt Quality & Safety scores in Europe.

## How can the index be used?

The GFSI is an interactive, benchmarking model with a range of analytical tools intended to facilitate cross-country and cross-regional comparisons. Available in both Excel and web-based versions, it also provides detailed information about each country's score. This year's model offers a streamlined interface and a variety of advanced analytical functionalities. Users can, for example, explore year-on-year trends to track food security developments in a given country or region, or perform a detailed analysis of the underlying data that drive a country's score. Any two countries may be compared directly, and individual indicators can be examined in detail. The index also allows overall and category scores to be correlated with external factors that may influence food security. The model contains a number of background variables, including the prevalence of undernourishment, stunted children and underweight children, plus measures of the intensity of food deprivation and a variable on obesity.

The Excel-based index analyses food security in four ways. An Overview module provides accessible insights into top-level results and year-on-year trends, including an interactive heat map and rankings and scores for the overall index and major categories. It also allows users to compare indicators through a scatterplot tool. The Series Explorer module allows users to move beyond the quick snapshot provided in the Overview by providing more detailed information on each of the indicators in the model. Results can be filtered by geographical region, level of economic development and landlocked versus coastal status. Top and bottom performers and year-on-year trends are also available for each indicator. The third module, the Country Explorer, presents underlying data for each country, highlighting strengths and weaknesses and progress over the four years since the GFSI was first released. Finally, the Country Comparison module allows a quick comparison of any two countries in the model.

At a basic level, the index and the tool are a

<sup>2</sup> The FAO Hunger Map, FAO, 2014 <http://www.fao.org/hunger/en/>

repository of more than 11,000 data points relating to food security. The GFSI moves beyond standard practice and provides access to the underlying data, sources and weightings, allowing a full understanding of the index's scores and rankings.

Finally, in addition to the annual refresh of the baseline model, every quarter the Economist Intelligence Unit (EIU) applies a food price adjustment factor to the index. This adjustment revises the Affordability score, and hence the overall score, based on changes in global food prices. The adjustment is intended to capture food price shocks in the scores, but it also reveals more gradual changes in Affordability over time.

An index, even a carefully constructed one, is only a tool. By analysing conditions at the national level, it necessarily misses much local context. It

cannot fully capture important cultural and political dimensions and risks, and thus may oversimplify complex issues. That said, by reducing major food security themes to their core elements, the index provides a useful approach to understanding the risks to food security. By centralising existing data and filling data gaps, it aims to further research on food security. Most important, the index is meant to spur dialogue about the drivers of food insecurity and to suggest areas in which policymakers and other stakeholders should focus their efforts in order to have the greatest impact. ■

See the index website for more information on how to use the data and findings to inform your work: <http://foodsecurityindex.eiu.com/>

# Key findings

## I. Overall results for 2015

**During the past year, food security has improved in almost every region of the world, according to the 2015 Global Food Security Index (GFSI).** The 109-country average score rose 1.2 points, with two-thirds of countries making progress from a year earlier. Driving the gains were sustained economic expansion in most regions and rapid growth in developing countries (especially in Sub-Saharan Africa—SSA), combined with lower global food prices. Government investments in agriculture and infrastructure—began in the wake of the food price shocks of 2007-08—have also been crucial to improving food security. The table below summarises average year-on-year score changes over the past four years of the index.

Global Food Security Index:  
109-country average score changes, year on year

	2012-13	2013-14	2014-15
OVERALL INDEX	+0.4	+1.1	+1.2
Affordability	-0.3	+2.3	+1.0
Availability	+1.2	+0.1	+1.4
Quality & Safety	0.0	+0.4	+1.1

**The most-improved countries made progress across a range of factors, but common elements include:** decreased dependence on food safety-net programmes, expanded crop storage capacity, lower levels of post-harvest/pre-consumer food loss, greater diet diversity and better access to high-quality protein sources. Political stability risk also decreased in a number of low-income and lower-middle-income countries, allowing them to focus on developing and sustaining structures that support food security.

**High-income countries still dominate the top of the rankings, but lower-middle-income countries made the biggest gains.** Collectively, these countries raised their score by 2 points, while low-income countries were next, with a +1.6 point increase. The group of high-income countries rose just 0.1 point, with marginal increases in Availability and Quality & Safety but constraints in Affordability.

## II. Regional results

**The Middle East & North Africa (MENA) made the largest strides in food security.** The 2.4-point increase in the region's average overall score was driven primarily by gains in Affordability, owing to a combination of lower household spending on food and higher GDP per capita in 83% of countries (10 of 12). Lower levels of food loss and increased access to high-quality protein resulted in marked improvements in the other two categories,



Availability and Quality & Safety, as well. The political environment also stabilised in most countries (Yemen is a noteworthy exception, as the intensity of its political crisis has escalated in recent months).

**Europe is the only region that worsened in food security, as scores of 85% of countries fell.** The region is complex and is composed of Western European countries and the transition economies in Central and Eastern Europe (26 countries in all). When considered as a separate group, the countries of Western Europe, though they also experienced a slight decline in their food security, outperform all other regions and are the benchmark for good food security practices in advanced economies. Although the availability of food remained constant, progress in reducing food loss and improving physical infrastructure for food systems was more than offset by higher levels of political risk and instability in 11 countries. A fall in urban absorption capacity—a measure of the extent to which the GDP growth rate outpaces the urbanisation rate, and the corresponding ability to support urban growth—was also a constraint.

**In Quality & Safety, SSA made impressive gains.** The region improved by 2.5 points—more than twice the increase recorded by MENA, which came in second in terms of improvement. Burkina Faso (+9.7) and Mali (+8.8) led the way, driven by improved access to quality protein, a measure of the average consumption of essential amino acids in a country's diet. Burkina Faso also made significant strides in the diet diversification indicator, with a 25% increase (87% score increase) in the amount of non-starchy foods consumed in the average diet.

**Strong economic fundamentals are driving GDP growth in emerging markets in Asia & Pacific,** where scores improved in 73% of countries. High saving and investment rates, rapid workforce growth, an expanding middle class and a shift from low-productivity agriculture to high-productivity

manufacturing are the key drivers of progress in developing and emerging markets in the region. As a result, the score gap between Asia & Pacific and the top scoring regions is shrinking.

### III. Four-year trends: 2012 GFSI to 2015 GFSI

**The right policies, priorities and investments can rapidly improve food security.** Over the past four years, most countries have achieved steady, incremental improvement in food security, but a few countries have made dramatic progress. Upper-middle-income countries have seen the most improvement in developing their food systems (+3.6 points). Low- and lower-middle-income populations in Asia & Pacific, MENA and SSA—comprising 41 of the 109 countries in the index—remain the most vulnerable to food price shocks.

**Concentrated government focus and public-private partnerships are crucial to progress in structural elements of food security.** These include such areas as infrastructure and programmes to ensure nutrition, food safety and farmer financing. The cost of food and its impact on household incomes has an almost immediate effect on food security, while infrastructure upgrades, improvements to national diets and the implementation of nutritional standards take longer to show results. On the negative side, corruption, political instability and failure to accommodate urbanisation all hinder the operating environment for food systems.

**Diet diversification and access to high-quality protein are increasing rapidly in low-income countries.** For example, SSA experienced the largest score increase in dietary intake of quality protein (+7.1). However, high-income countries still have greater diet diversity and better access to nutrient-rich foods. Both governments and NGOs are placing emphasis on increasing the intake of essential vitamins and nutrient-dense foods across the globe.

**In the five-year period between 2009 and 2013, lower-income countries saw the greatest increase in urbanisation.** The average urbanisation rate in lower-middle and low-income countries was 3.3%, which was more than double the rate in high and upper-middle-income countries (1.5%). There is a fairly strong negative correlation (-0.67) between urban growth rates and food security, indicating that countries struggle to improve their food security infrastructure when accommodating the costs of urbanisation. Since 2012, countries such as Ukraine, Sierra Leone, Honduras, Brazil and Mozambique have grappled to improve food security owing to rapid urbanisation and unstable GDP growth rates, resulting in score declines for both urban absorption capacity and overall food security.

**Nutritional standards have improved substantially in almost every region.** With the exception of North America, where standards were already high, all regions have improved their scores, largely owing to the introduction of nutritional monitoring and surveillance programmes. In 2012, 85 of the 109 countries had such programmes; an additional 18 have instituted them since then. For example, countries such as Azerbaijan and Côte d'Ivoire are taking steps to enable the government to collect data on and

monitor its citizens' nutritional status. And Azerbaijan's Ministry of Health, supported by the UN Children's Fund (UNICEF), conducted its first major nutritional survey in 2013.

**In the Affordability category, the food safety-net factor has seen the greatest gains.** Countries have made the most progress on the indicator that considers the scope and presence of food safety-net programmes, with SSA countries achieving an average 16.1-point increase. In Benin, dedicated aid from the UN World Food Programme (WFP), coupled with the country's commitment to establishing a national school food programme (in line with the government's strategy of making universal primary education available by 2015), has improved its performance on this indicator. In Senegal, meanwhile, combined efforts by the UN, NGO partners and the WFP have improved food security in accordance with the government's National Strategy for Economic and Social Development for 2013-17. Countries in other regions, most notably MENA and Asia & Pacific, have also seen improvements. Azerbaijan enjoyed significant economic growth in the late 2000s, and has since implemented social reforms, increasing government spending on assistance and establishing state programmes to reduce poverty and increase agricultural production. ■

## 2015 GFSI overall rankings table

Weighted total of all category scores (0-100 where 100=most favourable)

Rank		Score /100	Rank		Score /100	Rank		Score /100
1	United States	89.0	38	Costa Rica	66.9	75	Ghana	46.1
2	Singapore	88.2	39	Turkey	66.0	76	Cote d'Ivoire	46.0
3	Ireland	85.4	40	Panama	65.4	77	Pakistan	45.7
4	Austria	85.1	41	South Africa	64.5	78	Myanmar	44.0
5	Netherlands	85.0	42	China	64.2	79	Uganda	42.8
6	Switzerland	84.4	43	Russia	63.8	=80	Benin	41.7
7	Canada	84.2	44	Belarus	63.5	=80	Senegal	41.7
8	Germany	83.9	45	Romania	63.3	82	Cameroon	41.5
=9	Australia	83.8	46	Botswana	63.1	83	Kenya	41.2
=9	France	83.8	47	Egypt	61.8	84	Syria	40.6
=9	Norway	83.8	48	Venezuela	61.7	85	Nepal	40.5
12	Sweden	82.9	49	Serbia	61.5	=86	Ethiopia	38.5
13	New Zealand	82.8	50	Bulgaria	61.0	=86	Mali	38.5
14	Denmark	82.6	51	Tunisia	60.1	88	Tajikistan	38.3
15	United Kingdom	81.6	52	Thailand	60.0	89	Bangladesh	37.4
16	Portugal	80.5	53	Colombia	59.6	90	Yemen	37.3
17	Finland	79.9	54	Peru	58.6	91	Nigeria	37.1
18	Belgium	79.5	55	Jordan	58.5	92	Sudan	36.5
=19	Israel	78.9	=56	Dominican Republic	56.8	93	Malawi	35.3
=19	Spain	78.9	=56	Kazakhstan	56.8	=94	Angola	35.1
21	Japan	77.4	58	Azerbaijan	56.6	=94	Rwanda	35.1
22	Italy	77.0	59	Ukraine	56.1	96	Cambodia	34.6
23	United Arab Emirates	75.6	60	Ecuador	56.0	97	Guinea	33.9
24	Kuwait	75.5	61	Paraguay	54.5	98	Tanzania	33.7
25	Czech Republic	74.9	62	Morocco	53.9	=99	Burkina Faso	33.6
26	South Korea	74.8	63	Sri Lanka	53.7	=99	Niger	33.6
27	Chile	74.3	64	Uzbekistan	53.6	101	Togo	33.4
28	Poland	74.2	65	Vietnam	53.4	102	Zambia	32.9
29	Greece	73.5	66	El Salvador	53.3	103	Mozambique	32.6
30	Saudi Arabia	72.8	67	Bolivia	52.8	104	Haiti	31.1
31	Hungary	71.4	=68	Algeria	50.9	105	Congo (Dem. Rep.)	30.1
32	Slovakia	70.7	=68	India	50.9	106	Sierra Leone	29.0
33	Uruguay	69.4	=70	Guatemala	49.7	107	Madagascar	28.8
34	Malaysia	69.0	=70	Nicaragua	49.7	108	Chad	27.9
35	Mexico	68.7	72	Philippines	49.4	109	Burundi	25.1
36	Brazil	67.4	73	Honduras	49.3			
37	Argentina	67.1	74	Indonesia	46.7			

# Score changes

(Net change in overall score, 2015 v 2014)

Score improved				Score declined			
Score change		Score change		Score change			
Egypt	+12.4	Senegal	+1.8	Switzerland	+0.2	Sierra Leone	-2.1
Myanmar	+7.7	Ecuador	+1.7	United Arab Emirates	+0.2	Israel	-1.6
Azerbaijan	+7.0	Sri Lanka	+1.7	Belarus	+0.1	Spain	-1.6
Congo (Dem. Rep.)	+5.2	Pakistan	+1.7	Peru	+0.1	Ukraine	-1.3
Togo	+4.8	Botswana	+1.6			Norway	-1.2
Jordan	+4.4	Kazakhstan	+1.6			Honduras	-1.1
Mali	+4.3	Mexico	+1.5			Denmark	-1.1
Vietnam	+4.2	Algeria	+1.5			Greece	-1.0
Panama	+3.9	Yemen	+1.5			Austria	-1.0
Uruguay	+3.6	Chile	+1.4			Italy	-1.0
Benin	+3.6	Guinea	+1.4			Brazil	-1.0
Nicaragua	+3.5	South Korea	+1.3			Venezuela	-0.9
Ghana	+3.5	Morocco	+1.3			United States	-0.9
Singapore	+3.4	Cote d'Ivoire	+1.3			Finland	-0.9
El Salvador	+3.2	Haiti	+1.3			Tajikistan	-0.8
Cameroon	+3.2	Colombia	+1.2			Switzerland	-0.8
Tanzania	+3.0	Madagascar	+1.2			Serbia	-0.8
Sudan	+2.9	Argentina	+0.9			Uganda	-0.7
Chad	+2.9	Bangladesh	+0.9			Czech Republic	-0.6
Uzbekistan	+2.8	Australia	+0.8			Japan	-0.6
Saudi Arabia	+2.7	Costa Rica	+0.8			Hungary	-0.6
Nepal	+2.7	Kenya	+0.8			Syria	-0.5
United Arab Emirates	+2.5	Burkina Faso	+0.8			United Kingdom	-0.4
Guatemala	+2.4	Mozambique	+0.8			Slovakia	-0.4
South Africa	+2.3	Burundi	+0.8			Thailand	-0.3
India	+2.3	Malaysia	+0.7			Germany	-0.3
Ethiopia	+2.2	Malawi	+0.7			Portugal	-0.3
Niger	+2.2	Cambodia	+0.7			Russia	-0.3
China	+2.0	Paraguay	+0.6			Bulgaria	-0.2
Tunisia	+2.0	Ireland	+0.5			Canada	-0.2
Belarus	+1.9	Poland	+0.5			Belgium	-0.1
Peru	+1.9	New Zealand	+0.4			Netherlands	-0.1
Dominican Republic	+1.9	Nigeria	+0.3			France	-0.1
Kuwait	+1.8	Romania	+0.1			Sweden	-0.1
Turkey	+1.8	Indonesia	+0.1			Philippines	-0.1
Bolivia	+1.8	Philippines	+0.3			Rwanda	-0.1
						Zambia	-6.8
				<b>No change</b>			
				Angola			

# Rankings by income classification

(Income groups are World Bank classifications, as of July 1st 2013)

Rank		Score /100	Rank		Score /100	Rank		Score /100	Rank		Score /100
<b>High income</b> (US\$12,616 per capita or more)			<b>Upper middle income</b> (US\$4,086-12,615 per capita)			<b>Lower middle income</b> (US\$1,036-4,085 per capita)			<b>Low income</b> (US\$1,035 per capita or less)		
1	United States	89.0	1	Hungary	71.4	1	Egypt	61.8	1	Myanmar	44.0
2	Singapore	88.2	2	Malaysia	69.0	2	Ukraine	56.1	2	Uganda	42.8
3	Ireland	85.4	3	Mexico	68.7	3	Paraguay	54.5	3	Benin	41.7
4	Austria	85.1	4	Brazil	67.4	4	Morocco	53.9	4	Kenya	41.2
5	Netherlands	85.0	5	Argentina	67.1	5	Sri Lanka	53.7	5	Nepal	40.5
6	Switzerland	84.4	6	Costa Rica	66.9	6	Uzbekistan	53.6	=6	Ethiopia	38.5
7	Canada	84.2	7	Turkey	66.0	7	Vietnam	53.4	=6	Mali	38.5
8	Germany	83.9	8	Panama	65.4	8	El Salvador	53.3	8	Tajikistan	38.3
=9	Australia	83.8	9	South Africa	64.5	9	Bolivia	52.8	9	Bangladesh	37.4
=9	France	83.8	10	China	64.2	10	India	50.9	10	Malawi	35.3
=9	Norway	83.8	11	Belarus	63.5	=11	Guatemala	49.7	11	Rwanda	35.1
12	Sweden	82.9	12	Romania	63.3	=11	Nicaragua	49.7	12	Cambodia	34.6
13	New Zealand	82.8	13	Botswana	63.1	13	Philippines	49.4	13	Guinea	33.9
14	Denmark	82.6	14	Venezuela	61.7	14	Honduras	49.3	14	Tanzania	33.7
15	United Kingdom	81.6	15	Serbia	61.5	15	Indonesia	46.7	=15	Burkina Faso	33.6
16	Portugal	80.5	16	Bulgaria	61.0	16	Ghana	46.1	=15	Niger	33.6
17	Finland	79.9	17	Tunisia	60.1	17	Côte d'Ivoire	46.0	17	Togo	33.4
18	Belgium	79.5	18	Thailand	60.0	18	Pakistan	45.7	18	Mozambique	32.6
=19	Israel	78.9	19	Colombia	59.6	19	Senegal	41.7	19	Haiti	31.1
=19	Spain	78.9	20	Peru	58.6	20	Cameroon	41.5	20	Congo (Dem. Rep.)	30.1
21	Japan	77.4	21	Jordan	58.5	21	Syria	40.6	21	Sierra Leone	29.0
22	Italy	77.0	=22	Dominican Republic	56.8	22	Yemen	37.3	22	Madagascar	28.8
23	United Arab Emirates	75.6	=22	Kazakhstan	56.8	23	Nigeria	37.1	23	Chad	27.9
24	Kuwait	75.5	24	Azerbaijan	56.6	24	Sudan	36.5	24	Burundi	25.1
25	Czech Republic	74.9	25	Ecuador	56.0	25	Zambia	32.9			
26	South Korea	74.8	26	Algeria	50.9						
27	Chile	74.3	27	Angola	35.1						
28	Poland	74.2									
29	Greece	73.5									
30	Saudi Arabia	72.8									
31	Slovakia	70.7									
32	Uruguay	69.4									
33	Russia	63.8									

## Affordability

The Affordability category explores the capacity of a country's people to pay for food, and the costs that they may face both under normal circumstances and at times of food-related shocks. In addition to the annual baseline score, a quarterly adjustment accounts for changes in global food prices, incomes and exchange rates.

Affordability is measured across six indicators:

- Food consumption as a share of household expenditure
- Proportion of population under global poverty line
- Gross domestic product (GDP) per capita (at purchasing power parity, or PPP, exchange rates)
- Agricultural import tariffs
- Presence of food safety-net programmes
- Access to financing for farmers

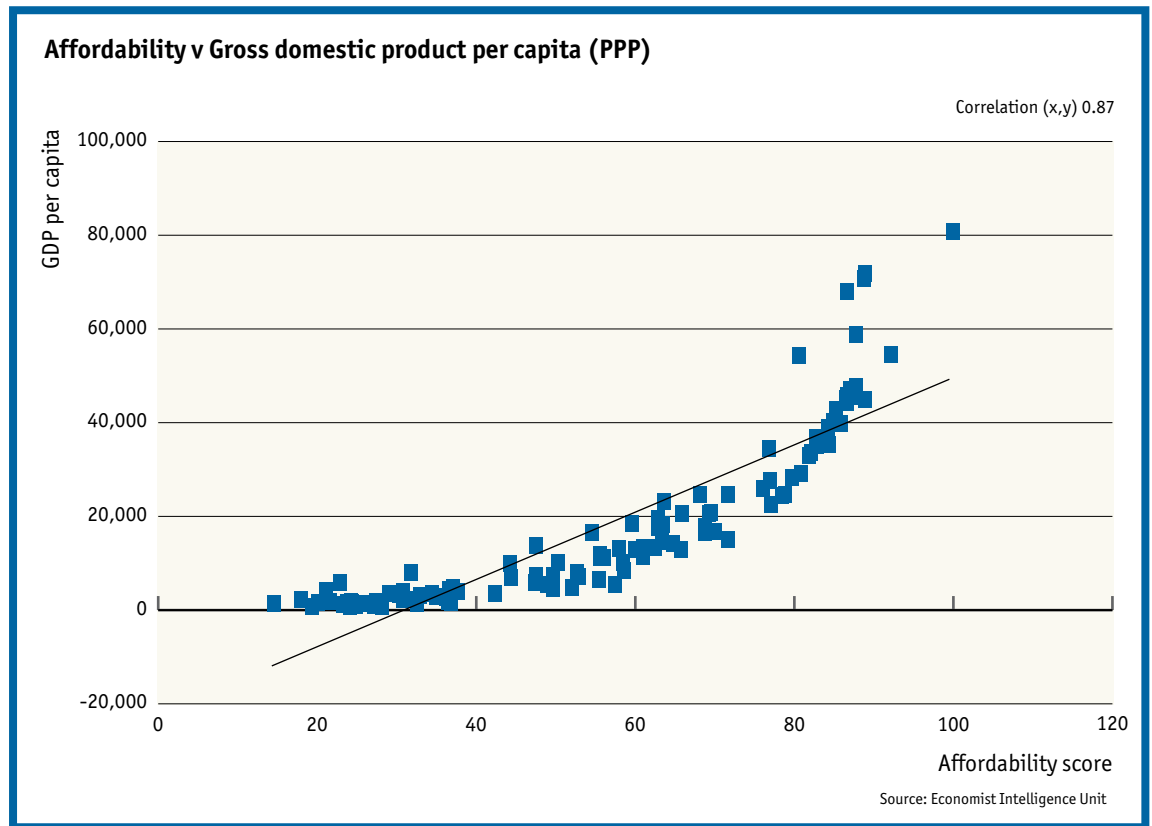
The capacity to afford good-quality food without undue stress is a crucial aspect of food security. The GFSI looks at affordability through two primary lenses: first, whether an average individual in a country has sufficient means to purchase food, and second, the public structures that have been established to respond to personal or societal shocks. Together, these provide a holistic treatment of affordability, exploring elements of ability to pay and cost under a broad array of environmental conditions.

In the 2015 GFSI, just over one-half of the countries in the index showed meaningful improvements in the Affordability category, resulting in a 1-point increase overall. Benin achieved the largest score increase (+11.2), despite its relatively low score of 36.2 in the category. In general, upper-middle-income

countries showed the greatest scores increases (with an average score improvement for that income group of +2.1), followed by lower-middle-income countries (+1.7). The Middle East & North Africa (MENA) improved most of all of the regions relative to the 2014 GFSI, with a 2.9 point increase. Of the 109 countries included in the index, 48 showed a decline in their Affordability scores in 2015; Uganda (-5.1), Norway (-3.1) and Paraguay (-3.1) recorded the largest falls. Only ten countries experienced score gains of 5 points or more, with Egypt recording the greatest improvement (+19.9).

Singapore improved by 6 points between 2014 and 2015, surpassing the performance of the United States (which declined by 2.7 points, to 92.1) to take first position in Affordability category. High-income countries experienced a 0.6-point fall in their average score but remained the top performers in the category: 31 of the 32 top scorers were high-income countries in 2015. Hungary, ranked 27th, was the highest-ranking non-high-income country. This result is unsurprising, as Affordability scores are generally highly correlated with income levels: 85% (17) of the 20 bottom-scoring countries were low-income ones. Madagascar received the worst score for Affordability, at 14.5, 0.6 points lower than last year, and this meant that the score range between the highest-scoring and lowest-scoring countries widened by 4.6 points, from 80.9 in 2014 to 85.5 in 2015.

The GFSI uses three indicators to assess directly the capacity of the average individual to afford food. The first is **food consumption as a share of household expenditure**, which captures the relative importance of food in household budgets. The lower the share of household expenditure on food, the easier it is for a household to cope with



price increases and shocks. Accordingly, the best ten performers in this indicator devoted less than 10% of total household expenditure to food. The US and Singapore, at 6.7%, have the lowest proportions of household expenditure allocated to food. By contrast, countries that received the lowest scores had figures of over 50%. Rwanda (71.7%) and Madagascar (71.8%) had the highest percentages of household expenditure devoted to food. Predictably, the top-performing countries in this indicator were generally in North America and Europe, while the lowest-ranked nations were in Sub-Saharan Africa (SSA) and Asia & Pacific.

The second indicator examines the **proportion of the population under the global poverty line**, defined as those living on less than US\$2 per day (measured at PPP exchange rates). People living below the poverty line have very limited resources and face considerable difficulty purchasing food. There was a tie among 29 countries—27 of which were high-income countries—for the top ranking. All of these countries have 0% of their populations below the global poverty line. This is in marked

contrast to the bottom 20 countries, in which an average of 78.7% of the population was living below the poverty line. With the exceptions of Bangladesh and Haiti, all of the bottom 20 economies were in SSA. Madagascar scored worst of all, with 95.1% of its population living on less than US\$2/day. Of the 28 countries from SSA included in the GFSDI, 13 experienced score declines in 2015.

#### **GDP per capita (at PPP exchange rates)**

provides an insight into the relative wealth of a country and the ability of the average citizen to consume. Understandably, countries with higher GDP tend to have higher levels of food security. GDP per capita in MENA improved by 4.9 points in 2015, owing to increases across the region; within that region, high-income countries—Kuwait (+25.4), Saudi Arabia (+20.1) and UAE (+7.5)—saw the greatest rises. Asia & Pacific's average score climbed by 1.1 points, as a result of improved scores in around three-quarters of the 22 countries in the region. Singapore's score improvement of 27 points countered fairly large falls in Australia

(-13.4), Japan (-9.2), New Zealand (-6.5) and South Korea (-5.1). All other regions experienced declines, with North America falling by a regional average of 9.2 points as all three countries in region experienced deteriorations in their scores in 2015 relative to 2014. The fall in the score for high-income countries (-3.5) in this category made a large contribution to the 0.6-point decrease in food affordability for high-income countries this year.

The index also includes two indicators that add perspective on the cost of food in each country. The **agricultural import tariff** is measured as the average applied most-favoured nation (MFN) rate on all agricultural imports. Higher tariff rates can hurt food security by raising the price of both domestically sourced and imported food. The worst performers in this category are mixed across regions and income levels. The correlation between Affordability and agricultural import tariff scores is slightly negative (-0.08): Egypt (66.7%), South Korea (52.7%), and Norway (51.3%) have the highest agricultural tariff rates, while Australia (1.2%), New Zealand (1.4%) and Singapore (1.4%) have the lowest agricultural tariff rates and were the best performers on this indicator. Thailand experienced a 12.3-point decrease in its score, following a rise from 21.8% to 29.9% in its tariff rate, resulting in a 0.5-point deterioration in its overall Affordability score.

**Access to financing for farmers**, a qualitatively scored indicator that examines the breadth and depth of financing for farmers, provides another perspective on food costs. Better access to financing allows farmers, and particularly smallholders, to respond appropriately to price shocks, and provides the means to create a more

vibrant agricultural sector. Central & South America (CSA) improved by 4.2 points in the provision of financing to farmers in 2015. This figure is double that achieved by MENA, which improved by 2.1 points, and is nearly four times that of Europe (+1). SSA improved by 1.8 points. Eight countries in the index—three in CSA, two in SSA and one each in Europe, Asia & Pacific and MENA—had improved access to financing for farmers. High-income countries continue to dominate the top tier, while lower-middle-income and low-income countries—again, many of them in SSA—have the lowest scores.

The remaining indicator in the Affordability category is the **presence of food safety-net programmes**. This qualitatively scored indicator measures the presence and depth of programmes that protect individuals from food-related shocks and considers the nature of the organising entity, for example, the government or non-governmental organisations (NGOs). Such programmes include in-kind food transfers, food vouchers and school feeding programmes. The more robust these programmes are, the higher a country's score will be. If people have a safety net to fall back on during a crisis, their food security improves substantially. This indicator follows the pattern of most other indicators in this category: highly developed, high-income countries score well, while low-income countries in SSA receive the weakest scores. North America improved by 8.3 points in 2015, owing solely to the improvement in Mexico's score. Asia & Pacific, four of whose countries achieved improvements, saw its score rise by 6.9 points, while in SSA (+6.2 points) six countries improved their scores. ■



## Availability

This category assesses factors that influence the supply of food and the ease of access to food. It examines how structural aspects determine a country's capacity to produce and distribute food, and explores elements that might create bottlenecks or risks to robust availability.

Availability is measured across eight indicators:

- Sufficiency of supply
- Public expenditure on agricultural research and development (R&D)
- Agricultural infrastructure
- Volatility of agricultural production
- Political stability risk
- Corruption
- Urban absorption capacity
- Food loss

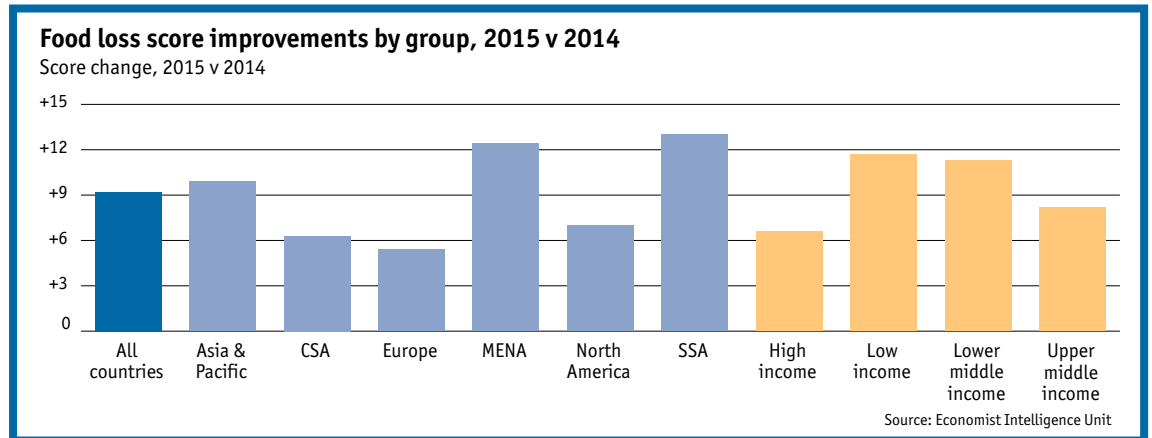
Affordable food has less value if access to it is difficult, volatile or uncertain. Accordingly, the GFSI examines eight crucial aspects of food availability to determine ease of access in each country. Economies with fewer structural restrictions on food availability (from both markets and governments) and more advanced agricultural markets (in terms of both infrastructure and support for the sector) tend to have environments that are more conducive to food security. Such environments are often less at risk of food supply shocks and can handle shocks better when they arise.

Globally, there was a 1.4-point increase in Availability, with over 72% of countries seeing improvements in this category. Given the structural nature of the Availability category, rich-world countries consistently rank at the top in this category but experience smaller year-to-year improvements than lower-middle-income and low-income countries. High-income countries improved their scores by 0.5 points overall in 2015,

while lower-middle-income countries showed the largest collective improvement in their score (+2.4). The United States, despite seeing its score decline by 0.1 points, was ranked first again in 2015, followed by three west European countries, Austria, Ireland and Switzerland, all of which experienced improvements in their scores. European countries continued to suffer a decline in food availability, continuing a trend that was seen in the 2014 GFSI; countries in Europe make up around one-third of the 29 countries that underwent deteriorations in their scores for Availability this year.

Low-income countries, particularly in SSA, achieved the lowest scores for Availability. The gap between the top-scoring country (the United States) and the bottom-scoring one (Burundi) was reduced by 2.4 points. The narrowing of the Availability gap indicates that significant and sustainable structural improvements are possible in SSA; significant improvements in scores in the Affordability category between 2013 and 2014 showed that economic growth in SSA was finally having an impact on personal incomes and the prevalence of food-subsidy programmes across the region. The proceeds of economic growth are now being allocated to the development of infrastructure and agricultural systems.

The first indicator in the Availability category measures **sufficiency of supply**. This composite indicator examines **average food supply** and **dependency on chronic food aid** to assess the core question of availability: is there enough food available in the country? The latter sub-indicator is particularly important because, while greater availability of food is generally preferable, reliance on external donors for regular food supplies reflects weaknesses in the system. High-income countries and upper-middle-income countries experienced an



average rise of 0.8 points in their scores for sufficiency of supply this year, compared with a 3.4-point increase for lower-middle-income and low-income countries. Myanmar's score improved by 27.9 points, the biggest improvement in this indicator, followed by El Salvador (+24.7), Guatemala (+22.0) and Egypt (+20.5). Just under two-thirds of European countries experienced a decline in average food supply, with Greece's score falling by the largest margin (-10.1 points). Hungary also experienced a large decline, at -8 points.

Domestic food supply is partly determined by the **volatility of agricultural production**. Fluctuating output can have a detrimental impact on food security by making it difficult to manage food supply. High volatility can create unneeded surpluses or shortages that severely affect food availability. Asia & Pacific and SSA contain the majority of countries with the least volatile levels of production. The best-scoring countries, led by Guinea (100) and China (99.5), had standard deviations in their agricultural output of less than 0.03 over the 20-year period measured in this indicator. MENA's average score improved by 1.1 points, although agricultural volatility in countries in that region such as Algeria (0.26), Tunisia (0.32), Morocco (0.33) and UAE (0.33) was more than ten times greater than volatility in the top-ranked countries.

While volatility of agricultural production reflects potential problems at the beginning of the food supply chain, **food loss** examines the share of

food that is lost between harvesting and distribution to the consumer. A large proportion of food lost during processing, production, transportation and storage often indicates deep-rooted structural problems in the supply chain. Food loss improvements were more common than declines this year, leading to a 9.2-point improvement in the global score. Only six countries experienced deteriorations in their scores this year. Sierra Leone suffered a 72.6-point decline; this weighed heavily on its overall score in the Availability category, which fell by 14.4 points. With the exception of Sierra Leone, SSA countries made tremendous strides in improving their food loss scores in 2015, with the average score for the region rising by 16.2 points when Sierra Leone is excluded, or by 13 points including Sierra Leone. Ghana's food loss score surged from 0 in 2014 to 44.3 in 2015, although it still scored second-lowest among all the countries included in the index.<sup>1</sup>

**Public expenditure on agricultural R&D** serves as a proxy measure of the amount that a country invests in innovations that can increase market efficiency. Greater expenditure on R&D can improve agricultural yields and increase a country's capacity to produce sufficient food supplies. The United States and Botswana remained tied for first place in 2015. Changes in public expenditure on agricultural

<sup>1</sup> Although 103 countries in the 2015 GFSI experienced score improvements in food loss, the percentage of food lost increased in 52 countries in the index. The data for the 2014 GFSI were based on the 2009 FAO Food Balance Sheets. The 2015 data are sourced from the 2011 FAO Food Balance Sheets. A few countries—Sierra Leone, Brazil, Mozambique and Costa Rica—had significantly higher percentages of food loss in the 2011 Food Balance Sheets than in the 2009 Food Balance Sheets. Given that GFSI indicator scores are normalised across all countries and these four countries saw drastic declines, the majority of the other countries in the index experienced relative score improvements.

R&D were minimal in all regions except MENA, which saw a 3.2 point decrease. This was a result of the drastic 37.5-point decline in Israel's score.<sup>2</sup> The average score change globally was a 0.1-point fall. Public expenditure on R&D is generally low around the world: only 20 countries spent more than 1.5% of their agricultural GDP on R&D.

The **agricultural infrastructure** indicator examines three vital infrastructure components—**the existence of adequate crop storage facilities** and **the extent and quality of port and road infrastructure**. Crop storage facilities are necessary to minimise food loss, facilitate the movement of goods and provide a buffer in case of shocks to the food supply. Robust port and road infrastructure assists in the distribution of food supplies. Without such networks, countries find it difficult to import and distribute products, particularly to rural or remote areas. SSA made the greatest improvement in agricultural infrastructure this year, with an increase in its score of around 11% relative to 2014, driven by improved crop storage facilities in Burundi, Ghana, Madagascar, Nigeria and Senegal. However, improvement in the region was tempered by deteriorations in road infrastructure in Ghana and in port infrastructure in Nigeria.

Good infrastructure can be threatened by both corruption and political instability. High **political stability risk** can limit access to food as a result of transport blockages or reduced international food aid commitments, for example. It can also create interruptions in the supply chain, as political uncertainty or outright conflict diminishes the ability and willingness of individuals to supply food products. Countries such as Syria and Yemen, which suffer from extreme political instability and score 0.0 on this indicator, and Russia, whose score was down by 16.7 points (so that it tied in ranking with Chad and Ukraine), score extremely poorly. Although Europe still scored second-highest on this indicator among all regions, behind only North

America, Europe includes 58% of the countries that experienced declines in political stability in 2015, resulting in a collective fall of 2.3 points for the region.

**Corruption** creates distortions and other inefficiencies in both the use of natural resources and food distribution, and thus poses similar difficulties for Availability to political stability risk. Corruption can divert food supplies, limiting availability in certain areas or creating undesirable bottlenecks. For the second year in a row, MENA experienced the greatest improvement in its corruption score, achieving a 2.1-point rise that was mainly attributable to Tunisia's 25-point improvement. Europe saw a decline of 0.9 points, owing to a fall of 25 points in Spain as a series of corruption scandals among members of the country's political establishment began to unfold in late 2014,<sup>3</sup> and SSA also suffered a 0.9-point deterioration, because of higher levels of corruption in Kenya and Madagascar.

Another potential vulnerability is captured by **urban absorption capacity**, which compares a country's real GDP growth rate with its urban growth rate. This metric provides an indication of whether a country has sufficient resources to accommodate the costs of urbanisation. Rapid urbanisation has the potential to place strains on infrastructure and can lead to difficulties in feeding a growing urban population, particularly if a country's economy is not growing rapidly enough to accommodate the changes. Asia & Pacific tends to perform well on this indicator, claiming five of the top ten positions, because of the fact that its relatively fast-growing emerging economies can more easily accommodate high levels of urbanisation. Asia & Pacific was the only region to record a rise in its score (+0.1). Unsurprisingly, owing to their high GDP growth rates and still only moderate urbanisation rates, lower-middle-income countries accounted for the three highest-ranked countries in the region. This year Sri Lanka ranked highest, experiencing a 16.1-point score improvement relative to 2014. ■

2 In the 2014 GFSI, Israel's score was based on an estimate owing to the fact that no data were available. Actual data became available from the Organisation for Economic Co-operation and Development for the 2015 GFSI. The actual figure is a significantly lower figure than the EIU's 2014 estimate; however, changes were not made to the 2014 data, as the EIU prefers to limit back-scoring to ensure that the scores for each country for 2014 remain comparable with each other and that there are as few changes as possible to the historical data.

3 "A lot of bad apples," The Economist, 2014 <http://www.economist.com/news/europe/21631126-wave-arrests-upends-political-establishment-lot-bad-apples>

## Quality & safety

The third category in the GFSI explores the nutritional quality of average diets and the food safety environment in each country. This category is sometimes referred to by other commentators as “utilisation” because it explores the energy and nutrient intake by individuals, safe food preparation and diversity of the diet.<sup>1</sup>

Food quality & safety is measured across five indicators:

- Diet diversification
- Nutritional standards
- Micronutrient availability
- Protein quality
- Food safety

The Quality & Safety category separates the concept of food security from more traditional welfare metrics, such as poverty, which are often linked to considerations of access. The GFSI category moves beyond such a focus to explore the overall quality of food supplies, based on the understanding that food security requires access to “nutritious food that meets [individuals’] dietary needs”.

In the 2015 index more countries experienced improvements in their Quality & Safety scores than suffered declines. Around 60% of countries improved their performance with the majority of the ten most-improved countries originating from SSA (Myanmar, Singapore, Egypt and Nepal are notable exceptions). The average Quality & Safety score increase was +2.8 points, while the average decline was -1.7 points, with Ukraine (-4.1) seeing the biggest decrease in score in this year’s index. Guinea was the only country not to see a change in

its Quality & Safety score between 2014 and 2015.

The countries that achieved the largest improvements were led by Myanmar (+17.6), Burkina Faso (+9.7), Mali (+8.8) and Singapore (+8.6); however, most of the countries that saw the biggest rises in their scores were ranked near the bottom of the overall index, and also near the bottom in the Quality & Safety category. The ten best-performing countries in the Quality & Safety section were all high-income countries, with eight of them improving their scores for this category; Greece (-0.8) and Israel (-3.1) were the exceptions.

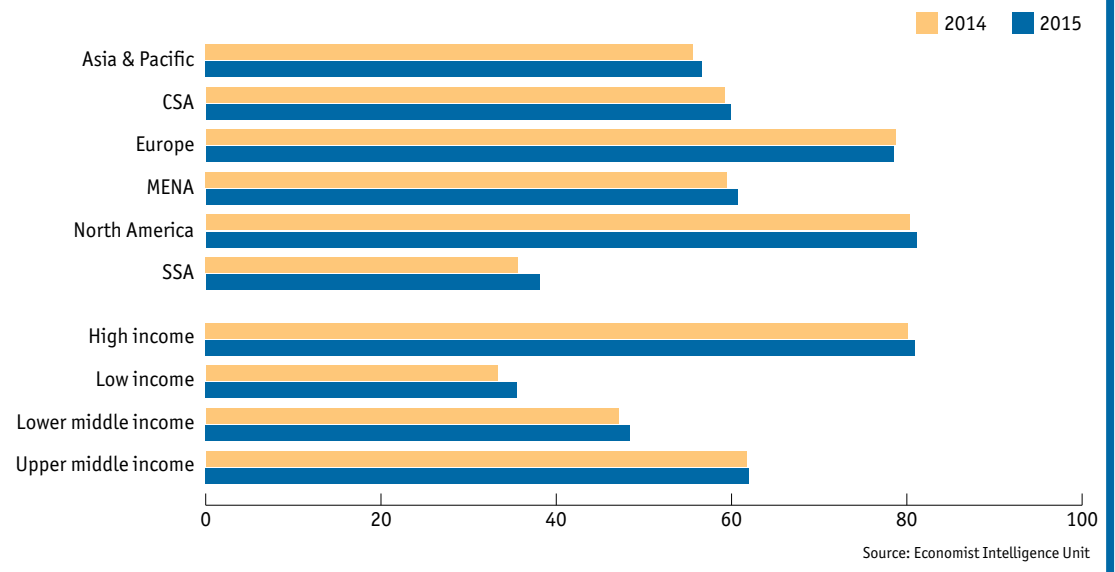
In the GFSI, Quality & Safety is explored by examining the composition of the average diet and the structural and regulatory environment in each country. Understanding the average diet provides important insights into whether individuals in a given country are receiving sufficient nutrients. Three indicators are employed to develop this understanding.

The first, **diet diversification**, measures the share of non-starchy foods in total dietary energy consumption. Diets that consist of higher percentages of non-starchy foods, which include everything but cereals, roots and tubers, tend to be more nutritious, owing to the prevalence of vegetables and dairy and meat products. Unsurprisingly, there are tremendous differences in diets between countries. Those with the highest levels of dietary diversification tend to be developed European countries, led by Switzerland, where 76% of the diet comes in the form of non-starchy foods. Low-income countries in the SSA and Asia & Pacific regions tended to score lower for diet diversification, as a result of the high proportions of starchy foods in their diets. Access to dairy and meat products is limited in countries with lower incomes, and as a result the

<sup>1</sup> *An Introduction to the Basic Concepts of Food Security*, FAO, 2008 <http://www.fao.org/docrep/013/al936e/al936e00.pdf>

### Quality & Safety scores by region and income group, 2015 v 2014

Weighted total of all indicators scores in the category (0-100 where 100=most favourable)



lower-income countries in SSA and Asia & Pacific do less well on this indicator. Non-starchy foods make up only 20% of the diet in Bangladesh—the country that achieved the lowest score in this indicator in the 2015 index. Europe was the only region that saw a decline in its score for this indicator, falling by -0.5 points between 2014 and 2015.

The second indicator that focuses on average diets explores **micronutrient availability**. This composite indicator considers three distinct micronutrients—**vitamin A**, **animal iron** and **vegetal iron**. Advanced countries in the Asia & Pacific region performed best on this indicator, with South Korea (80.9), Japan (75.5) and Singapore (71.1) occupying three of the top four positions. European countries also scored highly, with France (72) and Portugal (70.7) ranking third and fifth. However, the relationship between countries' levels of development and micronutrient availability was not as strong as with other indicators. Factors other than income, such as culture, play a significant role in determining national diets and thus influence access to key micronutrients. For instance, the US received a score of 58.5, which places it narrowly ahead of low-income Chad (58.4) in 20th position.

Additionally, consumption of vegetal iron is usually higher in countries and regions that have lower protein consumption and less dietary diversification; thus, countries that score well on the other nutrition-focused indicators often score less well in micronutrient availability.

**Protein quality** is the final nutrition-focused indicator. It measures the grams of high-quality protein consumed, based on the presence of nine essential amino acids. Europe dominated the protein quality rankings, with Portugal, Finland, Sweden and the Netherlands finishing in four of the top five positions. Singapore moved up to third place in 2015, from 33rd in 2014. Israel, which received the highest score for this indicator in the 2014 GFSI, dropped to tenth place in the rankings in 2015. Although Israel still boasts the highest total average dietary consumption of grams of protein (one of the inputs in this indicator), its food consumption patterns result in a lower level of consumption of high-quality protein than in other high-income countries. Additionally, relative increases in average dietary protein consumption in the developing world resulted in a significant decline in score for Israel, in which country average protein consumption remained unchanged. As with dietary

diversification, there was a strong relationship between income level and consumption of quality protein. CSA countries were generally positioned in the middle of the index, alongside MENA and Asia & Pacific countries.

The other two indicators within the Quality & Safety category, discussed below, assess the structural and regulatory environments in each country. These indicators address the safety component of the category by examining the presence of government oversight of the food sector and national nutrition. Both indicators are composites, incorporating multiple sub-indicators into their analyses.

**Nutritional standards** examines the presence of **national dietary guidelines** and a **national nutrition plan or strategy** in each country. It also considers whether a country has **nutritional monitoring or surveillance**. These three components provide insight into whether a country's government is committed to improving nutritional standards. Together, they determine whether the government is providing information on nutrition, implementing a policy to address nutritional issues and tracking progress. Most countries score well in this area, possessing all three components of the nutritional standards indicator. In the 2015 index, only five countries—Azerbaijan, Côte d'Ivoire, Mozambique, Myanmar and the UAE—saw changes in their scores, all of them positive. Despite strong performances across most countries on this indicator, SSA and low-

income countries make up the majority of countries with lower nutritional standards. Just over 30% of countries in the GFSI did not have all three of these nutritional components in place in 2015.

**Food safety** is the final indicator in the Quality & Safety category. It examines whether a country has an **agency to ensure the safety and health of food**—a baseline regulatory function that helps to ensure food safety and, consequently, security. It also explores two structural elements of food safety: the **percentage of the population with access to potable water** and the **presence of a formal grocery sector**. Both of these indicators assess whether a country has reached the level of development necessary to provide safe food. Access to potable water is clearly a key component of food safety, while a formal grocery sector provides consistent and accessible food products that are generally subject to some degree of public or private oversight. Of the 33 high-income countries in the index, 21 had perfect scores in food safety—a marked contrast with the countries in SSA, which constitute the majority of the lowest-ranked countries and received an average score of 49.1. Poor performance in SSA is primarily the result of lack of a formal grocery sector in 57% of countries in the region. The bottom ten economies in the ranking—all of which, with the exception of Haiti, are in SSA—had an average score of 23.6 (compared with 99.2 in advanced economies), reflecting the lack of resources and development necessary to ensure basic food safety. ■

## Regional comparisons

Food security is a complex and nuanced issue that can be analysed through many viewpoints and from many geographical perspectives—national, regional and global. The regional perspective is beneficial because of the commonalities that are often present across regions, and because it creates an additional basis for comparing countries beyond the global framework. This approach can offer greater insight into the GFSI's measures, and can provide points of comparison between different regions that can afford an understanding of the dynamics of food security and the mechanisms that may be employed to address the unique issues that are experienced within a region and its constituent countries.

At the regional level, structural elements, which are generally more similar within individual regions than across the globe, tend to play an extremely important role in determining food security. In regions that include countries with differing economic systems, policy environments, agricultural infrastructure and nutritional standards, the gap in food security between the best and worst performers is wider. These structural elements tend to change little year on year; however, when changes do occur, they have a

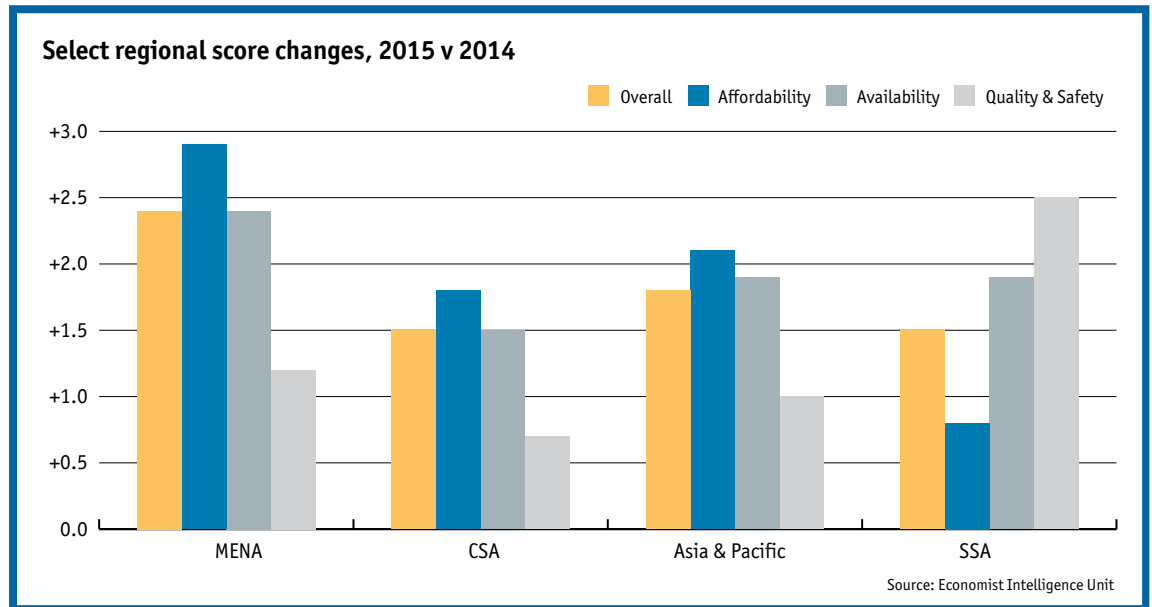
greater impact on food security than other factors explored in the index.

**North America** and **Europe**, which collectively encompass 29 of the 109 countries in the index, recorded the strongest performances in the 2015 GFSI. Developed countries dominate these regions, driving their high scores. Europe and North America have the highest scores in all except four indicators in the GFSI.<sup>1</sup> As two regions consisting primarily of rich countries, Europe and North America have relatively high levels of GDP per capita (although the high-income countries in Asia & Pacific actually have the highest average level of GDP per head) and low spending on food as a percentage of household expenditure (at 17.8% on average, compared with 39.8% on average in the other regions). Wealth corresponds with developed agricultural infrastructure, high sufficiency of supply, relatively low political stability risk and low corruption levels—factors that contribute to North America's and Europe's respective first and second rankings in the overall index and in each category.

<sup>1</sup> The indicators on which Europe and North America do not score highest are, for the most part, those that either do not have a strong correlation with food security or that correlate negatively with food security; these include volatility of agricultural production, urban absorption capacity and agricultural import tariffs. The other indicator on which Europe does not rank as one of the top two regions is nutritional standards. Some of the former Soviet countries lack nutrition-monitoring and surveillance programmes and national nutrition plans, driving down Europe's score on this indicator.

Global Food Security Index scores, 2015

	Overall score	Affordability score	Availability score	Quality & Safety score
Asia & Pacific	57.3	56.4	58.5	56.6
Central & South America	58.0	58.6	56.7	59.9
Europe	75.7	79.2	71.5	78.5
Middle East & North Africa	61.0	62.0	60.2	60.7
North America	80.6	82.9	78.3	81.8
Sub-Saharan Africa	37.8	29.6	45.2	38.1



However, increased household spending on food, deteriorating political stability and less dietary diversification, in addition to the deteriorating presence of a formal grocery sector in Ukraine, resulted in a decline of 0.5 points in Europe's overall food security score, while North America experienced a 0.1-point improvement. Europe outperforms North America on only four indicators in the 2015 GFSI, namely proportion of the population under the global poverty line, access to financing for farmers, food loss and food safety. In each of these indicators, Mexico, the only non-high-income country in North America, performs better than just one country in Europe. Since the North America region comprises just three countries in the index, Mexico's comparatively low—although rapidly improving—scores on these indicators have a much larger impact on the overall regional score than do those of the less-developed countries in Europe.

The next three highest-ranked regions—the **Middle East & North Africa (MENA)**, **Central & South America (CSA)** and **Asia & Pacific**—account for 52 countries in the index and fall within a range of 3.7 points in their overall scores. These regions comprise a mix of developed and developing countries that have varied economic and political

structures. MENA performs the best of the three regions owing to its strong performance in Affordability, for which it scored 3.4 points, ahead of CSA and 5.6 points ahead of Asia & Pacific. MENA also outperforms CSA and Asia & Pacific in the Availability and Quality & Safety categories, but by smaller margins: it came 3.5 points ahead of CSA (the worst performer of the three regions) in Availability, and 4.1 points ahead of Asia & Pacific in Quality & Safety. In Asia & Pacific, the comparatively large percentage of the population under the global poverty line and low level of high-quality protein explain the region's lower scores in the Affordability and Quality & Safety categories, while CSA's relatively weak performance in Availability is primarily a result of high corruption levels and inadequate agricultural infrastructure. CSA received the lowest scores across all three sub-indicators within the agricultural infrastructure indicator, namely road infrastructure, port infrastructure and the existence of crop storage facilities.

**Sub-Saharan Africa (SSA)** received the lowest regional score in the 2015 GFSI, with an overall score almost 20 points below that of Asia & Pacific. It also scored lowest in each of the index categories



and in all but five of the indicators in the index,<sup>2</sup> owing to the large number of low-income countries in the region: of the 28 countries in SSA, 18 are low-income nations according to World Bank income classifications. Commitment to agricultural research and development (R&D), while still weak, is an area of strength relative to some other regions, but underdeveloped agricultural infrastructure, low income levels (SSA's score on this measure is just 20% of the score achieved by the next-lowest region) and low consumption of high-quality protein drive its poor results. ■

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<sup>2</sup> SSA scores better than MENA in agricultural import tariffs and political stability risk and better than both CSA and Asia & Pacific in public spending on agricultural R&D (although SSA's score of 12.5 points in that indicator is still extremely low). SSA scores higher than MENA and Europe in volatility of agricultural production and urban absorption capacity. It also scores better than North America in urban absorption capacity.

## 2015 Rankings by regional classification

Rank		Score /100
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### North America

1	United States	89.0
2	Canada	84.2
3	Mexico	68.7

### Central & South America

1	Chile	74.3
2	Uruguay	69.4
3	Brazil	67.4
4	Argentina	67.1
5	Costa Rica	66.9
6	Panama	65.4
7	Venezuela	61.7
8	Colombia	59.6
9	Peru	58.6
10	Dominican Republic	56.8
11	Ecuador	56.0
12	Paraguay	54.5
13	El Salvador	53.3
14	Bolivia	52.8
=15	Guatemala	49.7
=15	Nicaragua	49.7
17	Honduras	49.3
18	Haiti	31.1

Rank		Score /100
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### Europe

1	Ireland	85.4
2	Austria	85.1
3	Netherlands	85.0
4	Switzerland	84.4
5	Germany	83.9
=6	France	83.8
=6	Norway	83.8
8	Sweden	82.9
9	Denmark	82.6
10	United Kingdom	81.6
11	Portugal	80.5
12	Finland	79.9
13	Belgium	79.5
14	Spain	78.9
15	Italy	77.0
16	Czech Republic	74.9
17	Poland	74.2
18	Greece	73.5
19	Hungary	71.4
20	Slovakia	70.7
21	Russia	63.8
22	Belarus	63.5
23	Romania	63.3
24	Serbia	61.5
25	Bulgaria	61.0
26	Ukraine	56.1

Rank		Score /100
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### Middle East & North Africa

1	Israel	78.9
2	United Arab Emirates	75.6
3	Kuwait	75.5
4	Saudi Arabia	72.8
5	Turkey	66.0
6	Egypt	61.8
7	Tunisia	60.1
8	Jordan	58.5
9	Morocco	53.9
10	Algeria	50.9
11	Syria	40.6
12	Yemen	37.3

### Asia & Pacific

1	Singapore	88.2
2	Australia	83.8
3	New Zealand	82.8
4	Japan	77.4
5	South Korea	74.8
6	Malaysia	69.0
7	China	64.2
8	Thailand	60.0
9	Kazakhstan	56.8
10	Azerbaijan	56.6
11	Sri Lanka	53.7
12	Uzbekistan	53.6
13	Vietnam	53.4
14	India	50.9
15	Philippines	49.4
16	Indonesia	46.7
17	Pakistan	45.7
18	Myanmar	44.0
19	Nepal	40.5
20	Tajikistan	38.3
21	Bangladesh	37.4
22	Cambodia	34.6

Rank		Score /100
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### Sub-Saharan Africa

1	South Africa	64.5
2	Botswana	63.1
3	Ghana	46.1
4	Cote d'Ivoire	46.0
5	Uganda	42.8
=6	Benin	41.7
=6	Senegal	41.7
8	Cameroon	41.5
9	Kenya	41.2
=10	Ethiopia	38.5
=10	Mali	38.5
12	Nigeria	37.1
13	Sudan	36.5
14	Malawi	35.3
=15	Angola	35.1
=15	Rwanda	35.1
17	Guinea	33.9
18	Tanzania	33.7
=19	Burkina Faso	33.6
=19	Niger	33.6
21	Togo	33.4
22	Zambia	32.9
23	Mozambique	32.6
24	Congo (Dem. Rep.)	30.1
25	Sierra Leone	29.0
26	Madagascar	28.8
27	Chad	27.9
28	Burundi	25.1

## Regional overview

### Asia & Pacific

Asia & Pacific includes the most diverse group of countries in any region in the GFSI. The majority are non-high-income countries, contributing to the region's comparatively weak overall score. The top five countries in the region—Singapore, Australia, New Zealand, Japan and South Korea—are all high-income countries, and if they were considered as a separate region their average food security score would rank them at the top of the index, above both North America and high-income countries. The remaining 22 countries in Asia & Pacific had an average overall score of 50.3 in 2015, putting them just 12.5 points ahead of SSA.

The correlation between income level and index performance is extremely strong in Asia & Pacific. Those countries in which food accounts for a high share of household expenditure and where GDP per capita is low have the lowest food security scores, highlighting the strong relationship between shifts in food affordability and overall food security. However, wealth does not only impact Affordability scores. There is a strong positive correlation in Asia & Pacific between a country's performance on indicators that are directly related to its level of development—agricultural infrastructure, sufficiency of supply, diet diversification and protein quality—and the country's income. The wealthier countries in the region are able to invest in food-system infrastructure, and advanced economies have better access to a food supply that is varied and contains necessary proteins.

Areas of strength for many of the poorer countries in Asia & Pacific are low agricultural import tariffs, the existence of government programmes (including food safety-net programmes, financing programmes for farmers

#### Overall food security in Asia & Pacific, by income level, 2015

Scores, 2015 0-100 where 100 = best

●	1	Singapore	88.2
●	2	Australia	83.8
●	3	New Zealand	82.8
●	4	Japan	77.4
●	5	South Korea	74.8
●	6	Malaysia	69.0
●	7	China	64.2
●	8	Thailand	60.0
●	9	Kazakhstan	56.8
●	10	Azerbaijan	56.6
●	11	Sri Lanka	53.7
●	12	Uzbekistan	53.6
●	13	Vietnam	53.4
●	14	India	50.9
●	15	Philippines	49.4
●	16	Indonesia	46.7
●	17	Pakistan	45.7
●	18	Myanmar	44.0
●	19	Nepal	40.5
●	20	Tajikistan	38.3
●	21	Bangladesh	37.4
●	22	Cambodia	34.6

Source: Economist Intelligence Unit

- High income
- Upper middle income
- Lower middle income
- Low income

and nutrition surveillance programmes), high urban absorption capacity, low volatility of agricultural production and low food loss. However, low levels of public spending on agricultural R&D hamper Asia & Pacific's overall score.

## Central & South America (CSA)

CSA experienced an increase of 1.5 points in its average score in the 2015 GFSI—a much greater rise than in 2014, when its score improved by just 0.4 points. Although the region achieved improvements across all three categories, Affordability and Availability were the main drivers of its score change. Improvements in the proportion of household budgets allocated to purchasing food, the proportion of the population living under the global poverty line, the increased presence of food safety-net programmes and better access to financing for farmers countered the regional fall in GDP per capita scores, leading to an overall increase in score of 1.8 points in the Affordability category. In several countries, the application of lessons learned from successful food safety-net programmes, notably Brazil's Bolsa Familia conditional cash-transfer initiative, has bolstered food accessibility and affordability. A major increase in average food supply across the region outweighed constraints arising out of weakness in urban absorption capacity, resulting in improved food availability.

The high-income and more developed southern countries in CSA, namely Chile, Uruguay, Brazil and Argentina, have the highest food security in the region—an unsurprising result, given that food security outcomes are closely linked to income levels. Although household expenditure on food in Argentina is high, and port and road infrastructure in Brazil is relatively underdeveloped, these four countries have the necessary structures and programmes in place to ensure adequate and healthy food. High scores for nutritional standards, the presence of food safety-net programmes and access to financing for farmers support the performances of the top-ranked countries in the region.

The less developed upper-middle-income economies in CSA, namely the Dominican Republic and Ecuador, have the weakest scores among the wealthier countries in the region. Comparatively low GDP per capita, insufficient food supply and micronutrient availability, and fairly high

agricultural import tariffs mean that these countries lag behind their income-level peers in the CSA region. Many Central American and Caribbean countries, and especially those that are classified as lower-middle-income nations (such as Guatemala, Nicaragua and Honduras) are placed at the bottom of the regional rankings, rounded out by Haiti, the only low-income country in CSA, which scored more than 18 points lower than the next-lowest-scoring country. Haiti's scores place it in the bottom tier of the region on every indicator in the index except agricultural import tariffs and volatility of agricultural production—two metrics that are negatively correlated with food security.

## Europe (Western and the transition economies)

The 26 countries of Europe can be divided into two distinct groups according to their levels of economic development. Long-time EU member countries, as well as non-EU countries with high per-capita incomes, such as Norway and Switzerland, tend to do very well in the GFSI, ranking consistently in the top 25 countries. The Eastern European countries (and especially the former Soviet states) that are either EU newcomers or non-members score relatively poorly, although they tend to still rank in the second quartile of countries in the index. Ukraine, owing to its high political stability risk and corruption levels, its low level of GDP per capita and the virtual absence of public spending on agricultural R&D, is an exception, ranking 59th overall. Despite Europe's impressive overall performance, its food security is not improving as fast as that in other regions.

Europe is the only region that experienced a deterioration in its score between 2014 and 2015. It registered score improvements in just four indicators: agricultural import tariffs, access to financing for farmers, agricultural infrastructure and food loss. Europe has the lowest levels of food loss of any region, and achieved a 5.4 point improvement in its score in 2015 owing to rises in scores in every country except Norway (although Europe's increase in its food loss score paled in comparison with the improvements in scores

achieved by the other five regions in the GFSI). Improved road infrastructure in the UK and Slovakia and advances in port infrastructure in Greece resulted in better agricultural infrastructure, while access to financing for farmers improved in Belarus. Although EU agricultural import tariffs remained constant, improvements in every non-EU European country except Switzerland resulted in a small improvement for Europe as a whole.

The region's Affordability score fell by 1.1 points in 2015; the change was driven by a large decline in Europe's GDP per capita score, as the region experienced an average percent increase in GDP per capita from 2014 to 2015 of just 10.8%, compared with 46.6% in MENA, 44.7% in Asia & Pacific and 32.4% in SSA. Only North America, where GDP per capita shrank by 0.7% owing to a 6.5% contraction in Mexico, fared worse on this indicator. Although Europe's Availability score remained constant, improvements in food loss and infrastructure were cancelled out by increased political stability risk in 11 countries and reduced urban absorption capacity. In addition to urbanisation rates that exceeded GDP growth rates in a number of west European countries,<sup>1</sup> negative GDP growth in Finland, Greece, Italy, Russia and Ukraine and slow overall economic growth by comparison with other regions resulted in Europe's scoring second-lowest among the regions, above only MENA, for the urban absorption capacity indicator and in a deterioration in score for 60% of European countries.

## Middle East & North Africa (MENA)

The countries that make up the MENA region in the GFSI are extremely diverse in terms of both food supply and consumption. These differences have a significant impact on the food and agricultural policies that countries have in place across the region. Several states, including Turkey, Morocco and Israel, are major food exporters and are self-sufficient in most agricultural products. As major food exporters, Turkey and Morocco, along

with Egypt, have some of the highest agricultural import tariff rates of any countries in the index. Conversely, the arid Gulf Arab states are, unsurprisingly, heavily dependent on food imports, and their governments are focused on ring-fencing supplies from abroad while expanding food storage capacity domestically. These countries have very low agricultural import tariffs and very highly developed agricultural infrastructure systems, which allow them to transport imported food easily. Despite these intraregional differences, MENA performs well in the GFSI, ranking third regionally behind North America and Europe in over one-half of the indicators that contribute to the overall food security score.

The MENA region experienced the greatest improvement in food security between 2014 and 2015. The 2.4-point increase in its score was driven primarily by increased food affordability, as household expenditure on food fell and scores for GDP per head rose in 83% of countries in the region (Israel and Syria are notable exceptions). The improvement in the political environment of most countries in the region—Yemen is a noteworthy exception, as the intensity of its political crisis has escalated over recent months—and decreases in food loss, along with increased access to high-quality protein, have also resulted in marked improvements in Availability and Quality & Safety. However, improvements in Availability have been hampered by falls in urban absorption capacity: 67% of the MENA countries in the index experienced declines in their scores in this category as the gap between GDP growth rates and urbanisation rates narrowed or, as in the case of Yemen and Kuwait, urbanisation rates began to exceed GDP growth.<sup>2</sup>

## North America

North America comprises three countries that all have relatively high levels of personal income, well-developed agricultural infrastructure, high levels of dietary diversification, and comprehensive

<sup>1</sup> Belgium, Denmark, Finland, France, Netherlands, Norway and Portugal.

<sup>2</sup> A 3.2-point decline in MENA's score for public spending on agricultural research and development also negatively impacted the region's Availability score. However, the fall was the result of an estimated score in 2014 that has been replaced by newly accessible data for 2015.

access to safe and nutritious food. The region experienced a small overall score improvement of 0.1 points and maintained its position as the top-scoring region in the 2015 GFSI. However, slight falls in GDP per capita scores for Canada and the United States, and an actual decrease in GDP per capita in Mexico, resulted in declines in food affordability in the United States and Canada and in the region overall. Owing to an enhancement in the presence of food safety-net programmes and a small reduction in the number of people under the global poverty line, Mexico saw a rise of almost 3 points in its Affordability score between 2014 and 2015. It also experienced a 1.5-point score increase, while the United States and Canada suffered declines in their overall scores.

Increases across the majority of indicators in the Quality & Safety category were the biggest factor behind the overall regional improvement in North America. Scores for access to high-quality protein improved in all three countries, but the rise was especially great in Mexico.<sup>3</sup> Canada experienced an increase in dietary diversification, while both the United States and Mexico improved their food safety, owing to the fact that larger percentages of their populations gained access to potable water—this also bolstered the region's Quality & Safety score.

North America's make-up in the GFSI—two high-income countries and one upper-middle-income country—makes it unique among regions globally. Each country carries significant weight within the regional average, meaning that each individual country has major impact on regional performance across indicators. Europe outperforms North America in only four indicators: percentage of the population under the global poverty line, food loss, access to financing for farmers and food safety. In these indicators, Mexico is the regional laggard and only one European country—either Bulgaria or Romania in each case—does worse; however, Mexico's relatively poor performance has

a tremendous impact, driving down North America's score to below that of Europe.<sup>4</sup> Additionally, although the United States and Canada perform extremely well in the 2015 index, ranking first and seventh respectively, food loss and percentage of the population with access to potable water (a component of food safety) are two of their comparatively weaker indicators, and this has an impact on regional performance. As Mexico continues to improve its food security, the gap between North America's overall score and Europe's overall score is likely to continue to widen: it grew from 4.3 points in 2014 to 4.9 points in 2015.

### Sub-Saharan Africa (SSA)

Food security in SSA is continuing to improve. Of the 28 countries in the region, 82% recorded score increases between 2014 and 2015, and the region as a whole saw a score improvement of 1.5 points. For the first time, improvements in the structures that impact food security, rather than income improvements, are driving positive score changes. The high economic growth rates that SSA has experienced in recent years have resulted in increased investment in the structures that are necessary to ensure food security. Both public and private investment in SSA's agricultural and food systems have begun to pay off: major improvements have occurred in the presence of food safety-net programmes, the existence of crop storage facilities, the percentage of food loss and the existence of nutritional standards. Additionally, lower political stability risk across the region and increased access to high-quality protein—a result of economic development—have resulted in regional improvement.

Despite this improvement, SSA continues to lag. At 29.6 in the Affordability category, SSA's score in 2015 was 26.8 points lower than that of Asia & Pacific. The gap is primarily a result of low incomes. Deteriorating scores in household spending on

<sup>3</sup> All three countries actually had lower levels of consumption of high-quality protein in 2015 compared with 2014, but other countries in the index experienced even greater falls, resulting in positive score increases for Mexico, Canada and the United States. The falls in the scores for high-quality protein consumption for many countries in 2015 is primarily the result of the release of/the availability of new protein-consumption data from the FAO.

<sup>4</sup> In the indicator that examines access to financing for farmers, Ukraine performed worse than Mexico and six countries received the same score as Mexico. However, the 19 countries in Europe that received the highest score outweigh the other European countries poorer performances. In North America, Mexico's score impacts the regional average much more, as it accounts for 33% of the overall regional score.

food and GDP per capita tempered the improvement in SSA's score for food affordability and its overall improvement in food security. Although only five countries in the region experienced real increases in the proportion of household expenditure devoted to food<sup>5</sup>, the improvement on this indicator is occurring much more slowly in SSA than in CSA, MENA or Asia & Pacific. SSA's Affordability score was also impacted by falling scores for GDP per capita in 18 countries; however, 61% of all countries in the 2015 GFSI experienced falls for this indicator, and the impact on SSA's overall score was therefore negligible. ■

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5 Of these five countries, two—Uganda and Zambia—recorded declines because data estimates from the 2014 index were replaced with actual figures for the 2015 GFSI.

# Global Food Security Index 2015: Key Trends, 2012-2015

## Summary of key trends

Since the inception of the Global Food Security Index (GFSI) in 2012, the world has become more food secure, with a series of steady, incremental improvements every year for the past four. This trend has been driven predominately by progress in upper-middle-income countries, where overall food security scores improved by 3.6 points. However, lower-middle-income (+3.3) and low-income (+3.2) countries have also seen marked increases in food security.

These improvements have manifested themselves in a number of ways, most directly through outcomes. The Global Hunger Index—an annual International Food Policy Research Institute (IFPRI) index that creates a composite score based on the proportion of the population that is undernourished, the number of underweight children and the child mortality rate—reports that scores have fallen more quickly (lower scores indicate improvements, i.e. lower levels of deficiencies) between 1990 and 2014 in East & Southeast Asia and Latin America & the Caribbean than in the less developed regions of South Asia and Sub-Saharan Africa (SSA).<sup>1</sup>

Major factors include improvements in policies to ensure nutrition, such as Ministry of Health nutrition surveillance programmes in Azerbaijan and Cote d'Ivoire, supported by UNICEF, as well as NGO and multilateral investments in food safety-net programmes. Economic growth across emerging markets and SSA has also improved food security over the past four years in terms of easing household expenditures on food.

Many countries have also reset their policy

priorities to address this most basic need, following the 2008 spike in global food prices. In addition to nutrition programmes, these efforts have included greater spending on agricultural extension, research & development (R&D) and other initiatives to improve inputs and increase productivity; upgrading infrastructure and storage facilities to mitigate food loss; and working more closely with international agencies to access food aid. As a result, most countries have been able to achieve slow, incremental progress, and the real-world results of their efforts are clearly evident in the indicators in the GFSI.

In the Affordability category, for example, the indicator for food safety-net programmes registered the best improvement across all regions, with SSA making the biggest gains. Benin, Senegal, Sudan and Togo were especially noteworthy, owing to factors including dedicated international aid and stronger government focus on food programmes. The latter also drove significant improvement in the Middle East and North Africa (MENA), where some countries also benefitted from stronger agricultural planning policies in areas such as sustainable development.

The Availability category is affected by many elements that have featured prominently on the international landscape, including political instability and corruption. Central & South America (CSA) made the greatest gains in the food supply indicator (a product of the lessening of both political instability and corruption), as well as growth in personal incomes. Egypt's overall Affordability score improved significantly when political disruptions lessened, while in Yemen, a food crisis followed immediately on the heels of political strife. Transport and storage also play a large role in this category's scores: Sierra Leone

<sup>1</sup> *Global Hunger Index: The Challenge of Hidden Hunger*, IFPRI, 2014 [http://www.ifpri.org/sites/default/files/ghi/2014/feature\\_1813.html](http://www.ifpri.org/sites/default/files/ghi/2014/feature_1813.html)



fared poorly due to substandard storage, transport and harvesting systems, while in SSA overall, the construction of large storage facilities mitigated its score, but infrastructure continues to deteriorate.

Meanwhile, both MENA and SSA have made significant strides in the Quality & Safety category, thanks in part to the implementation of national nutrition programmes. Elsewhere, the scores of countries such as Cambodia have benefitted from stronger government food safety oversight.

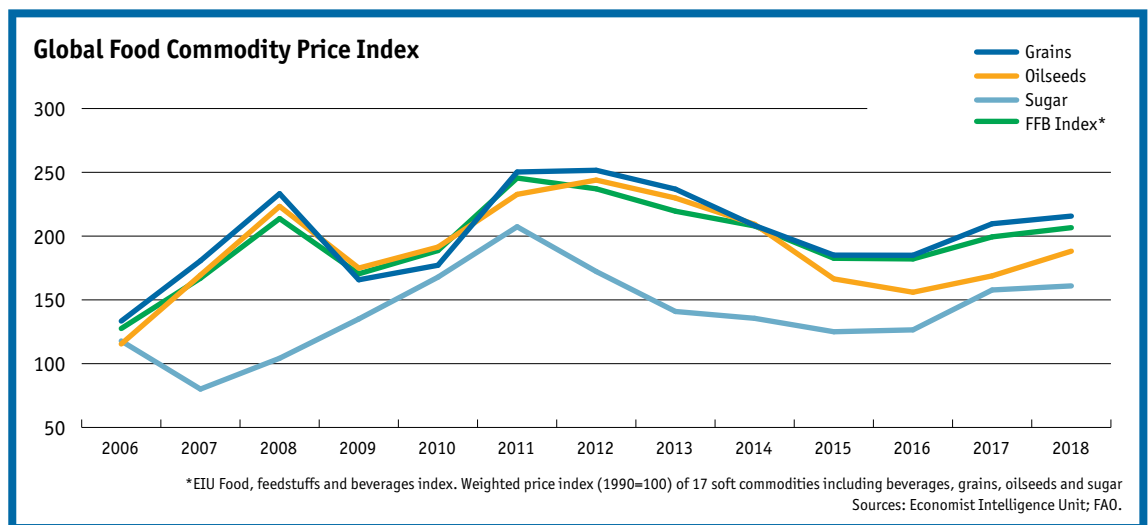
With four years of experience and, more importantly, data and information from the GFSI, we can move beyond our examination of year-on-year trends to consider food security trends over time. What do longer-term trends tell us about food security? Four years of data, which reveal key changes in the index indicators, provide the basis for a better understanding of how the world is becoming more food secure as well as a stark reminder of all that remains to be done.

These are the key trends observed from the index over the past four years:

- The set of upper-middle-income countries have seen the most improvement in food security.
- Low- and lower-middle-income populations in Asia & Pacific, MENA and SSA—comprising 41 of the 109 countries in the index—remain the most vulnerable to food price shocks.
- As global prices on most major commodities have fallen slightly since 2012 (see image), the average

share of household spending on food across the countries in the index has declined by 11%.

- Countries in lower-middle-income and low-income brackets that are absorbing the costs of rapid urbanisation struggle to increase their food security infrastructures. Advanced economies also grapple with urbanisation, as their growth rates are generally slow and feeding growing urban populations efficiently can be a significant challenge.
- Food system infrastructure, including transport and storage facilities, takes longer to improve than other elements necessary for food security, but government prioritisation and public-private-sector partnerships have driven, and will likely continue to drive, progress.
- Almost 70% of the countries in the index have comprehensive nutritional standards in place; all of the countries engage in at least one key effort to ensure national nutrition. School-based nutrition programmes and partnerships with international humanitarian organisations are widely used.
- High-income countries have greater access to high-quality protein, owing to diverse and nutritious diets and better supply chains. However, developing countries have benefitted from more diversity in their diets in recent years. They also have higher dietary availability of vegetal iron.



In the following sections, trend analysis identifies the indicators across each category that drive changes to countries' food security scores. This, in turn, gives insight into the key policies, structures and capacities that a food secure system requires, and provides an opportunity to identify the related patterns across regions and income groups. Overall, the structural elements that are critical to food security—ranging from extensive presence of government policies or multilateral programmes to ensure food access and safety to physical infrastructure for the supply chain—often do not change year on year. However, countries that can establish these structures do ensure a more solid base for long-term food security. Since 2012, during a period of rapid economic growth in the developing world, structural change improvements are starting to be seen in the form of increased storage facilities, and a more general prioritisation of supply chain infrastructure. These gains increase access to food—both at the producer and consumer level—and help to mitigate supply chain-related food loss. The trend analysis tells us that it takes longer to put the right policies in place, but countries that have done so reap results, even effective short-term ones.

Exploring longer-term trends illustrates the impact of food security-related policies and interventions, as the impact of these requires several cycles to assess. The most progress has been made in countries and regions where governments have focused on policy agendas to enhance food security or where NGOs and multilaterals have an active and growing presence, such as in Azerbaijan. On the other hand, insecurity happens quickly when political instability, corruption and poor governance factors affect systems and this takes years to rebuild.

The following sections present a summary of key four-year results and trends across the three food security framework categories: Affordability, Availability and Quality & Safety.

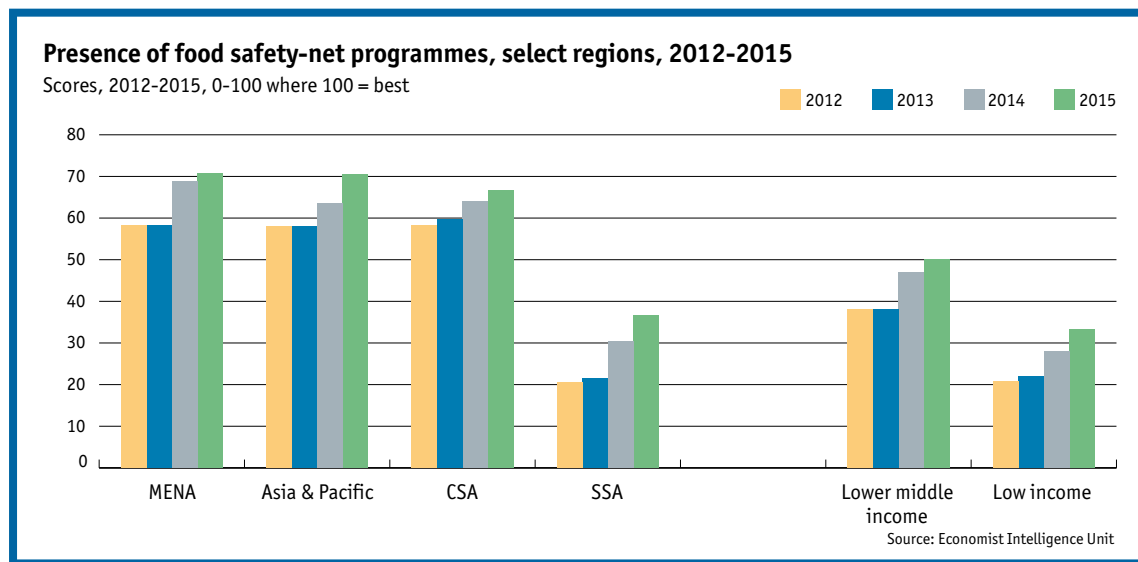
## Affordability

**Overall results:** Food affordability has increased, on average, by 3 points since the first edition of the GSFI in 2012. Just over 70% of the 109 countries have improved their affordability scores, with Asia & Pacific seeing the largest increase (+4.5 points) among all regions. Despite having the second-lowest actual score in Affordability (56.4 points in 2015), the region benefitted from exceptional progress in lessening the proportion of the population under the global poverty line, with 16 of 22 countries improving; five of the six countries that did not do better had already reached the highest possible score. The presence of food safety-net programmes, a measure of the country's public protection initiatives for the poorer members of the population against food shocks, also contributed to improvements across all regions. Increasing NGO and multilateral aid, which effectively supported households' ability to access food, was the main source of improvement for SSA countries.

### Key areas of improvement:

**1. Food safety-net programmes** The indicator for the presence of food safety-net programmes—reflecting public initiatives to protect the poor from food-related shocks—considers government, NGO and multilateral in-kind food transfers, conditional cash transfers and school food programmes. Increases in food aid from organisations such as the World Food Programme (WFP) are also considered, as such aid shows initiative within a country to provide food availability to those most in need. This indicator saw the highest net improvement of all of those in the Affordability category since 2012, averaging a 9.4-point increase across all countries.

Improvement in SSA, which experienced a 16.1-point increase, contributed the most to this change. Notable countries—those improving by at least 50 points over the four years of the study—include Benin, Senegal, Sudan and Togo. Dedicated aid from the WFP, coupled with Benin's commitment to establishing a national school food



programme, has contributed in this regard. Similarly, in 2014, USAID allocated US\$183.7m to support WFP and UNICEF programmes that directly distribute food aid and vouchers to food-insecure and vulnerable populations in Sudan.<sup>2</sup> Combined efforts of the UN, NGO partners and the WFP have also improved food security in Senegal, in accordance with the government's National Strategy for Economic and Social Development, 2013-2017. Likewise, an influx of Ghanaian refugees has renewed WFP operations in Togo, as the organisation has established general food distribution, supplementary rations and food for work programmes.<sup>3</sup>

The MENA region also benefitted from the increased presence of food safety-net programmes (+12.5), with a 50-point rise in Algeria owing to a boost in aid from the Food and Agriculture Organisation (FAO) and WFP in light of the ongoing refugee crisis.<sup>4</sup> Azerbaijan has demonstrated the most improvement in this indicator (100 points since 2012), driving success in the Asia & Pacific region. Unlike the other improved countries, which are largely low- to lower-middle-income, Azerbaijan saw significant economic growth in the late 2000s and implemented social reforms, increased

government spending on social assistance and allowances, and established programmes intended to reduce poverty, enhance agricultural production and foster sustainable development.<sup>5 6</sup>

**2. Food consumption as a share of household expenditure.** Another key factor in the affordability of food, household expenditure on food, saw improvement over the four year period as well. Overall food spending declined by 11% across all of the countries in the index from 2012 to 2015, as the average spending on food as a percentage of household expenditures fell from 38.2% to 33.9%, and 84 of the 109 countries in the index saw their share of spending fall. Correspondingly, the global average score for food consumption as a percentage of household expenditures increased 7.1 points, with high-income countries enjoying the most rapid improvement (+8.6 points). Europe and North America drove much of the positive change in this indicator, but Egypt saw the largest change, up by 49 points since 2012. Egypt's political and economic instability, which erupted in 2011, have finally subsided and the index has now started to capture the changes that were implemented post-revolution.

<sup>2</sup> *Agriculture and Food Security*, USAID, 2014 <http://www.usaid.gov/sudan/agriculture-and-food-security>

<sup>3</sup> *Togo*, World Food Programme <https://www.wfp.org/countries/togo/operations>

<sup>4</sup> *Algeria*, World Food Programme <http://www.wfp.org/countries/algeria/operations/current-operations>

<sup>5</sup> "State Social Protection Fund holds a meeting with World Bank mission," State Social Protection Fund of Azerbaijan Republic, 2014 <http://sspf.gov.az/view.php?lang=en&menu=385&id=1702>

<sup>6</sup> *Trends of Agro-industry*, FAO [http://www.fao.org/fileadmin/user\\_upload/Europe/documents/Publications/AI\\_briefs/Azerbaijan\\_ai\\_en.pdf](http://www.fao.org/fileadmin/user_upload/Europe/documents/Publications/AI_briefs/Azerbaijan_ai_en.pdf)

## Availability

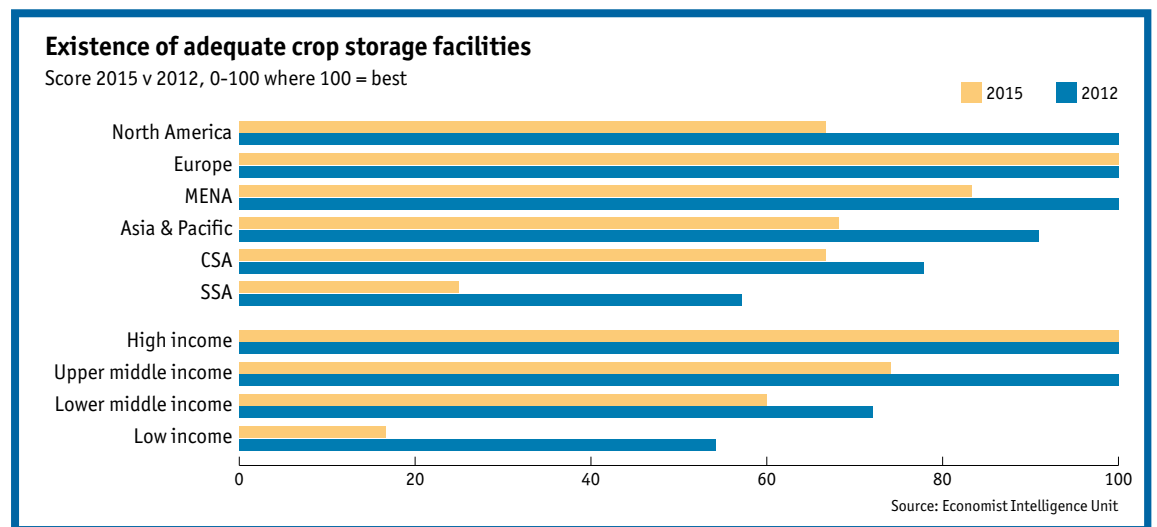
**Overall results:** Globally, the score for food availability has increased 2.8 points for the 109-country set from the first edition of the GFSI in 2012 to the 2015 index, as 77% of countries in the index have been able to improve the availability of food. There was an average 2.7-point global increase in sufficiency of supply, an indicator that measures average food supply and dependency on chronic food aid (in tonnes), from 2012 to 2015. CSA improved the most (+6.6 points) in this indicator, owing to an average score improvement of 7 points in average food supply over this period. Every country in the region except Colombia (-3.6 points) and El Salvador (-3.0 points) saw score improvements and increases in the estimated daily per capita number of calories available. The region—where the WFP intervenes in half of the 18 countries—also made considerable collective strides in lessening the dependence on chronic food aid over the past four years, as incomes increased and political stability risk and corruption fell. This resulted in a 5.6-point improvement since 2012.

### Key areas of improvement:

1. **Agricultural infrastructure**, a composite of the adequacy of crop storage facilities and both road and port infrastructure, has seen a collective score improvement of 3.7 points since the inception of

the GFSI in 2012. Upper-middle-income countries have improved the most (+8 points), while the average increase for lower-middle-income countries was just 0.4 points; however, low-income countries improved 6.0 points. While low-income countries improved 37.5 points for the indicator that tracks the existence of adequate crop storage facilities—owing primarily to the construction of large storage facilities in SSA—these countries have not seen the greatest long-term improvement in agricultural infrastructure. In fact, the failure to make meaningful improvements to their ports and roads has led to score declines of -5.2 and -1.1 in those areas, respectively, over the past four years—primarily a consequence of failing infrastructure in SSA.

2. **Political stability** provides the context for the smooth operation of food systems, and shocks can dramatically affect food security. This is seen in Yemen, where the disintegration of political structures led to an almost immediate food crisis. In the index, average political stability risk scores have risen just 1.3 points since 2012, highlighting the long-term constraints this factor can also have on food supplies. CSA again experienced the greatest net gain; while some countries are suffering from political conflict, the region has seen an improvement overall since 2012. A significant score drop in MENA between 2012 and 2013, owing to instability in the United Arab



Emirates (UAE) and Jordan, set the region back, though its score has risen 2.8 points since 2013. The average score for high-income countries had remained fairly constant through 2014, but this year, political instability has increased in half of the high-income countries in Europe (10 of 20).<sup>7</sup> Many of these scores have been affected by rising international tensions, especially with Russia. For example, in the second half of 2014, Poland urged the European Commission to take Russia to the World Trade Organisation (WTO) over its ban on European Union (EU) food imports.<sup>8</sup>

**3. Corruption** can also disrupt key areas of governance. Globally, there has been little improvement in corruption scores (+0.5 points) from 2012 to 2015. In fact, low-income countries have experienced the most intense deterioration (-2.1 points) owing to increased corruption in Burundi, Kenya and Malawi since 2012. Only Niger has seen consistent falls in corruption levels. Russia is the only high-income country with the worst possible score for corruption, though Spain experienced deterioration in last year (dropping from a score of 75 to 50) because of corruption scandals among members of the country's political establishment that began to unfold in late 2014.<sup>9</sup> The increase in corruption among low-income countries bodes poorly for this at-risk contingent. These countries already have the highest risk of food insecurity; the addition of corruption—an indication of misallocation of resources and inability to effectively implement change and development—heightens the risk for levels of food availability to stagnate and makes these countries less suitable prospects for intervention.

**4. Food loss.** Globally, food loss levels, and consequently scores, have seen a 9.2-point improvement since the first year of the index. In absolute terms, SSA's gain of 13.0 points, thanks to investments in infrastructure development, was the largest, while the advanced economies, where infrastructure is already developed and generally efficient, had the smallest improvements. Over all, the gap between high-income and low-income country averages has narrowed by 5.1 points, as low-income countries saw the greatest average score increase over four years, led by SSA's Ghana, Togo, Benin and Guinea. Sierra Leone struggled, with a net 72.6-point decrease, owing to poor structures and systems to support the transport, storage and harvesting of food. The country also saw an increase in the volatility of its agricultural production, which is directly related to food loss.

**5. Urbanisation.** The four-year trend for urban absorption capacity, which measures the ability of economic growth in countries to keep pace with urbanisation rates, is a net 8.7-point decline across all regions. MENA experienced the lowest percentage decrease, owing primarily to lower urbanisation rates for the majority of countries in the region, though some countries there also saw higher average GDP growth, which strengthened cities' capacity to absorb the impact of increased migration. The UAE has been the driving force behind MENA's outstanding improvement; its score rose 53.0 points from 2012 to 2015, as a result of a drastic slowdown in its urbanisation.

7 Czech Republic, Denmark, Finland, Poland, Russia, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

8 "Russia/Poland risk: Alert – Disputes over sanction to reach WTO?", The Economist Intelligence Unit, August 25th 2014 [http://viewswire.eiu.com/index.asp?layout=RKArticleVW3&article\\_id=952214679&country\\_id=1730000173&channel\\_id=&category\\_id=&refm=rkCtry&page\\_title=Latest+alerts](http://viewswire.eiu.com/index.asp?layout=RKArticleVW3&article_id=952214679&country_id=1730000173&channel_id=&category_id=&refm=rkCtry&page_title=Latest+alerts)

9 "A lot of bad apples," The Economist, 2014 <http://www.economist.com/news/europe/21631126-wave-arrests-upends-political-establishment-lot-bad-apples>

## Quality & Safety

**Overall results:** The Quality & Safety category increased +1.4 points globally between 2012 and 2015. While this is the lowest increase among the three categories in the index, it belies the fact that the majority of countries are already engaged in ensuring food safety and nutritional standards. Many countries that did not already have nutritional standards in place are beginning to monitor nutrition and are working to implement measures to ensure food safety. Just over half the countries (55%) saw score improvements in food safety over the past four years, with an average rise of +4.2 points; the average decline among those that saw a deterioration was -2 points. Between the 2012 and 2015 indices, all regions improved their scores except North America (-0.1), where all three countries already performed in the top third. Analysis from 2012 to 2015 indicates that SSA is the most improved region (+3.6), but 75% of the 20 lowest-performing countries in Quality & Safety are in SSA.

Of the 109 countries in the GFSI, 60 have seen score increases in Quality & Safety since 2012. The top five most-improved countries were Mali (+16.4), Ethiopia (+13.2), Singapore (+12.9), Venezuela (+12.5) and Saudi Arabia (+11.7),

primarily driven by nutritional standards and increased access to high-quality protein. The five countries with the largest net declines were Argentina (-4.1), Madagascar (-5.3), Yemen (-5.3), Tanzania (-5.4) and Sierra Leone (-5.4), driven by score decreases in diet diversification and food safety.

### Key areas of improvement:

**1. Food safety:** Saudi Arabia (+41.1) and Cambodia (+28.5) were among the biggest improvers, making important strides in improving food safety. The presence of a formal grocery sector and agencies to protect the health and safety of food have increased access to nutritious, good-quality food and reduced hunger. According to the FAO, Cambodia's proportion of undernourished people has declined significantly over the years, from 19.6% in 2005-2007 to 16.1% in 2012-2014.<sup>10</sup> In Saudi Arabia, the Food and Drug Authority (SFDA) has partnered with consultancies, experts and researchers to help improve food processing standards and policies. Most recently, it worked with Michigan State University and the Global Food Protection Institute to increase education and professional development for food industry

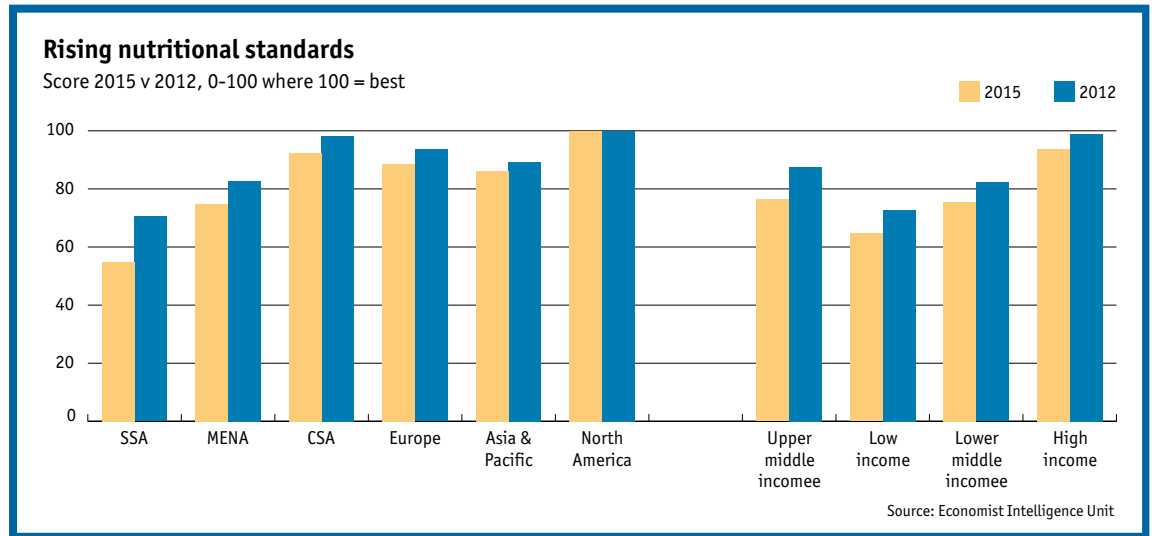
<sup>10</sup> *The State of Food Insecurity in the World: Strengthening the enabling environment for food security and nutrition*, FAO, 2014 <http://www.fao.org/3/a-i4030e.pdf>

### Biggest movers in food Quality & Safety, 2012-15

Score by, 0-100 where 100 = best and changes 2015 vs 2012

	2012	2013	2014	2015	▲ 2012-2015
Mali	25.8	23.7	33.4	42.2	+16.4
Ethiopia	20.8	22.6	29.6	34.0	+13.2
Singapore	71.7	71.8	76.0	84.6	+12.9
Venezuela	54.9	67.8	66.2	67.4	+12.5
Saudi Arabia	55.6	61.6	64.4	67.3	+11.7
Argentina	78.2	77.9	78.0	74.1	-4.1
Madagascar	24.4	26.7	21.0	19.1	-5.3
Yemen	37.7	24.3	32.7	32.4	-5.3
Tanzania	33.7	31.6	26.5	28.3	-5.4
Sierra Leone	37.7	34.8	33.6	32.3	-5.4

Source: Economist Intelligence Unit



professionals.<sup>11</sup> Diversey Consulting, an independent arm of Sealed Air, organised Saudi Arabia's first International Food Safety Conferences in 2010 and 2011.<sup>12</sup>

**2. Nutritional standards** scores—driven primarily by rises in the indicators relating to national nutrition plans and nutritional monitoring and surveillance—improved across all regions except North America, where the score remained constant over the four-year period. In CSA, Asia & Pacific and North America, the scores for national nutrition plans did not change from 2012 to 2015, but Europe, MENA and SSA saw an average increase of +11.6 points. The MENA and SSA regions rose +16.7 points and +14.3 points, respectively, indicating the increased implementation of national nutritional strategies across the globe.

**3. Diet diversification** scores have improved by +1.4 points across all countries since 2012, owing to higher average dietary consumption of non-starchy foods in three-fifths of the countries in the index. Low-income countries such as Tajikistan (+5.8), Nepal (+5.6) and Zambia (+5.5) have improved the most (+4.3), while the average improvement for high-income countries was just +0.9 points. Between 2013 and 2014, MENA saw a decrease of 1.2 points largely owing to high inflation rates in Egypt; however, since 2014, the region has risen 0.6 points.

<sup>11</sup> "MSU Partners with Saudi Agency to Improve Food Safety," Michigan State University, 2012 <http://msutoday.msu.edu/news/2012/msu-partners-with-saudi-agency-to-improve-food-safety/>

<sup>12</sup> "Diversey Consulting organizes Saudi Arabia's First International Food Safety Conference and workshops," Clean Middle East <http://www.cleanmiddleeast.ae/articles/219/diverse-consulting-organizes-saudi-arabia-rsquo-s-first-international-food-safety-conference-and-workshops.html>

## Has the world become more food secure?

According to the latest FAO data, there has been a global drop of more than 100 million in the number of undernourished people in the past decade. And yet food security is still a major international concern.<sup>13</sup> According to UN estimates, the global population is expected to jump from 7.2bn people in 2013 to 9.6bn by 2050, and most of that growth will occur in the developing world.<sup>14</sup> As populations boom and incomes rise in developing countries, the FAO estimates food production will have to grow by 70% to meet demand.<sup>15</sup> However, the world faces many challenges to increasing production.

For example, wheat is the second-largest food crop globally, with about 50m acres under cultivation. Demand is projected to increase 60% by 2050;<sup>16</sup> however, global wheat production is decreasing, despite an increase in total acreage.

Yields in northern and eastern India, Pakistan, southern Nepal and Bangladesh, which account for 15% of global production, are at high risk from rising temperatures.<sup>17</sup> Current climate change models suggest that by 2050, wheat yields could decline by as much as 40% in South Asia.<sup>18</sup>

How do we increase production capacity to meet the needs of the 2050 population? This massive job requires significant effort across the sector, including further investment in infrastructure and additional government and multilateral programmes to guarantee food safety and ensure nutritional standards. The greatest burden, however, will fall to innovation to ensure an adequate and sustainable food supply in the future. This issue is explored in more detail in the thematic paper the Economist Intelligence Unit is publishing for the GFSI 2015 release, which explores the role of innovation in ensuring increased food security in 2050. ■

13 *The State of Food Insecurity in the World: Strengthening the enabling environment for food security and nutrition*, FAO, 2014 <http://www.fao.org/3/a-i4030e.pdf>

14 *World Population Prospects: The 2012 Revision*, United Nations, 2012 <http://esa.un.org/wpp/>.

15 *Global Agriculture toward 2050*, FAO High-Level Expert Forum, October 2009 [http://www.fao.org/fileadmin/templates/wsfs/docs/Issues\\_papers/HLEF2050\\_Global\\_Agriculture.pdf](http://www.fao.org/fileadmin/templates/wsfs/docs/Issues_papers/HLEF2050_Global_Agriculture.pdf)

16 "Arcadia Biosciences, USAID and CIMMYT to Develop Heat-tolerant Wheat," Arcadia Biosciences <http://www.arcadiabio.com/news/press-release/arcadia-biosciences-usaid-and-cimmyt-develop-heat-tolerant-wheat>

17 *Feed the Future: Global Food Security Research Strategy*, Feed the Future, 2011 [http://www.feedthefuture.gov/sites/default/files/resource/files/FTF\\_research\\_strategy.pdf](http://www.feedthefuture.gov/sites/default/files/resource/files/FTF_research_strategy.pdf)

18 "Arcadia Biosciences, USAID and CIMMYT to Develop Heat-tolerant Wheat," Arcadia Biosciences <http://www.arcadiabio.com/news/press-release/arcadia-biosciences-usaid-and-cimmyt-develop-heat-tolerant-wheat>



## Appendix: Methodology

The objective of the Global Food Security Index (GFSI) is to determine which countries are most and least vulnerable to food insecurity. To do this, The Economist Intelligence Unit (EIU) created the GFSI as a dynamic quantitative and qualitative benchmarking model, constructed from 28 unique indicators, that measures drivers of food security across 109 countries. Definitions of the indicators are provided below.

### Scoring criteria and categories

Categories and indicators were selected on the basis of EIU expert analysis and consultation with a panel of food security specialists. The EIU convened this panel in February 2012 to help to select and prioritise food security indicators through a transparent and robust methodology. The goal of the meeting was to review the framework, selection of indicators, weighting and overall construction of the index.

Three category scores are calculated from the weighted mean of underlying indicators and are scaled from 0 to 100, where 100=most favourable. These categories are: Affordability, Availability, and Quality & Safety. The overall score for the GFSI (on a range of 0-100) is calculated from a simple weighted average of the category scores.

The categories and indicators are:

#### 1. Affordability

- 1.1 Food consumption as a share of household expenditure
- 1.2 Proportion of population under the global poverty line
- 1.3 Gross domestic product per capita (PPP)
- 1.4 Agricultural import tariffs
- 1.5 Presence of food safety-net programmes
- 1.6 Access to financing for farmers

#### 2. Availability

- 2.1 Sufficiency of supply
  - 2.1.1 Average food supply
  - 2.1.2 Dependency on chronic food aid
- 2.2 Public expenditure on agricultural R&D
- 2.3 Agricultural infrastructure
  - 2.3.1 Existence of adequate crop storage facilities
  - 2.3.2 Road infrastructure
  - 2.3.3 Port infrastructure
- 2.4 Volatility of agricultural production
- 2.5 Political stability risk
- 2.6 Corruption
- 2.7 Urban absorption capacity
- 2.8 Food loss

#### 3. Quality & Safety

- 3.1 Diet diversification
- 3.2 Nutritional standards
  - 3.2.1 National dietary guidelines
  - 3.2.2 National nutrition plan or strategy
  - 3.2.3 Nutrition monitoring and surveillance
- 3.3 Micronutrient availability
  - 3.3.1 Dietary availability of vitamin A
  - 3.3.2 Dietary availability of animal iron
  - 3.3.3 Dietary availability of vegetal iron
- 3.4 Protein quality

- 3.5 Food safety
  - 3.5.1 Agency to ensure the safety and health of food
  - 3.5.2 Percentage of population with access to potable water
  - 3.5.3 Presence of formal grocery sector

Data for the quantitative indicators are drawn from national and international statistical sources. Where there were missing values in quantitative or survey data, the EIU has used estimates. Estimated figures have been noted in the model workbook. Of the qualitative indicators, some have been created by the EIU, based on information from development banks and government websites, while others have been drawn from a range of surveys and data sources and adjusted by the EIU.

The main sources used in the GFSI are the EIU, the World Bank Group, the International Monetary Fund (IMF), the UN Food and Agriculture Organisation (FAO), the UN Development Programme (UNDP), the World Health Organisation (WHO), the World Trade Organisation (WTO), the World Food Programme (WFP), Agricultural Science and Technology Indicators (ASTI) and national statistical offices.

## Country selection

The 109 countries in the index were selected by the EIU based on regional diversity, economic importance, the size of population (countries with larger populations were chosen so that a greater sub-section of the global population was represent) and the goal of representing regions across the globe. The countries included in the 2015 index are:

Asia & Pacific	Central & South America	Europe	Middle East & North Africa	North America	Sub-Saharan Africa
Australia	Argentina	Austria	Algeria	Canada	Angola
Azerbaijan	Bolivia	Belarus	Egypt	Mexico	Benin
Bangladesh	Brazil	Belgium	Israel	United States	Botswana
Cambodia	Chile	Bulgaria	Jordan		Burkina Faso
China	Colombia	Czech Republic	Kuwait		Burundi
India	Costa Rica	Denmark	Morocco		Cameroon
Indonesia	Dominican Republic	Finland	Saudi Arabia		Chad
Japan	Ecuador	France	Syria		Congo (Dem. Rep.)
Kazakhstan	El Salvador	Germany	Tunisia		Côte d'Ivoire
Malaysia	Guatemala	Greece	Turkey		Ethiopia
Myanmar	Haiti	Hungary	United Arab Emirates		Ghana
Nepal	Honduras	Ireland	Yemen		Guinea
New Zealand	Nicaragua	Italy			Kenya
Pakistan	Panama	Netherlands			Madagascar
Philippines	Paraguay	Norway			Malawi
Singapore	Peru	Poland			Mali
South Korea	Uruguay	Portugal			Mozambique
Sri Lanka	Venezuela	Romania			Niger
Tajikistan		Russia			Nigeria
Thailand		Serbia			Rwanda
Uzbekistan		Slovakia			Senegal
Vietnam		Spain			Sierra Leone
		Sweden			South Africa
		Switzerland			Sudan
		Ukraine			Tanzania
		United Kingdom			Togo
					Uganda
					Zambia

## Weightings

The weighting assigned to each category and indicator can be changed to reflect different assumptions about their relative importance. Two sets of weightings are provided in the index. One possible option, known as neutral weights, assumes that all indicators are equally important and distributes weightings evenly. The second available option, known as peer panel recommendation, averages the weightings suggested by five members of an expert panel. The expert weightings are the default weightings in the model. The model workbook also provides the ability to create customised weightings to allow users to test their own assumptions about the relative importance of each indicator.

## 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. The indicators for which a higher value indicates a more favourable environment for food security—such as GDP per capita or average food supply—have been normalised on the basis of:

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

where  $\text{Min}(x)$  and  $\text{Max}(x)$  are, respectively, the lowest and highest values in the 109 economies 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 the indicators for which a high value indicates an unfavourable environment for food security—such as volatility of agricultural production or political stability risk—the normalisation function takes the form of:

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

where  $\text{Min}(x)$  and  $\text{Max}(x)$  are, respectively, the lowest and highest values in the 109 economies 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.

## Food price adjustment factor

Food prices play an integral role in food security by affecting affordability. High food prices have the greatest impact in developing countries, where the poor typically spend a large share of their income on food and a price rise can significantly reduce food consumption. Food producers may benefit from price increases and the resulting higher revenue, but this is typically a medium- to long-run phenomenon and is not considered for the purposes of our index.

To measure the effect of food prices on affordability, in each quarter following the launch of the index we will apply a food price adjustment factor to each country's affordability score in the GFSI, as we have done for the past two models. This factor will be based on quarterly changes in global food prices as measured by the FAO Food Price Index.

The global price is multiplied by what we call the "local food price pass-through rate", to adjust for local circumstances. We define this rate as the ratio of the change in local food prices to the change in global food prices between 2000 and 2012. If local food prices in country X rose by 20% of the FAO index change during the historical period, we assume that there will be a 20% pass-through of global prices going forward. The size of the pass-through factor is capped at 100% of the FAO global change, so that in no case would a country's local price change be of a higher magnitude than the global change.

To capture other elements of affordability, we consider two additional factors, exchange rates and income. Each country's local food price change is adjusted according to the change in the local currency's US dollar exchange rate to incorporate any change in the relative cost of imports. The quarterly change in the exchange rate is first

adjusted by the import dependency ratio to account for the relative importance of foreign trade. Thus, countries that are more heavily reliant on imports will experience a greater impact on their affordability scores from fluctuations in the exchange rate, while more autarkic countries will experience smaller impacts from such changes.

Additionally, the price factor is adjusted to account for quarterly growth in income per head as forecast by the EIU. All things being equal, higher incomes imply a greater ability to afford food products.

The food price adjustment factor is calculated every quarter following the launch of the yearly baseline model. This provides three comparative quarterly models that track the effects of food price changes over the year. The first quarterly adjustment for the 2015 model will be released in the third quarter of 2015.

## Sources and definitions

Where the quantitative or survey data have missing values, the EIU has estimated the scores.

Indicator	Primary source(s)	Year	Indicator definitions and construction
<b>1) Affordability</b>			
Food consumption as a share of household expenditure	UN Food and Agriculture Organisation (FAO); UN	Latest available year in 1990-2014	A measure of the national average percentage of household expenditure that is spent on food
Proportion of population under global poverty line	World Bank, <i>World Development Indicators</i> ; UN Development Programme (UNDP)	Latest available year in 2008-14	A measure of the prevalence of poverty, calculated as the percentage of the population living on less than US\$2/day at purchasing power parity (PPP) exchange rates.
GDP per capita at PPP	The Economist Intelligence Unit (EIU)	2014	A measure individual income and, hence, affordability of food, calculated in US dollars at PPP.
Agricultural import tariffs	World Trade Organisation (WTO)	Latest available year in 2010-13	Measured as the average applied most-favoured nation (MFN) tariff on all agricultural imports.
Presence of food safety-net programmes	Qualitative scoring by EIU analysts	Latest available year in 2009-15	<p>A measure of public initiatives to protect the poor from food-related shocks. This indicator considers food safety-net programmes, including in-kind food transfers, conditional cash transfers (e.g., food vouchers) and the existence of school feeding programmes provided by the government, non-governmental organisations (NGOs) or the multilateral sector.</p> <p>Measured on a 0-4 scale based on the prevalence and depth of food safety-net programmes:</p> <p>0 = Minimal evidence of food safety-net programmes or programmes run only by NGOs or multilaterals. Emergency food aid programmes funded by multilaterals are not considered.</p> <p>1 = Moderate presence of food safety-net programmes, but run mainly by NGOs or multilaterals. Depth and/or prevalence is inadequate.</p> <p>2 = Moderate prevalence and depth of food safety-net programmes run by government, multilaterals or NGOs.</p> <p>3 = National coverage, with very broad, but not deep, coverage of food safety-net programmes;</p> <p>4 = National government-run provision of food safety-net programmes.</p> <p>Depth indicates the quantity of funds available to recipients; breadth indicates the range of services available.</p>

Indicator	Primary source(s)	Year	Indicator definitions and construction
Access to financing for farmers	Qualitative scoring by EIU analysts	Latest available year in 2007-15	<p>A measure of the availability of financing to farmers from the public sector.</p> <p>Measured on a 0-4 scale based on the depth and range of financing for farmers:</p> <p>0 = No access to government or multilateral farmer financing programmes (typically, but not necessarily, a developing economy).</p> <p>1 = Limited multilateral or government farmer financing programmes (typically, but not necessarily, a developing economy).</p> <p>2 = Some multilateral or government financing (typically, but not necessarily, an emerging-market economy).</p> <p>3 = Broad, but not deep, farmer financing (typically, but not necessarily, a developed economy) OR well-developed multilateral farmer financing programmes (typically, but not necessarily, an emerging-market economy).</p> <p>4 = Access to deep farmer financing (typically, but not necessarily, an advanced economy).</p> <p>Depth indicates the quantity of funds available; range covers credit and insurance.</p>

## 2) Availability

Sufficiency of supply	EIU scoring	-	<p>A composite indicator that measures the availability of food. It comprises the following sub-indicators:</p> <ul style="list-style-type: none"> <li>• Average food supply in kcal/capita/day</li> <li>• Dependency on chronic food aid</li> </ul>
Average food supply	FAO	2011	An estimate of the amount of food available for human consumption in kcal/capita/day.
Dependency on chronic food aid	World Food Programme (WFP)	2006-13	<p>Measures whether a country is a recipient of chronic food aid. For the purpose of this index, chronic aid recipients are defined as those countries that have received non-emergency food aid over a five-year time span.</p> <p>It is measured on a 0-2 scale:</p> <p>0 = Received chronic food aid on an increasing basis over the last five years.</p> <p>1 = Received chronic food aid on a decreasing basis over the last five years.</p> <p>2 = Receives little or no food aid, or receives food aid only on an emergency basis.</p>

Indicator	Primary source(s)	Year	Indicator definitions and construction
Public expenditure on agricultural research and development (R&D)	EIU estimates based on OECD, World Bank, Agricultural Science and Technology Indicators (ASTI); EIU data	Latest available year in 2001-13	A measure of government spending on agricultural R&D. Expenditure on agricultural R&D is a proxy for agricultural innovation and technology that increases market efficiency and access. It is measured as a percentage of agricultural GDP and is scored on a nine-point scale: 1 = 0-0.5%; 2 = 0.51-1.0%; 3 = 1.01-1.5%; 4 = 1.51-2.0%; 5 = 2.01-2.5%; 6 = 2.51-3.0%; 7 = 3.01-3.5%; 8 = 3.51-4.0%; 9 = 4.01-4.5%
Agricultural infrastructure	EIU scoring	-	A composite indicator that measures ability to store crops and transport them to market. Sub-indicators include: <ul style="list-style-type: none"> <li>• Existence of adequate crop storage facilities</li> <li>• Road infrastructure</li> <li>• Port infrastructure</li> </ul>
Existence of adequate crop storage facilities	Qualitative scoring by EIU analysts	Latest available year in 2009-15	This binary indicator assesses the presence of sufficient crop storage facilities based on size of agricultural sector and population. It is measured on a 0-1 scale: 0 = No 1 = Yes
Road infrastructure	EIU Risk Briefing	2015	This qualitative indicator measures the quality of road infrastructure and is measured on a 0-4 scale, where 4=best.
Port infrastructure	EIU Risk Briefing	2015	This qualitative indicator measures the quality of port infrastructure and is measured on a 0-4 scale, where 4=best.
Volatility of agricultural production	FAO	1993-2012	This indicator measures the standard deviation of the growth of agricultural production over the most recent 20-year period for which data are available.
Political stability risk	EIU Risk Briefing	2015	A measure of general political instability. Political instability has the potential to disrupt access to food through such avenues as transport blockages or reduced food aid commitments.
Corruption	EIU Risk Briefing	2015	This indicator measures the pervasiveness of corruption in a country by assessing the risk of corruption. Corruption can impact food availability through distortions and inefficiencies in the use of natural resources, as well as bottleneck inefficiencies in food distribution. Measured on a 0-4 scale, where 4=highest risk.
Urban absorption capacity	World Bank, World Development Indicators; EIU	2013-15	This indicator measures the capacity of a country to absorb the stresses placed on it by urban growth and still ensure food security. It does so by evaluating a country's resources (real GDP) against the stress of urbanisation (urban growth rate). It is calculated as the average percentage of real change in GDP minus the urban growth rate.



Indicator	Primary source(s)	Year	Indicator definitions and construction
Food loss	FAO	2011	A measure of post-harvest and pre-consumer food loss as a ratio of the domestic supply (production, net imports and stock changes) of crops, livestock and fish commodities (in tonnes).

### 3) Quality & Safety

Diet diversification	FAO	2009-11	A measure of the share of non-starchy foods (all foods other than cereals, roots and tubers) in total dietary energy consumption. A larger share of non-starchy foods signifies a greater diversity of food groups in the diet.
Nutritional standards	EIU scoring	-	A composite indicator that measures government commitment to increasing nutritional standards. It comprises the following binary sub-indicators: <ul style="list-style-type: none"> <li>• National dietary guidelines</li> <li>• National nutrition plan or strategy</li> <li>• Nutrition monitoring and surveillance</li> </ul>
National dietary guidelines	Qualitative scoring by EIU analysts based on WHO, FAO and national health ministry documents	Latest available year in 2001-15	A binary indicator that measures whether the government has published guidelines for a balanced and nutritious diet: 0 = No 1 = Yes
Nutrition plan or strategy	Qualitative scoring by EIU analysts based on WHO, FAO and national health ministry documents	Latest available year in 1995-2015	This is a binary indicator that measures whether the government has published a national strategy to improve nutrition: 0 = No 1 = Yes
Nutrition monitoring and surveillance	Qualitative scoring by EIU analysts based on WHO, FAO and national health ministry documents	Latest available year in 2000-15	This is a binary indicator that measures whether the government monitors the nutritional status of the general population. Examples of monitoring and surveillance include the collection of data on undernourishment, nutrition-related deficiencies, etc. 0 = No 1 = Yes
Micronutrient availability	EIU	-	A composite indicator that measures the availability of micronutrients in the food supply. Sub-indicators include: <ul style="list-style-type: none"> <li>• Dietary availability of vitamin A</li> <li>• Dietary availability of animal iron</li> <li>• Dietary availability of vegetal iron</li> </ul>
Dietary availability of vitamin A	FAO	2005-07	The dietary availability of vitamin A is calculated by converting the amount of food available for human consumption (as estimated by the FAO Food Balance Sheets) into the equivalent of vitamin A. This indicator is expressed in micrograms of retinol activity equivalent (RAE)/capita/day on a 0-2 scale. 0 = less than 300 mcg RAE/capita/day; 1 = 300-600 mcg RAE/capita/day; 2 = more than 600 mcg RAE/capita/day

Indicator	Primary source(s)	Year	Indicator definitions and construction
Dietary availability of animal iron	FAO	2005-07	The dietary availability of iron is calculated by converting the amount of food available for human consumption (as estimated by the FAO Food Balance Sheets) into the equivalent of iron. Animal iron is obtained from foods such as meat, milk, fish, animal fats and eggs. This indicator is expressed in mg/capita/day.
Dietary availability of vegetal iron	FAO	2005-07	The dietary availability of iron is calculated by converting the amount of food available for human consumption (as estimated by the FAO Food Balance Sheets) into the equivalent of iron. Vegetal iron is obtained from foods such as cereals, pulses, roots and tubers, vegetable oils, fruits and vegetables. This indicator is expressed in mg/capita/day.
Protein quality	EIU calculation based on data from FAO, WHO and USDA Nutrient Database	2005-11	This indicator measures the amount of high-quality protein in the diet using the methodology of the Protein Digestibility Corrected Amino Acid Score (PDCAAS). The PDCAAS methodology assesses the presence of nine essential amino acids in the average national diet. The inputs for this calculation include: the amino acid profile, protein digestibility value and the average amount (in grams) consumed of each food item that contributes a minimum of 2% to total protein consumption.
Food safety	EIU scoring	-	A composite indicator that measures the enabling environment for food safety. The sub-indicators are: <ul style="list-style-type: none"> <li>• Agency to ensure the safety and health of food</li> <li>• Percentage of population with access to potable water</li> <li>• Presence of formal grocery sector</li> </ul>
Agency to ensure the safety and health of food	Qualitative scoring by EIU analysts	Latest available in 2005-15	Binary indicator that measures the existence of a regulatory or administrative agency to ensure the safety and health of food: 0 = No 1 = Yes
Percentage of population with access to potable water	World Bank	Latest available in 2007-12	Access to potable water is the proportion of people using improved drinking water sources, namely household connection, public standpipe, borehole, protected dug well, protected spring, rainwater.
Presence of formal grocery sector	Qualitative scoring by EIU analysts	Latest available in 2009-15	Qualitative indicator measuring the prevalence of a formal grocery sector, measured on a 0-2 scale: 0 = Minimal presence 1 = Moderate presence 2 = Widespread presence

#### 4) Output variables

Prevalence of undernourishment	FAO	2011-13	The proportion of the population that does not receive the minimum number of required calories for an average person as defined by the FAO/WHO/UN University Expert Consultation in 2001.
Percentage of children stunted	WHO	Latest available year in 1977-2012	The percentage of children under five years who have a height-for-age below -2 standard deviation from the National Centre for Health Statistics (NCHS)/WHO reference median.

Indicator	Primary source(s)	Year	Indicator definitions and construction
Percentage of children underweight	WHO	Latest available year in 1977-2012	The percentage of children under five years who have a weight-for-age below -2 standard deviation from the NCHS/WHO reference median.
Intensity of food deprivation	FAO	2011-14	A measure of how far, on average, the population falls below the dietary energy requirement. It is measured as the difference between the minimum dietary energy intake and the average dietary energy intake of the undernourished population.
Human Development Index	UNDP	2013	A composite index that measures development by combining indicators on life expectancy, educational attainment and income.
Global Gender Gap Index	World Economic Forum	2014	The Global Gender Gap Index seeks to measure the gaps between women and men across a large set of countries and across the four key areas of health, education, economy and politics.
EIU Democracy Index	EIU	2014	The Democracy Index provides a snapshot of the state of democracy in 165 states and two territories. The index includes indicators in the following five categories: electoral process and pluralism, functioning of government, political participation, political culture, and civil liberties.
Prevalence of obesity	WHO	2008	Measures the percentage of the population over 20 years of age that is obese. Obesity is defined as an age-standardised body mass index (BMI) greater than 30.

Whilst every effort has been taken to verify the accuracy of this information, neither The Economist Intelligence Unit Ltd. nor the sponsor of this report can accept any responsibility or liability for reliance by any person on this white paper or any of the information, opinions or conclusions set out in the white paper.

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