

# WHERE WE ARE IN IMPLEMENTING SUSTAINABLE FOOD SYSTEMS

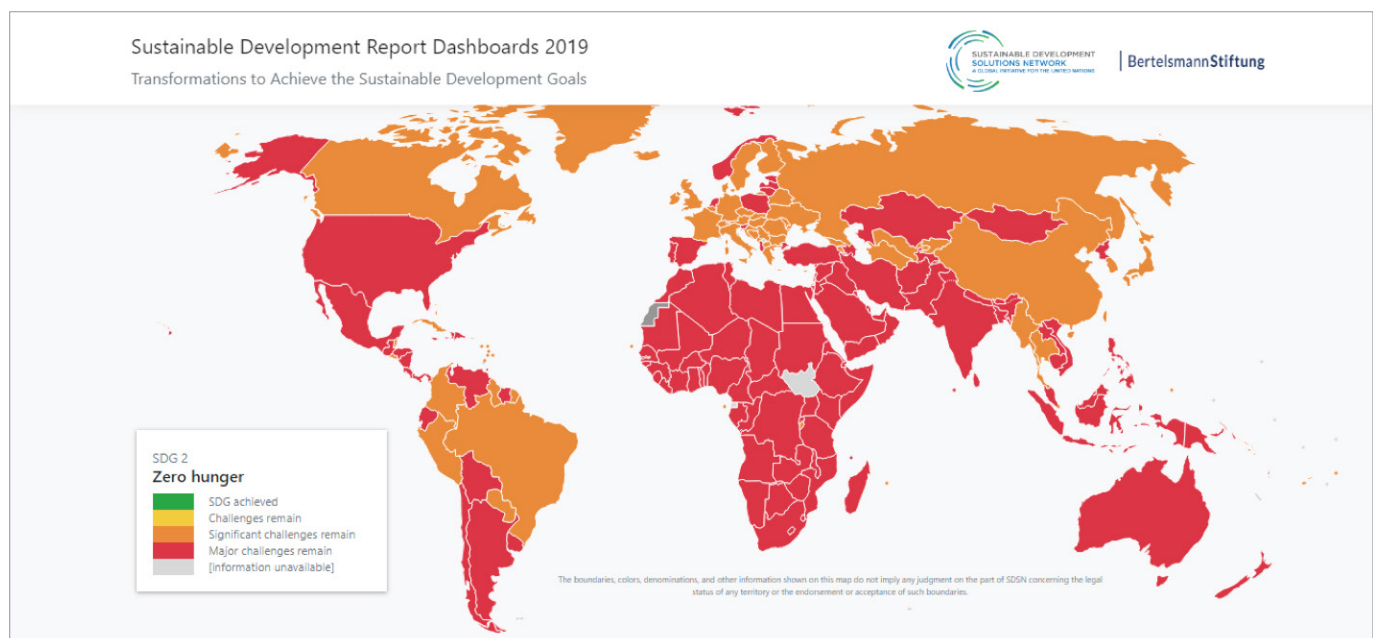
SANTA CHIARA LAB AND BARILLA FOUNDATION

The topic “Sustainability of Food Systems” clearly falls within the scope of the Sustainable Development Goal SDG 2 - zero hunger - of the 17 SDGs presented in the 2030 Agenda. The SDG 2 aims to end hunger, achieve food security and improved nutrition, and promote sustainable agriculture. Based on the assessment of SDG indexes provided in the Sustainable Development Report 2019 (Sachs et al. 2019), the SDG 2 index scores 53.6 as a world average (162 UN countries monitored). The score signifies a position between the worst (0) and the best (100) of target outcomes; this suggests that the world is 53.6% of the way to the best possible outcome, not a good position.

Taking into account the composite nature of the index, that embeds different indicators, the first ten countries in the ranking ranges from 78% to 68% (including the Republic of Korea, China, Singapore, Austria, Belgium, Ireland, Slovak Republic, Germany, Denmark, Japan) thus demonstrating that even the best countries in the world do not properly accomplish all the requirements. Out of the 162 monitored, 56 countries perform under the 50%.

Figure 1.5.1 shows the interactive map of the Sustainable Development Report Dashboards 2019 representing the performance of world countries on the SDG 2. Given the scale from green (achieved goal), down to yellow, orange and red (unavailable data is in grey), it is an eloquent proof. There is not any country in the world performing the right way (not green or yellow); in most of world countries, especially the African continent, major challenges remain.

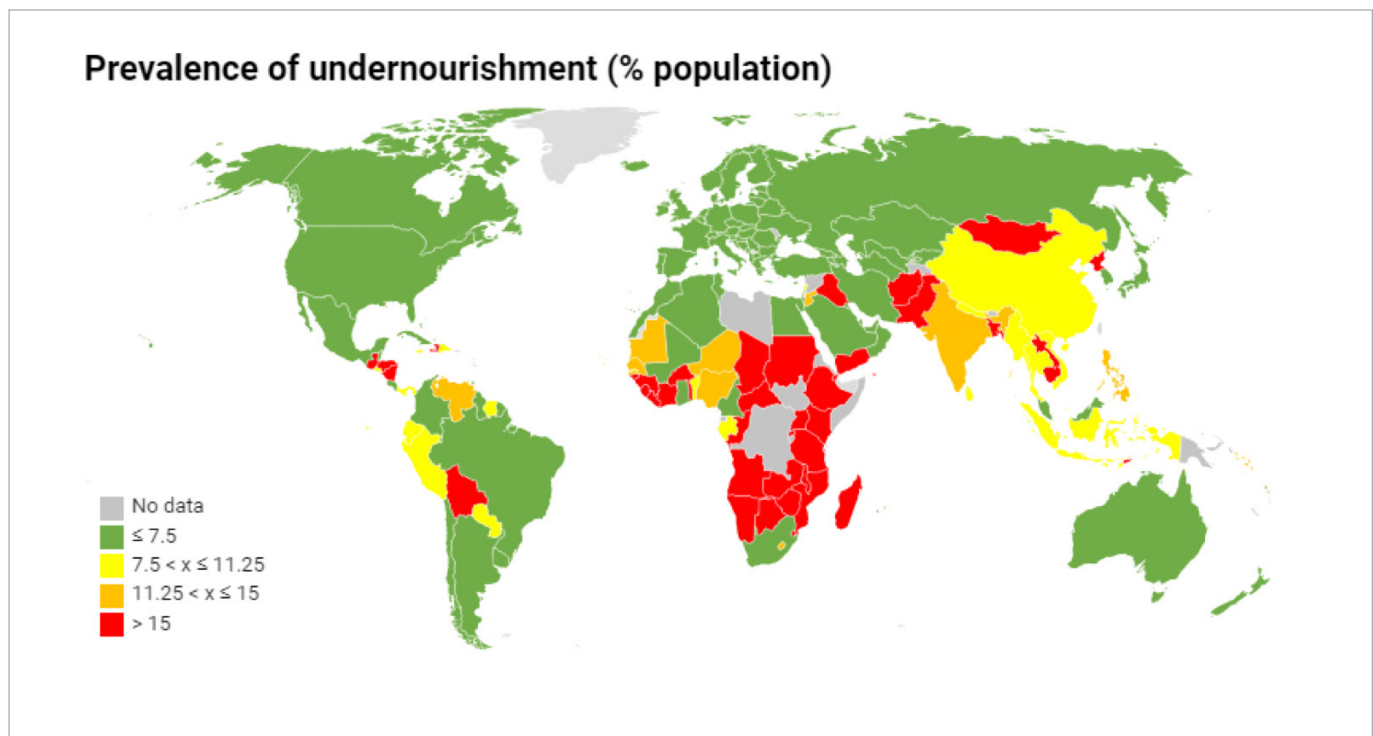
**Figure 1.5.1.** Map of SDG 2 dashboard – Source: SDG Index and Dashboards Report 2019.



The SDG 2 index is based on a set of eight indicators that refers to general problems such as lack of nutrition (most relevant in low income countries), unhealthy trends in food consumption (most relevant in high income countries) and impacts of agriculture (almost everywhere especially referring to the nitrogen cycle). The definition of each indicator is reported below as stated in by Sachs et al. (2019), together with a sequence of maps, specifically made to represent at a glance the state of the world per each indicator.

**Prevalence of undernourishment** (% population): The percentage of the population whose food intake is insufficient to meet dietary energy requirements for minimum one year. Dietary energy requirements are defined as the amount of dietary energy required by an individual to maintain body functions, health and normal activity. FAO et al. (2015) report 14.7 million undernourished people in developed regions (1.17%) (Sachs et al. 2019).

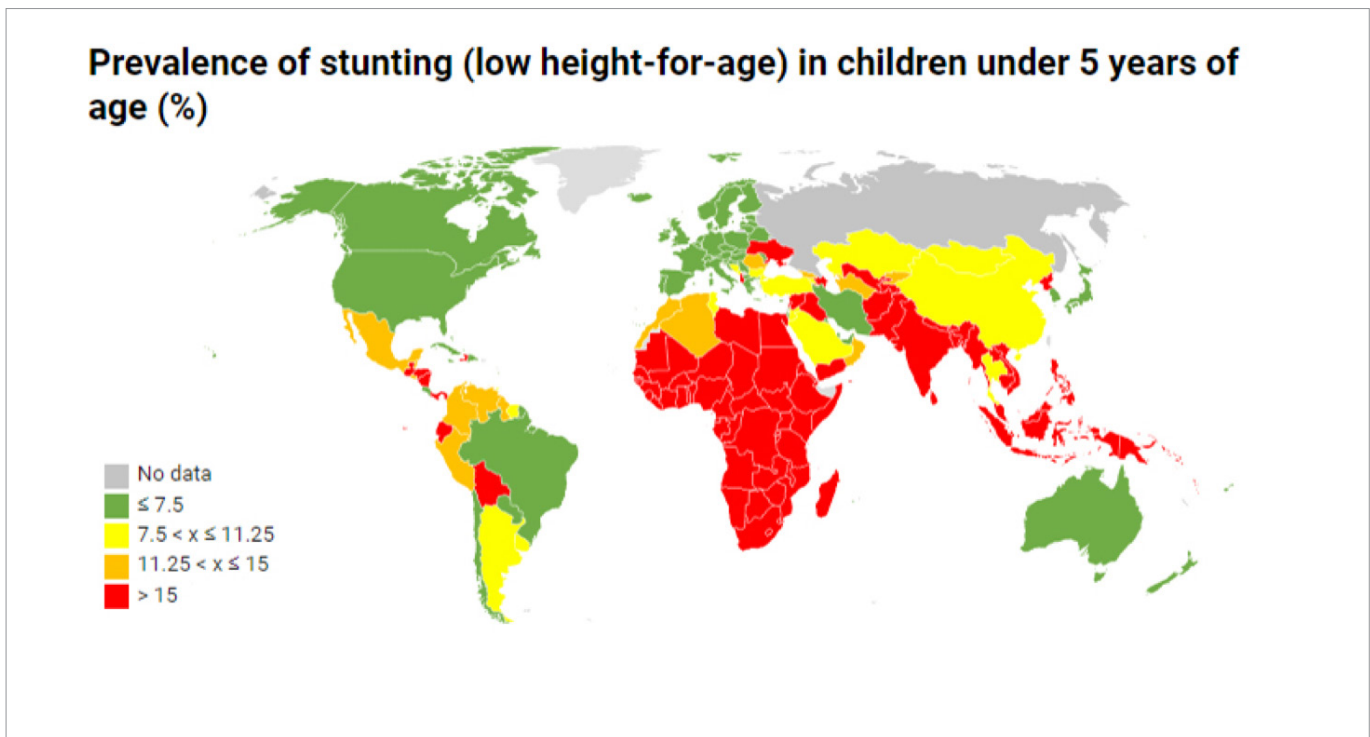
**Figure 1.5.2.** Map of "prevalence of undernourishment" – SDG Index and Dashboards Report 2019 –  
Data source: FAO (2019).



Undernourishment is an issue in countries that presents political and economic instability such as in some countries of the sub-Saharan region, a few in Asia, including Afghanistan, Bangladesh, Cambodia, Iraq, Laos, North Korea, Pakistan and Yemen, and a few in South America including Bolivia, Guatemala, Haiti, Honduras and Nicaragua. All the OECD, together with most of South America, North Africa and the Middle East, perform well (green). South-Eastern Asia still presents risks and need to face significant challenges in this field.

**Prevalence of stunting (low height-for-age) in children under 5 years of age (%)**:the percentage of children up to the age of 5 years that are stunted, measured as the percentage that fall below minus two standard deviations from the median height for their age, according to the WHO Child Growth Standards. UNICEF et al. (2016) report an average prevalence of wasting in high-income countries of 2.58% (Sachs et al. 2019).

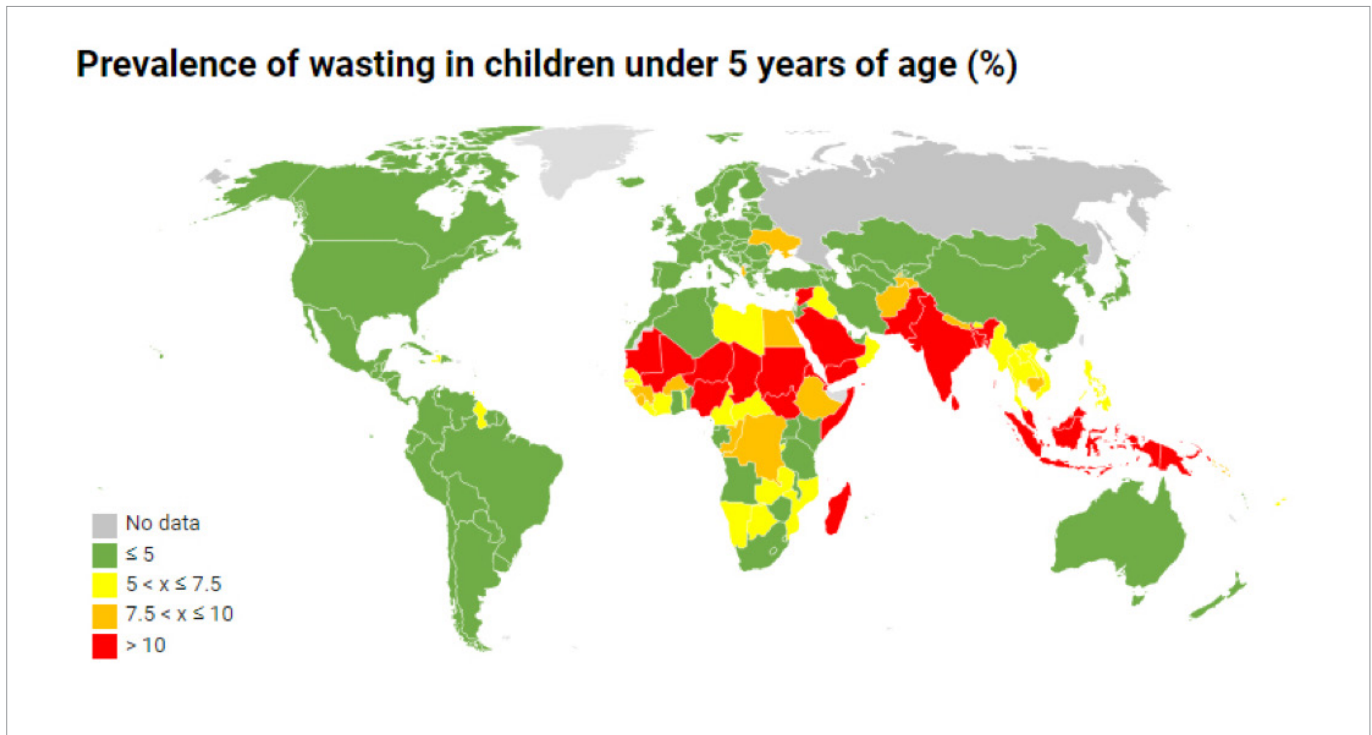
**Figure 1.5.3.** Map of "Prevalence of stunting in children under 5 years of age" – SDG Index and Dashboards Report 2019 – Data source: UNICEF et al. (2019).



The prevalence of stunting children is a critical issue in Africa and part of Asia with only a few exceptions (Iran, Japan, South Korea, United Arab Emirates). Some OECD countries will also have challenges to face, such as Mexico and Turkey. A number of countries in Central and South America do not achieve international standards.

**Prevalence of wasting in children under 5 years of age (%)**:the percentage of children up to the age of 5 years whose weight falls below minus two standard deviations from the median weight for their age, according to the WHO Child Growth Standards. UNICEF et al. (2016) report an average prevalence of wasting in high-income countries of 0.75% (Sachs et al. 2019).

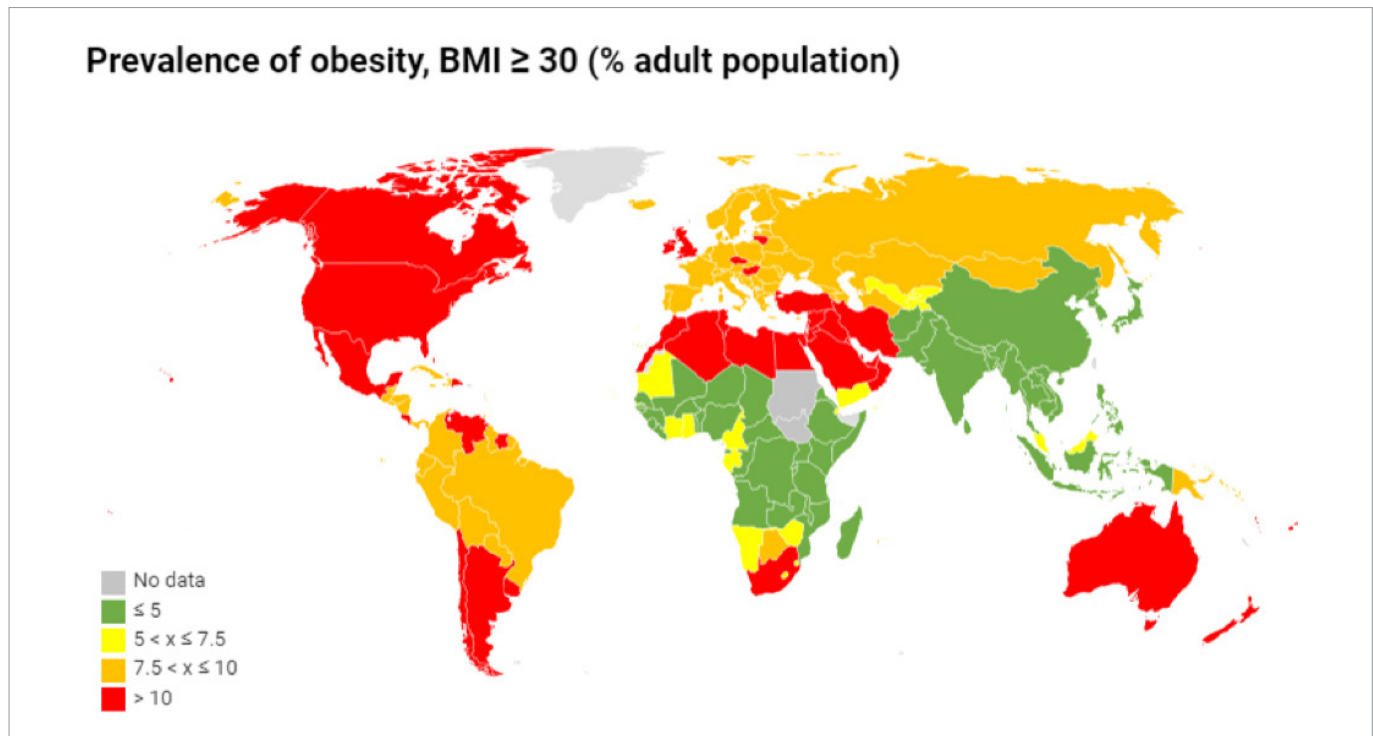
**Figure 1.5.4.** Map of "Prevalence of wasting in children under 5 years of age" – SDG Index and Dashboards Report 2019 – Data source: UNICEF et al. (2019).



Most warring conditions are detected in countries of the sub-Saharan belt, Arabic peninsula and South-East Asia. Almost all of the American and European countries are safe.

**Prevalence of obesity, BMI  $\geq 30$**  (% adult population): the percentage of the adult population that has a body mass index (BMI) of 30kg/m<sup>2</sup> or higher, based on measured height and weight (Sachs et al. 2019).

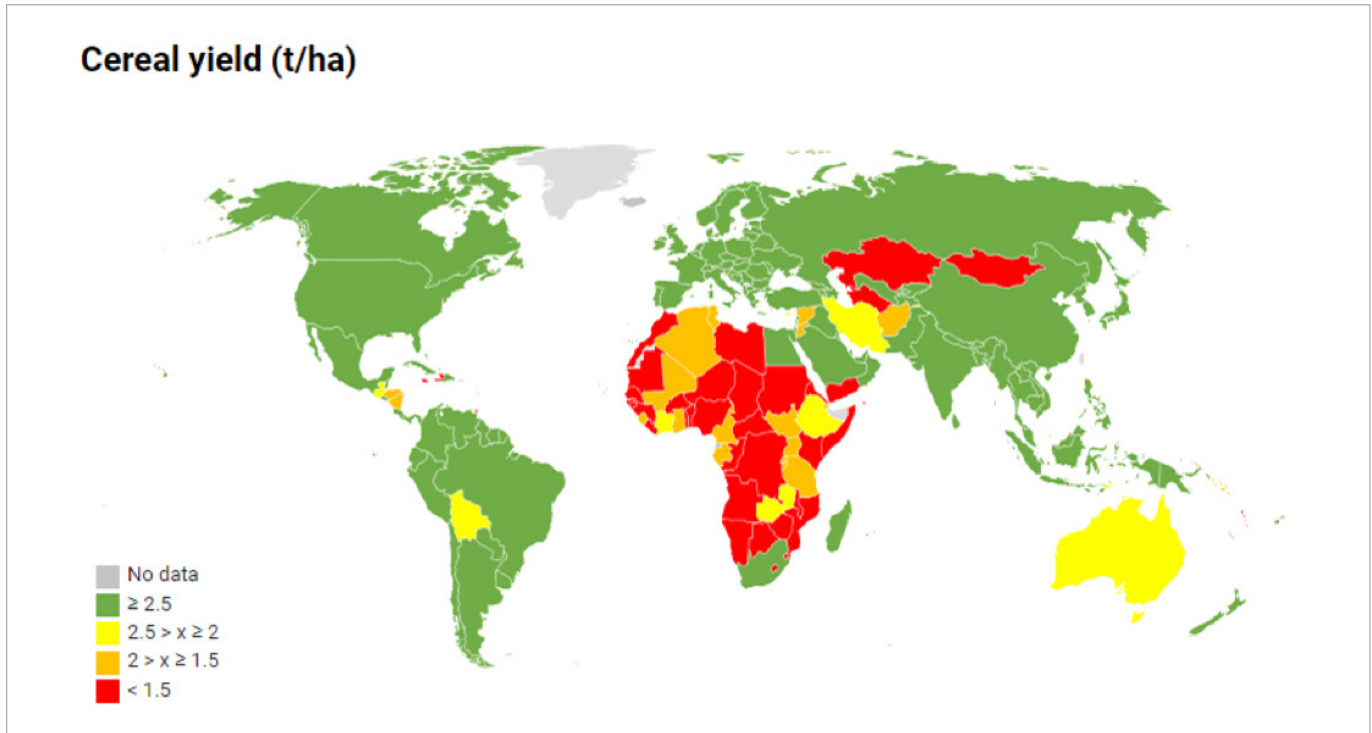
**Figure 1.5.5.** Map of "Prevalence of obesity" – SDG Index and Dashboards Report 2019 – Data source: WHO (2019).



Overweight population increases in countries with high income. Food behaviours in OECD countries provide major challenges, except for Japan and South Korea. North African and Middle Eastern countries perform even worst. One impressive outcome is that Mediterranean countries show critical conditions despite their UNESCO heritage recognised Mediterranean diet, meaning that attitudes of food consumption have drastically changed in recent years, mainly conditioned by the expansion of the food industry and intensive agriculture and breeding farming. North (and South) America and Oceania would also urgently need to promote healthier habits in food consumptions.

**Cereal yield** (t/ha): Cereal yield, measured as tonnes per hectare of harvested land. Production data on cereals relate to crops harvested for dry grain only and excludes crops harvested for hay or green for food, feed, or silage and those used for grazing.

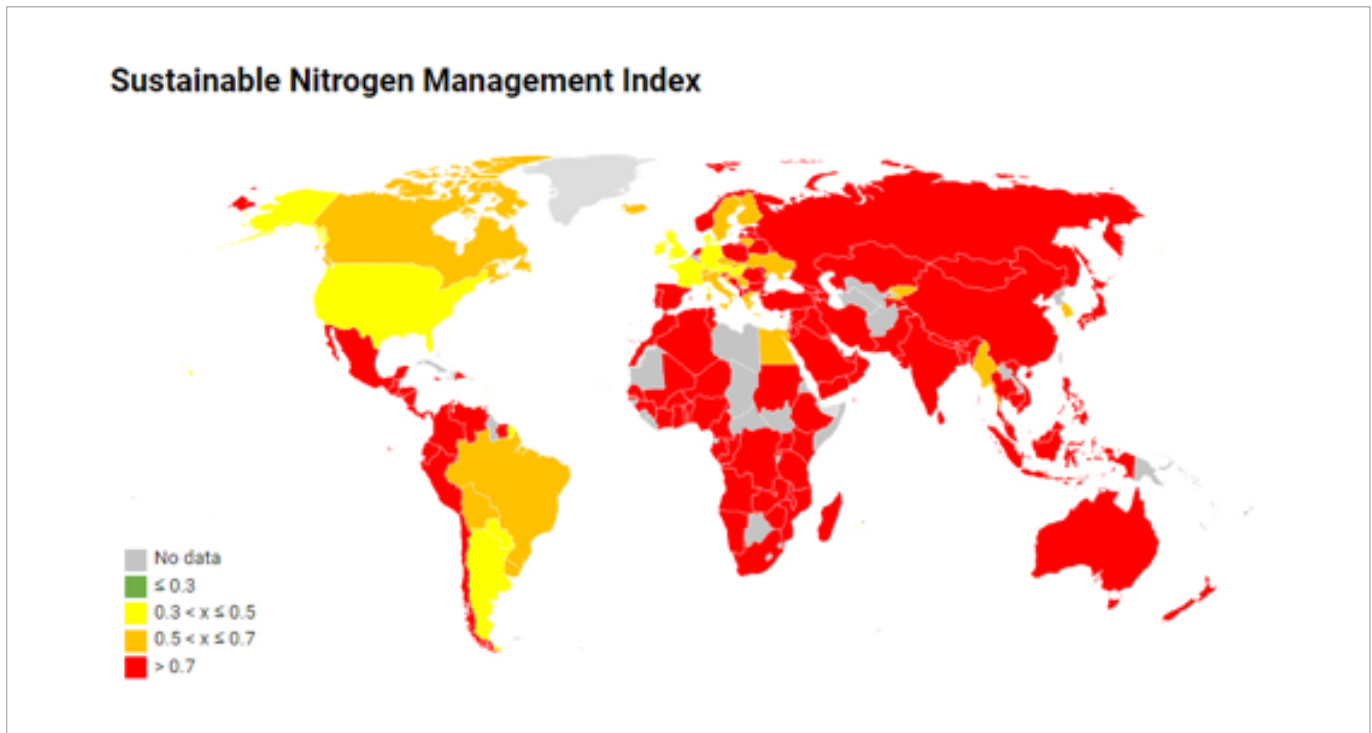
**Figure 1.5.6.** Map of "Cereal Yield" – SDG Index and Dashboards Report 2019 – Data source: FAO (2019).



Values of Cereal Yield are intended as a good proxy for evaluating the level of productivity of agricultural lands. The worst performances are located in Africa and Central Asia, especially in Kazakhstan, Mongolia and Turkmenistan, including single countries such as Haiti e Yemen. Low scores in some countries (such as Australia, Bolivia, Guatemala and Iran) just depend on deserts or mountain regions.

**Sustainable Nitrogen Management Index:** The Sustainable Nitrogen Management Index (SNMI) is a one-dimensional ranking score that combines two efficiency measures in crop production: Nitrogen Use Efficiency (NUE) and land use efficiency (crop yield) (Sachs et al. 2019).

**Figure 1.5.7.** Map of "Sustainable Nitrogen Management Index" – SDG Index and Dashboards Report 2019 – Data source: Zhang and Davidson (2016).

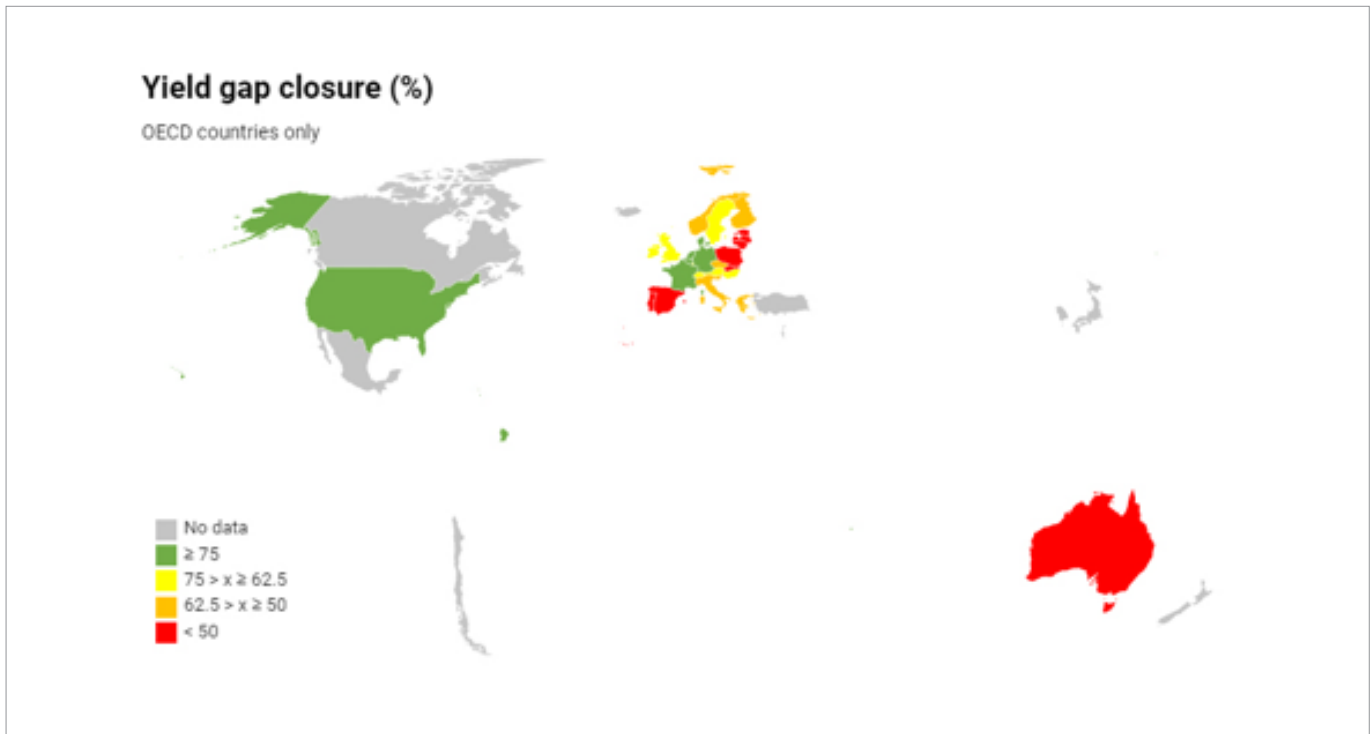


The deployment of intensive agricultural practices, with a high rate of fertiliser use, is alarming, as clearly demonstrated in the map. Countries that start to manage proper procedures in this regard are in Central Europe, United States and Argentina. Nevertheless, relevant challenges remain to be faced in most of the world to promote a more sustainable agriculture and food production.



**Yield gap closure (%)**: The ratio of the actual yield to the country's potential yield in the three annual crops using the most land area, weighted for the relative importance of each crop in terms of surface area (Sachs et al. 2019).

**Figure 1.5.8.** Map of "Yield Gap Closure" – SDG Index and Dashboards Report 2019 – Data source: Global Yield Gap Atlas (2015).

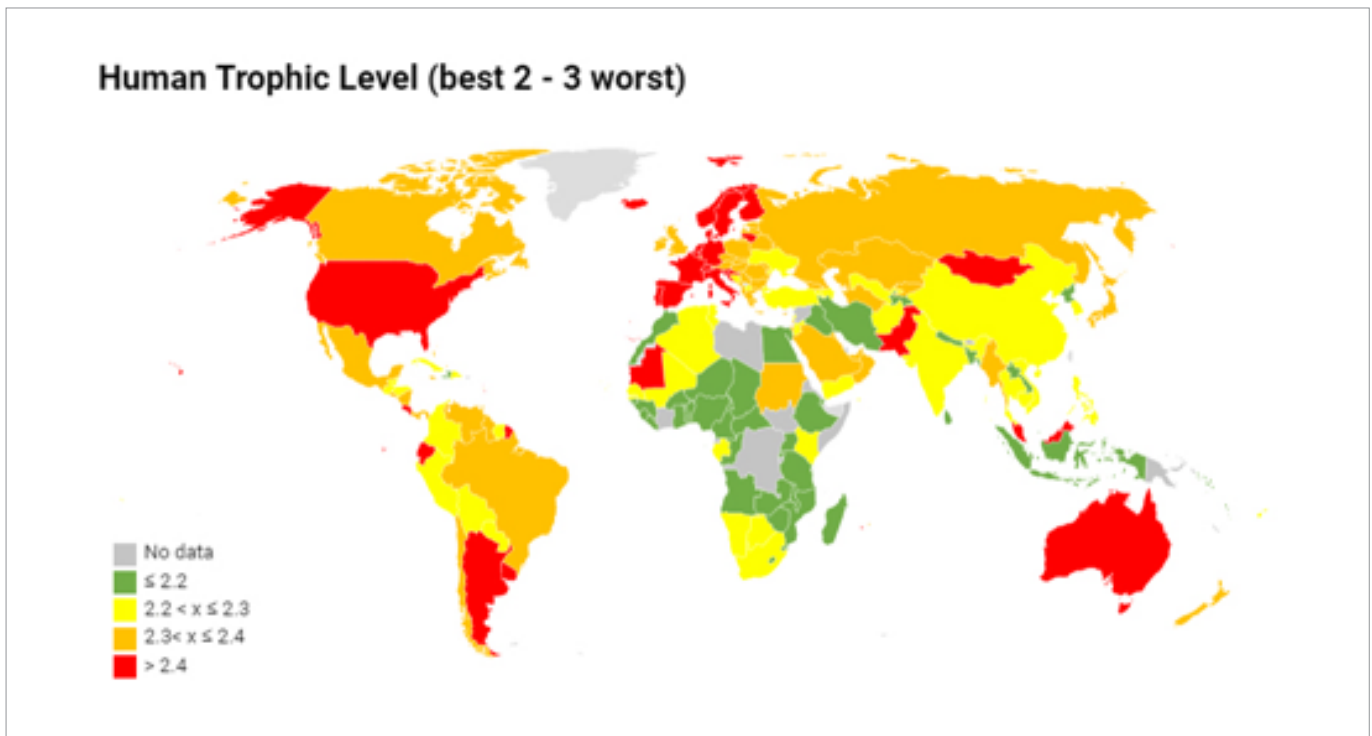


This indicator has been monitored only in OECD countries. High performances are found in Belgium, Denmark, France, Germany, Netherlands and United States. Worst performances are located in Australia, Estonia, Latvia, Lithuania, Poland, Portugal and Spain.



**Human Trophic Level** (best 2–3 worst): Trophic levels are a measure of the energy intensity of diet composition and reflect the relative amounts of plants as opposed to animals eaten in a given country. A higher trophic level represents a greater level of consumption of energy intensive animals (Sachs et al. 2019).

**Figure 1.5.9.** Map of "Human Trophic Level" – SDG Index and Dashboards Report 2019 – Data source: Bonhommeau et al. (2013).



The Human Trophic level is better in countries with low income, such as in most African and Asian countries. Worst performances concern high income countries, especially in Europe, United States and Oceania.