Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture
Target 2.a: Increase investment, including through enhanced international cooperation, in rural infrastructure, agricultural research and extension services, technology development and plant and livestock gene banks in order to enhance agricultural productive capacity in developing countries, in particular least developed countries
Indicator 2.a.1: The agriculture orientation index for government expenditures

Institutional information

Organization(s):
Food and Agriculture Organization of the United Nations (FAO)

Concepts and definitions

Definition:
The Agriculture Orientation Index (AOI) for Government Expenditures is defined as the Agriculture Share of Government Expenditures, divided by the Agriculture Share of GDP, where Agriculture refers to the agriculture, forestry, fishing and hunting sector. The measure in a currency-free index, calculated as the ratio of these two shares. National governments are requested to compile Government Expenditures according to the international Classification of Functions of Government (COFOC), and Agriculture Share of GDP according to the System of National Accounts (SNA).

Rationale:
An Agriculture Orientation Index (AOI) greater than 1 reflects a higher orientation towards the agriculture sector, which receives a higher share of government spending relative to its contribution to economic value-added. An AOI less than 1 reflects a lower orientation to agriculture, while an AOI equal to 1 reflects neutrality in a government's orientation to the agriculture sector.

Government spending in Agriculture includes spending on sector policies and programs; soil improvement and soil degradation control; irrigation and reservoirs for agricultural use; animal health management, livestock research and training in animal husbandry; marine/freshwater biological research; afforestation and other forestry projects; etc.

Spending in these agricultural activities helps to increase sector efficiency, productivity and income growth by increasing physical or human capital and /or reducing inter-temporal budget constraints.

However, the private sector typically under-invests in these activities due to the presence of market failure (e.g. the public good nature of research and development; the positive externalities from improved soil and water conditions; lack of access to competitive credit due to asymmetric information between producers and financial institutions, etc.). Similarly, the high risk faced by agricultural producers, particular smallholders unable to hedge against risk, often requires government intervention in terms of income redistribution to support smallholders in distress following crop failures and livestock loss from pests, droughts, floods, infrastructure failure, or severe price changes.

Government spending in agriculture is essential to address these market failures and the periodic need for income redistribution. This leads to several potential indicators for the SDGs, which include: a) the level of Government Expenditures in Agriculture (GEA); b) the Agriculture share of Government Expenditures, and c) the AOI for Government Expenditures.

An indicator that measures GEA levels fails to take into account the size of an economy. If two countries, A and B, have the same level of GEA, and the same agriculture contribution to GDP, but country A's

economy is 10 times that of country B, setting the same target levels for GEA fails to take economic size into account.

An indicator that measures the Agriculture share of Government Expenditures fails to take into account the relative contributions of the agricultural sector to a country's GDP. Consider two countries with the same economic size, C and D, where agriculture contributes 2 per cent to C's GDP, and 10 per cent to country D's GDP. If total Government Expenditures were equal in both countries, C would experience greater relative investment in Agriculture than D. If total Government Expenditures differed, the result could be magnified or diluted.

The AOI index takes into account a country's economic size, Agriculture's contribution to GDP, and the total amount of Government Expenditures. As such, it allows for the setting of a universal and achievable target. Nonetheless, it is useful to interpret the AOI in combination with its numerator and denominator separately: the Agriculture share of Government Expenditures and the Agriculture Share of GDP

Concepts:
Agriculture refers to the agriculture, forestry, fishing and hunting sector, or Division A of ISIC Rev 4 (equal to Division A+B of ISIC Rev 3.2). Government Expenditures are based on the Classification of the Functions of Government (COFOG) developed by the OECD and published by the United Nations Statistics Division (UNSD), found at http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=4&Top=1&Lg=1.

Government Expenditures are all outlays or expenses associated with supporting a particular sector, including compensation of employees, and subsidies and grants paid as transfers to individuals or corporations in that sector. For a full description, see the Government Finance Statistics Manual (GFSM) 2001, developed by the International Monetary Fund (IMF), found at http://www.imf.org/external/pubs/ft/gfs/manual/.

The Agriculture Share of GDP is measured by the ratio of Agriculture Value Added over GDP, based on official data reported by countries to the United Nations Statistics Division.

Comments and limitations:
Since the numerator of this data is based on administrative sources, there is no confidence interval or standard error associated with government expenditure data. For the denominator, national accounts data typically do not provide any standard error or confidence interval information.

The key limitation with this indicator is that it takes into account only central government expenditures. To the extent that some countries may have heavier intervention in Agriculture by sub-national governments, this will not be taken into account.

Methodology

Computation Method:
AOI = (Agriculture Share of Government Expenditures) / (Agriculture Share of GDP),

where
1) Agriculture Share of Government Expenditures = (Central Government Expenditures on Agriculture) / (Total Central Government Outlays); and
2) Agriculture Share of GDP = (Agriculture Value-Added) / GDP

Agriculture refers to the Division A of ISIC Rev 4 (Agriculture, forestry, fishing and hunting), equal to Division A+B of ISIC Rev 3.2.

Disaggregation:
Since this indicator is based on national accounts data and total central government expenditures, it does not allow for disaggregation by demographic characteristics or geographic location.

Treatment of missing values:

- At country level

  There is currently no treatment of missing values.

- At regional and global levels

  There is currently no treatment of missing values, so regional and global aggregates are based solely on those countries for which data are available. This may result in users interpreting these aggregates as pertaining to all countries in the region, which is the equivalent of treating countries with missing data as if they were the same as those for which data are available.

Regional aggregates:
Global and regional estimates are compiled by first separately summing across countries the four individual components of the index: government expenditures on agriculture, total government expenditures, agriculture value-added, and GDP. These are added only for those countries in a region (or globally) for which all components are available, and the index then calculated for this larger region.

Sources of discrepancies:
Since FAO does not alter government expenditure data reported by countries, and uses the national accounts estimates published by the UN Statistics Division (where some national data may be imputed), there should be no difference between data reported by FAO and national figures.

Methods and guidance available to countries for the compilation of the data at the national level:
The Agriculture Orientation Index (AOI) for Government Expenditures is defined as the Agriculture Share of Government Expenditures, divided by the Agriculture Share of GDP, where Agriculture refers to the agriculture, forestry, fishing and hunting sector. The measure in a currency-free index, calculated as the ratio of these two shares. National governments are requested to compile Government Expenditures according to the international Classification of Functions of Government (COFOG), and Agriculture Share of GDP according to the System of National Accounts (SNA).

Computation Method:
AOI = (Agriculture Share of Government Expenditures) / (Agriculture Share of GDP), where
1) Agriculture Share of Government Expenditures = (Central Government Expenditures on Agriculture) / (Total Central Government Outlays); and
2) Agriculture Share of GDP = (Agriculture Value-Added) / GDP
Agriculture refers to the Division A of ISIC Rev 4 (Agriculture, forestry, fishing and hunting), equal to Division A+B of ISIC Rev 3.2.

Agriculture refers to the agriculture, forestry, fishing and hunting sector, or Division A of ISIC Rev 4 (equal to Division A+B of ISIC Rev 3.2). Government Expenditures are based on the Classification of the Functions of Government (COFOG) developed by the OECD and published by the United Nations Statistics Division (UNSD), found at https://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=4&Top=1&Lg=1. Government Expenditures are all outlays or expenses associated with supporting a particular sector, including compensation of employees, and subsidies and grants paid as transfers to individuals or corporations in that sector. For a full description, see the Government Finance Statistics Manual (GFSM) 2014, developed by the International Monetary Fund (IMF), found at https://www.imf.org/external/Pubs/FT/GFS/Manual/2014/gfsfinal.pdf.

The Agriculture Share of GDP is measured by the ratio of Agriculture Value Added over GDP, based on official data reported by countries to the United Nations Statistics Division.

Quality assurance

Since the numerator of this data is based on administrative sources, there is no confidence interval or standard error associated with government expenditure data. For the denominator, national accounts data typically do not provide any standard error or confidence interval information.
The key limitation with this indicator is that it takes into account only central government expenditures. To the extent that some countries may have heavier intervention in Agriculture by sub-national governments, this will not be taken into account.

Data on government expenditures (total and on agriculture) are collected from countries using a questionnaire issued by FAO, developed in collaboration with the IMF. Data from countries may be supplemented, for missing countries, with data collected by the IMF, or published on official national governmental websites. The official counterpart(s) at country level are, depending on the country, from the national statistics office, the ministry of finance (or other central planning agency), or the ministry of agriculture. Validation and consultation were conducted through various FAO commissions and committees, including its two agricultural statistics commissions in Africa and the Asia and Pacific, its Committee on Agriculture and Livestock Statistics in Latin America and the Caribbean, and its Committee on Agriculture.

Data Sources

Description:

Data on government expenditures is collected from countries using an annual questionnaire administered by FAO. Since countries typically compile government expenditure data based on their financial systems, and is administrative data covering the entirely of government expenditures, particularly at the central government level, there is no sampling issue and no possibility of sampling error. For some countries that do not report such data to FAO, data may be obtained from the IMF (which collects similar data but covering more sectors, and with less disaggregation of ISIC Rev 4 Division A) or from official national governmental websites.

Data on agriculture value-added and GDP are based on the system of national accounts, which is an analytical framework that compiles national data from a mix of survey, census and administrative (e.g. tax) sources. This data is obtained from the UN Statistics Division, which provides national accounts estimates for 220 countries and territories.

Collection process:

Data on government expenditures (total and on agriculture) are collected from countries using a questionnaire issued by FAO, developed in collaboration with the IMF. Data from countries may be supplemented, for missing countries, with data collected by the IMF, or published on official national governmental websites. The official counterpart(s) at country level are, depending on the country, from the national statistics office, the ministry of finance (or other central planning agency), or the ministry of agriculture. Validation and consultation were conducted through various FAO commissions and committees, including its two agricultural statistics commissions in Africa and the Asia and Pacific, its Committee on Agriculture and Livestock Statistics in Latin America and the Caribbean, and its Committee on Agriculture.

Data Availability

Description:

Data are available for about 100 countries on a regular basis. However, differences in timeliness of data collection, compilation and reporting mean that this coverage is rarely available for year T-1 or T-2 where T is the current year.

Time series:
From 1991 to 2014

Calendar

Data collection:
The 2016 data collection of Government Expenditures in Agriculture is currently underway, with data release planned for October 2016. Due to time required to collect, compile and publish national data, very few countries will be able to provide 2015 reference year data for the FAO Spring 2016 data collection cycle.

Data release:
As this data is largely compiled annually, the next release for this indicator is planned for October 2016, covering data up to reference year 2015 (for the countries for which data collection, compilation, release is more timely).

Data providers

Department of Finance (or other central planning agency), National Statistics Office, and/or Ministry of Agriculture

Data compilers

Food and Agriculture Organization of the UN (FAO)

References

URL:
www.fao.org

References:
http://faostat3.fao.org/mes/methodology_list/E.

Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture
Target 2.a: Increase investment, including through enhanced international cooperation, in rural infrastructure, agricultural research and extension services, technology development and plant and livestock gene banks in order to enhance agricultural productive capacity in developing countries, in particular least developed countries
Indicator 2.a.2: Total official flows (official development assistance plus other official flows) to the agriculture sector

Institutional information

Organization(s):

Organisation for Economic Co-operation and Development (OECD)

Concepts and definitions

Definition:

Gross disbursements of total ODA and other official flows from all donors to the agriculture sector.

Rationale:

Total ODA and OOF flows to developing countries quantify the public effort (excluding export credits) that donors provide to developing countries for agriculture.

Concepts:

ODA: The DAC defines ODA as "those flows to countries and territories on the DAC List of ODA Recipients and to multilateral institutions which are

i) provided by official agencies, including state and local governments, or by their executive agencies; and
ii) each transaction is administered with the promotion of the economic development and welfare of developing countries as its main objective; and

is concessional in character and conveys a grant element of at least 25 per cent (calculated at a rate of discount of 10 per cent). (See http://www.oecd.org/dac/stats/officialdevelopmentassistancedefinitionandcoverage.htm)

Other official flows (OOF): Other official flows (excluding officially supported export credits) are defined as transactions by the official sector which do not meet the conditions for eligibility as ODA, either because they are not primarily aimed at development, or because they are not sufficiently concessional. (See http://www.oecd.org/dac/stats/documentupload/DCDDAC(2016)3FINAL.pdf, Para 24).

The agriculture sector is as defined by the DAC and comprises all CRS sector codes in the 311 series (see here: http://www.oecd.org/dac/stats/purposecodessectorclassification.htm)

Comments and limitations:

Data in the Creditor Reporting System are available from 1973. However, the data coverage is considered complete since 1995 for commitments at an activity level and 2002 for disbursements.

Methodology

Computation Method:

The sum of ODA and OOF flows from all donors to developing countries in the agriculture sector.

Disaggregation:

This indicator can be disaggregated by type of flow (ODA or OOF), by donor, recipient country, type of finance, type of aid (project agriculture sub-sector) etc.

Treatment of missing values:

- At country level

  Due to high quality of reporting, no estimates are produced for missing data.

- At regional and global levels

  Not applicable

Regional aggregates:

Global and regional figures are based on the sum of ODA and OOF flows to the agriculture sector.

Sources of discrepancies:

DAC statistics are standardized on a calendar year basis for all donors and may differ from fiscal year data available in budget documents for some countries.

Data Sources

Description:

The OECD/DAC has been collecting data on official and private resource flows from 1960 at an aggregate level and 1973 at an activity level through the Creditor Reporting System (CRS data are considered complete from 1995 for commitments at an activity level and 2002 for disbursements).

The data are reported by donors according to the same standards and methodologies (see here: http://www.oecd.org/dac/stats/methodology.htm).

Data are reported on an annual calendar year basis by statistical reporters in national administrations (aid agencies, Ministries of Foreign Affairs or Finance, etc.

Collection process:

A statistical reporter is responsible for the collection of DAC statistics in each providing country/agency. This reporter is usually located in the national aid agency, Ministry of Foreign Affairs or Finance etc.

Data Availability

Description:

On a recipient basis for all developing countries eligible for ODA.

Time series:

Data available since 1973 on an annual (calendar) basis

Calendar

Data collection:

Data are published on an annual basis in December for flows in the previous year.

Detailed 2015 flows will be published in December 2016.

Data release:

December 2016.

Data providers

Data are reported on an annual calendar year basis by statistical reporters in national administrations (aid agencies, Ministries of Foreign Affairs or Finance, etc.

Data compilers

OECD

References

URL:

www.oecd.org/dac/stats

References:

See all links here: http://www.oecd.org/dac/stats/methodology.htm

Related indicators

Other ODA indicators:

Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture
Target 2.b: Correct and prevent trade restrictions and distortions in world agricultural markets, including through the parallel elimination of all forms of agricultural export subsidies and all export measures with equivalent effect, in accordance with the mandate of the Doha Development Round
Indicator 2.b.1: Agricultural export subsidies

Institutional information

Organization(s):

The World Trade Organization (WTO)

Concepts and definitions

Definition:

Agricultural export subsidies are defined as export subsidies budgetary outlays and quantities as notified by WTO Members in Tables ES:1 and supporting Tables ES:2 (following templates in document G/AG/2 dated 30 June 1995).

Data cover:
• Notifications by WTO Members with export subsidy reduction commitments included in part IV of their Schedules;
• Notifications of export subsidies by developing country Members pursuant to the provisions of article 9.4 of the Agreement on Agriculture.

Other WTO Members are not entitled to use export subsidies and their notifications are therefore not recorded in the indicator series.

Budgetary outlays and quantities are expressed in a currency (national or other) and in quantity units as per Member's notification practices. For Members with export subsidy reduction commitments included in part IV of their Schedules, the currency used in the notifications is similar to the one used in the Schedules.

Data are available by country and by products or groups of products, according to Members' schedules for Members with export subsidy reduction commitments included in part IV of their Schedules and according to Member's notification practices in the case of developing country Members using export subsidies under the provisions of article 9.4 of the Agreement on Agriculture."

Rationale:

The purpose of this indicator is to give detailed information on the level of export subsidies applied annually per product or group of products, as notified by WTO Members.

Comments and limitations:

The quality of the indicator depends on WTO Members' timeliness and accuracy of their notifications.

Methodology

Computation Method:

The country level data come directly from Members' notifications to the WTO and are not subject to any computation by the WTO. Each WTO Member collects data following his own national practice to prepare his notification.

Disaggregation:

The indicator gives country and product based information on the level of applied export subsidies, both in terms of budgetary outlays and quantities.

Treatment of missing values:

- At country level

  Values are missing when a WTO Member has not submitted their notification. Missing values cannot be estimated.

- At regional and global levels

  Not relevant.

Regional aggregates:

The WTO does not calculate regional aggregates.

An overall global indicator measuring the total annual applied export subsidies budgetary outlays is calculated by summing all the available data after having converted them into a single currency (US$).

Sources of discrepancies:

The WTO does not estimate data. Only data contained in WTO Members' notifications are used. Therefore, there is no difference between country produced data and data available at the WTO.

Data Sources

Description:

The sources of data are WTO Members' notifications in their Table ES:1 and supporting table ES:2 notifications, pursuant to the notification requirements and formats adopted by the WTO Committee on Agriculture and contained in document G/AG/2.

Collection process:

Not relevant. Cf. previous replies

Data Availability

Description:

Cf. WTO document G/AG/GEN/86/Rev.24 (table under section 2.4 – Members with shaded cells) for a detailed description of data availability for export subsidies notified by Members with export subsidy reduction commitments.

In addition, 10 developing country Members notified since 1995 the use of export subsidies, pursuant to the provisions of article 9.4 of the Agreement on Agriculture.

Contrary to the information for developed country Members with export subsidy reduction commitments that is available for all notified years, information for developing country Members using export subsidies, pursuant to the provisions of article 9.4 of the Agreement on Agriculture is available only for the years during which these export subsidies were used.

Time series:

Since 1995

Calendar

Data collection:

Data are collected on a regular basis, following the timing of WTO Members' notification submissions.

Data release:

Cf. above

Data providers

WTO Members

Data compilers

Name:

WTO

Description:

The WTO is receiving WTO Members notifications and compiling the information contained in these notifications to report on this indicator.

References

URL:

www.wto.org

References:

http://agims.wto.org/Pages/ES/ESSearchAnalyse.aspx?ReportId=1403&Reset=True

https://www.wto.org/english/tratop_e/agric_e/transparency_toolkit_e.htm

Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture
Target 2.c: Adopt measures to ensure the proper functioning of food commodity markets and their derivatives and facilitate timely access to market information, including on food reserves, in order to help limit extreme food price volatility
Indicator 2.c.1: Indicator of food price anomalies

Institutional information

Organization(s):

Food and Agriculture Organization of the United Nations (FAO)

Concepts and definitions

Definition:

The indicator of food price anomalies (IFPA) identifies abnormally high or low prices that occur for a food commodity price series over a given period of time

Rationale:

The food price surge in global markets in 2007-2008 and then again in 2011, spurred a lot of interest in creating an indicator to detect abnormal growth in prices in commodity and consumer markets, where advance warning of an impending food crisis can be critical. Sometimes market prices are the only source of information available to assess the severity of a market shock. Because prices summarize information held by a large number of economic agents, including their expectations regarding likely short-term developments in supply and demand, they are ideal to characterize the functioning of food commodity markets and may help to put in place policies that limit extreme price volatility.

Concepts:

The basis for the IFPA is a weighted sum of two compound growth rates (CGR). The use of two compound growth rates, quarterly and annual, aims to take into account the potential seasonal movements of food prices.

A CGR is a geometric mean that assumes that a random variable grows at a steady rate, compounded over a specific period of time. Because it assumes a steady rate of growth the CGR smooths the effect of volatility of periodic price movements. The CGR is the growth in any random variable from time period t-0 to t-n, raised to the power of one over the length of the period of time being considered.

Comments and limitations:

The indicator cannot be used and is not suitable for forecasting of future events, it is only able to characterize previous events.

Methodology

Computation Method:

Step 1: Calculation of two compound growth rates, on a rolling quarterly and annual basis

Step 2: Computing a weighted average and standard deviations for each of the compound growth rates. In the computation of both these moments of the distribution of the compound growth rates, declining time weights are used to make sure that more recent price dynamics are not overshadowed by past extreme events which could prevent the detection of significant market shocks on prices.

Step 3: Identification of a price anomalies. First the normalized difference between the current months CGR from its historical mean for the quarterly and annual compound growths is calculated. Then the results for each CGR are summed using a weight of 0.6 for the results of the annual CGR and 0.4 for the quarterly CGR. When this sum exceeds one standard deviation, the change in price (positive or negative) is considered abnormal.

Disaggregation:

The IFPA at is most dis-aggregated level is reported at a country/market/commodity level. The IFPA can be aggregated to the national, sub-national and regional level depending on the availability of aggregated price series.

Treatment of missing values:

- At country level

  When missing values occur in a price series different techniques are used from using trend growth to fitting a simple auto-regressive model.

- At regional and global levels

  Not Applicable

Sources of discrepancies:

At the moment there are no differences as the indicator is calculated by FAO. No country is calculating the IFPA at the moment

Data Sources

The data for the calculation of the IFPA is compiled from national line-ministries, mostly agricultural ministries, and are available at: http://www.fao.org/giews/pricetool/

Data Availability

The indicator has been calculated for 92 countries, for over 1600 series on a monthly basis since 2014. Results are reported to at least 2007 if not earlier.

Calendar

Data collection:
Data has been collected continuously on a monthly basis since 2009.

Data release:
The results are published the 10th of each month at: http://www.fao.org/giews/food-prices/home/en/

Data providers

The sources are numerous and are listed for each price series in the FPMA Price Tool, which can be found at: http://www.fao.org/giews/pricetool/

Data compilers

The data is compiled by FAO's Global Information and Early Warning System

References

URL:

http://www.fao.org/giews/food-prices/home/en/

References:

http://www.fao.org/giews/food-prices/research/detail/en/c/235685/

Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture
Target 2.1: By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round
Indicator 2.1.1: Prevalence of undernourishment

Institutional information

Organization(s):

Food and Agriculture Organization of the United Nations (UN FAO)

Concepts and definitions

Definition:

The prevalence of undernourishment (PoU) (French: pourcentage de sous-alimentation; Spanish: porcentaje de sub-alimentación; Italian: prevalenza di sotto-alimentazione) is an estimate of the proportion of the population whose habitual food consumption is insufficient to provide the dietary energy levels that are required to maintain a normal active and healthy life. It is expressed as a percentage.

Rationale:

The indicator has been used by FAO to monitor the World Food Summit Target and the MDG Target 1C, at national, regional and global level, since 1999. It allows monitoring trends in the extent of dietary energy inadequacy in a population over time, generated as a result of the combination of changes in the overall availability of food, in the households' ability to access it, and in the socio-demographic characteristics of the population, as well as differences across countries and regions in any given moment in time.

The parametric approach adopted by FAO allows obtaining reliable estimated for relatively large population groups. As it reflects a severe condition of lack of food, it is fully consistent with the spirit of a Goal that aims at reducing hunger.

Concepts:

Undernourishment is defined as the condition by which a person has access, on a regular basis, to amounts of food that are insufficient to provide the energy required for conducting a normal, healthy and active life, given his or her own dietary energy requirements.

Though strictly related, "undernourishment" as defined here is different from the physical conditions of "malnutrition" and "undernutrition" as it refers to the condition of insufficient intake of food, rather than to the outcome in terms of nutritional status. In French, Spanish and Italian the difference is marked by the use of the terms alimentation, alimentación, or alimentazione, instead of nutrition, nutrición or nutrizione, in the name of the indicator. A more appropriate expression in English that would render the

precise meaning of the indicator might have been “prevalence of under-feeding” but by now the term “undernourishment” has long been associated with the indicator.

While the undernourishment condition applies to individuals, due to conceptual and data-related considerations, the indicator can only be referred to a population, or group of individuals. The prevalence of undernourishment is thus an estimate of the percentage of individuals in a group that are in that condition, but it does not allow for the identification of which individuals in the group are, in fact, undernourished.

Comments and limitations:

Over the years, the parametric approach informing the computation of the PoU has been criticized, based on the presumptions that undernourishment should be assessed necessarily starting at the individual level, by comparing individual energy requirements with individual energy intakes. According to such view, the prevalence of undernourishment could be simply computed by counting the number of individuals in a representative sample of the population that is classified as undernourished, based on a comparison of individual habitual food consumption and requirements. Unfortunately, such approach is not feasible for two reasons: first, due to the cost of individual dietary intake surveys, individual food consumption is measured only in a few countries, every several years, on relatively small samples; moreover, individual energy requirements are practically unobservable with standard data collection methods (to the point that observed habitual energy consumption of individuals in a healthy status is still the preferred way to infer individual energy requirements). This means that even if it were possible to obtain accurate observations of the individual dietary energy consumption, this would be insufficient to infer on the undernourishment condition at individual level, unless integrated by the observation on the physical status (body mass index) and of its dynamic over time, of the same individual.

The model based approach to estimate the PoU developed by FAO integrates information that is available with sufficient regularity from different sources for most countries in the world, in a theoretically consistent way, thus providing what is still one of the most reliable tools to monitor progress towards reducing global hunger.

Further specific consideration

1. Feasibility

Estimation of PoU at national level has been feasible for most countries in the world since 1999. In the worst case scenario, when no data on food consumption was available from a recent household survey, the model-based estimate of the PoU is informed by an estimate of mean level of dietary energy consumption (DEC) from Food Balance Sheets (FBS), an indirect estimate of the coefficient of variation (CV) based on information on the country’s GDP, Gini coefficient of Income, an index of the relative price of food, or other indicators of development such as country’s Under 5 Mortality Rate, and an estimate of the Minimum Dietary Energy Requirement (MDER) based on the UN Population Division’s World Population Prospects data.

2. Reliability

Reliability mostly depends on the quality of the data used to inform the estimation of the model's parameters.

DEC could be estimated either from survey data or from food balances. Neither source is devoid of problems. When comparing estimates of national DEC from FBS and from surveys, differences are frequently noted.

DEC estimates from survey data can be affected by systematic measurement errors due to under-reporting of food consumption, or to incomplete recording of all food consumption sources. Recent research shows that a negative bias of up to more than 850 kcal can be induced on the estimated daily per capita caloric consumption can be induced by the type of food consumption module chosen to capture the data at the household level. (See De Weerdt et al., 2015, Table 2, https://feb.kuleuven.be/drc/licos/publications/dp/DP%20365%20Complete.pdf). A detailed analysis of a recent Household Budget Survey in Brazil revealed how food provided for free through the school meals program and consumed by children while at school, had not been accounted among the sources of household food consumption, accounting for a downward bias of the average per capita daily dietary energy consumption of 674 kcal. (See Borlizzi, Cafiero & Del Grossi, forthcoming.)

DEC estimates from Food Balance Sheets can also be affected by errors, though it is difficult to establish the direction of induced bias. As average food availability is a residual in the FBS method, any errors in reported production, trade, and stocks might affect the estimates of national food availability. Moreover, errors might be induced by the difficulty in properly accounting for all forms of food commodity utilization. To the extent that all these errors are uncorrelated, though, the impact on the estimated average food consumption will be lower than each of the errors, considered separately, might imply. Nevertheless, considering how problematic it is to precisely account for variations in national reserves of food commodities, for which official data may be unreliable, it is recognized that the estimated annual stock variation is prone to considerable uncertainty that would be transferred to the estimated DEC in each given year.

To limit the impact of such errors, FAO has traditionally presented estimates of PoU at national level as three-year averages, on the presumption that errors induced by imprecise recording of stocks variations in each single year might be highly reduced when considering an average over three consecutive years.

Survey data are the only source to estimate the CV and Skewness. As described in the section of metadata on the method of computation, unless obtained from high quality individual dietary intake surveys, data needs to be treated to reduce the likely upward bias in the estimates of the CV that would be induced by the spurious variability due to errors in measuring individual habitual dietary energy intake.

3. Comparability

If the same method of computation is used, comparability across time and space is relatively high, with the only potential cause of inhomogeneity found in the different quality of the background data.

4. Limitations

Due to the probabilistic nature of the inference and the margins of uncertainty associated with estimates of each of the parameters in the model, the precision of the PoU estimates is generally low. Even though it is not possible to compute theoretical Margins of Error (MoE) for PoU estimates, these would very likely exceed plus or minus 5% in most cases. For this reason, FAO publishes national level PoU estimates only when they are larger than 5%. This also suggests that 5% is the lowest feasible target that can be set for the PoU indicator, a value that is unsatisfactorily large when the ambition is to fully eradicate the scourge of hunger.

If no survey is available that collects food consumption data and that is representative at subnational level, the indicator can only be computed at national level."

Methodology

Computation Method:

The indicator is computed at the population level. To this aim, the population is represented by an “average” individual for which a probability distribution of the habitual daily dietary energy intake levels is modelled through a parametric probability density function (pdf).

Once the pdf is characterized, the indicator is obtained as the cumulative probability that daily habitual dietary energy intakes (x) are below the lower bound of the range of normal dietary energy requirements for that representative, or average individual (MDER), as in the formula below:

PoU= ∫_(x<MDER) f(x | DEC; CV; Skew) dx

where DEC, CV and Skew are the mean, coefficient of variation and skewness that characterize the distribution of habitual dietary energy consumption levels in the population.

Until 2012, the probability distribution f(x) was modelled as a Log-normal pdf, informed by only two parameters: mean and coefficient of variation. In its most recent formulation, it is modelled as a three-parameter pdf, able to represent different degrees of skewness, ranging from that of a symmetric Normal distribution to that of the positively skewed Log-normal distribution. The flexibility in capturing different degrees of skewness is needed to take into account the fact that human energy consumption levels are naturally bounded by physiological limits. It is thus conceivable that, as mean consumption levels increases, the skewness of the distribution decreases, gradually moving from (positively skewed) Log-normal distributions, typical of populations where average food consumption is relatively low, towards (symmetric) Normal distributions. The skew-normal and skew-lognormal families of distribution allow for the characterization of all possible intermediate degrees of positive skewness. (See http://www.fao.org/3/a-i4046e.pdf for a detailed description)

A custom R function is available from the Statistics Division at FAO to compute the PoU, given the four parameters DEC, CV, Skew and MDER.

Different data sources can be used to estimate the different parameters of the model.

DEC

The mean of the distribution of dietary energy consumption levels for the average individual in a population (DEC) corresponds, by definition, to the average, daily per capita food consumption level in the population.

DEC can be estimated from data on food consumption obtained through surveys that are representative of the population of interest. Depending on the survey design, they can be used to estimate DEC at national and at sub national levels, either by geographic areas or by socio-economic population groups. Unfortunately, though the situation is rapidly improving, representative surveys that collect food consumption data are still not available for every country and every year.

For the national population only, DEC can be estimated also from accounts of the total supply and utilization of all food commodities in a country, where the contribution of each commodity to the availability of food for human consumption is expressed in their dietary energy content, and their total is divided by the size of the population. The major source of data on national food balances are the Food Balance Sheets (FBS) maintained by FAO for most countries in the world (see http://www.fao.org/economic/ess/fbs/en/), informed by official data reported by member countries, and disseminated through FAOSTAT (http://faostat3.fao.org/download/FB/*/E)

CV

Surveys that contain information on food consumption at individual or household level are the only available source to directly estimate the CV of habitual food consumption for the representative individual in the population. Unfortunately, survey data on food consumption are fraught by many problems that complicate the reliable estimation of CV.

In principle, repeated observations of daily consumption for each individual in a sample would be needed to estimate levels of habitual consumption and to control for measurement errors. Moreover, data should be collected in different periods of the year on the same individuals or households to account for possible seasonal variation in levels of dietary energy consumption. Due to their cost, nationally representative individual dietary intake surveys with such characteristics are very rare, and virtually inexistent for most developing countries. As a consequence, the most common sources of data to estimate CV are multipurpose household surveys, such as Living Standard Measurement Surveys, Household Incomes and Expenditure Surveys (or Household Budgets Survey), that collect also information on food consumption. When using data collected at household level however, careful attention should be taken in distinguishing levels of food purchases or acquisitions from levels of actual utilization (consumption and wastage) during the identified reference period and in properly recording the number of individuals who participate in consumption; moreover, household level data will mask the variability due to intra-household allocation of food.

For all these reasons, the coefficient of variation calculated on the series of average per capita daily dietary energy consumption levels recorded for each household included in a survey is never a reliable estimate of CV, which should reflect variability in the levels of habitual (and not occasional) daily dietary energy consumption level, at the individual (and not household) level. Empirical estimates of CV from household survey data are upward biased due to the spurious variability induced by measurement error, differences between occasional and habitual consumption, differences between acquisition and actual consumption and seasonality; moreover, they do not reflect the variability in dietary energy consumption

in the population associated with individual characteristics of the household members (such as sex, age, body mass and physical activity levels).

When using data collected through household surveys, CV is thus best estimated indirectly, controlling for spurious variability, and adjusted to reflect inter-individuals (in addition to inter-households) variability. The simplest way to proceed is to classify households into homogeneous groups and to calculate the coefficient of variation of the average per capita dietary energy consumption across household groups. This yields an estimate of the inter-households component of CV, labelled CV_H. An estimate of the inter-individuals component of the CV, labelled CV_I, is obtained, for each population, from its structure by sex, age and body masses, and the two components are combined to obtain the needed estimate as:

CV^ = v[(CV_H)^2+(CV_I)^2)].

For countries and years when no data from household survey are available, an indirect estimate of the CV, CV_IND, is obtained via a regression that projects the values of per capita GDP, Gini coefficient of income, and an index of the relative price of food (FPI) on the CV, while controlling for a regional shifter (REG).

CV^_IND=ß_0+ß_1 GDP+ ß_2 GINI+ ß_3 FPI+ß_4 REG.

Coefficients of the regression are estimated from the set of data and years for which data on CV, GDP, GINI and FPI are available.

Skew
As skewness is not strongly affected by the presence of spurious variability, Skew is estimated directly from household level data on the average daily dietary consumption, with the only exception of eliminating rare extremely high or extremely low values. If the empirically estimated skewness exceeds the value that would correspond to the skewness of Log-normal distribution with given mean and coefficient of variation, the parameter is neglected and a two parameter lognormal distribution is used for f(x). (See http://www.fao.org/3/a-i4046e.pdf for additional details).

MDER
Human energy requirements are computed by multiplying normative requirements for basic metabolic rate (BMR, expressed per kg of body mass) by the ideal weight of a healthy person of given height, and then multiplied by a coefficient of physical activity level (PAL). Ranges of normal energy requirements are thus computed for each sex and age group of the population, observing that there exist a whole range of Body Mass Index (BMI) values – from 18.5 to 25 – that are compatible with health. This implies that any given attained height might correspond to a whole range of healthy body weights, and therefore to a range of values for energy requirement for BMR.

Given information on the median height and the consideration that the group might contain individuals engaged in different levels of physical activity, the minimum, average and maximum dietary energy requirement can be computed for every sex and age class by taking into consideration special allowances for growth in individuals aged 0-21 and for pregnancy and lactation.
(See ftp://ftp.fao.org/docrep/fao/007/y5686e/y5686e00.pdf for further details).

The MDER for a given population group, including for the national population, is obtained as the weighted average of the minimums of the energy requirements ranges of each sex and age class, using the population size in each class as weights.

In computing the prevalence of dietary energy inadequacy in a population there has often been confusion between the concept of MDER and that of the Recommended Dietary Energy Intake, and regarding the appropriate threshold to be used to compute the probability of inadequacy. The reason why the probability of dietary energy inadequacy should be computed with reference to the MDER, and not the ADER (which, instead, can be used as an estimate of the average recommended dietary intake level for the whole population) is simply to recognize the fact that in any population there exists a certain range of normal variability in requirements; using the ADER as a threshold would greatly overestimate undernourishment as it would count also the proportion of the healthy population that consumes less than average, simply because of having less than average requirements. When needed, the ADER, or the average Recommended Dietary Energy Intake level in a population must be used instead to compute the dietary energy gap."

Disaggregation:

Due to reliance on national Food Balance Sheets data to estimate mean caloric consumption levels in the population, the global monitoring of MDG Target 1C and of the WFS target has been based on estimates of the PoU at national level only.

In principle, the indicator can be computed for any specific population group, provided sufficient accurate information exists to characterize the model's parameters for that specific group, that is, if data on the group's food consumption levels, age/gender structure and – possibly – physical activity levels, exist.

The scope for disaggregation thus crucially depends on the availability of surveys designed to be representative at the level of sub national population groups. Given prevailing practice in the design of national household surveys, sufficient reliable information is seldom available for disaggregation beyond the level of macro area of residence (urban-rural) and of the main Provinces/Divisions in a country. To the extent that most of the used surveys are designed to accurately capture the distribution of income, inference can be drawn on the PoU in different income classes of the population. Gender disaggregation is limited by the possibility to identify and group households by gender-related information (such as sex of the head of the household, or male/female ratio).

Treatment of missing values:

- At country level

  When no data on food consumption is available from a recent household survey, the model-based estimate of the PoU is informed by an estimate of DEC from Food Balance Sheets, an indirect estimate of CV based on information on the country's GDP, Gini coefficient of Income, an index of the relative price of food, or other indicators of development such as country's Under 5 Mortality Rate, and an estimate of the MDER based on the UN Population Division's World Population Prospects data.

  See the section on method of computation for details.

- At regional and global levels

  Missing values for individual countries are implicitly imputed to be equal to the population weighted average of the estimated values of the countries present in the same region.

Regional aggregates:

Regional and global aggregates of the PoU are computed as:

PoU_REG = (_i PoU_i × N_i) / (_i N_i)

where PoU_i are the values of PoU estimated for all countries in the regions for which available data allow to compute a reliable estimate, and N_i the corresponding population size.

Sources of discrepancies:

Many countries have produced and reported on estimates of the Prevalence of Undernourishment, including in their national MDG Reports, but almost invariably using a different methodology than the one developed by FAO, which makes national figures not comparable to those reported by FAO for global monitoring.

The most common approach used in preparing national reports has been to calculate the percentage of households for which the average per capita daily dietary energy consumption is found to be below thresholds based on daily Recommended Dietary Intake, usually set at 2,100.00 kcal, based on household survey data. In some cases, also lower thresholds of around 1,400.00 kcal have been used, probably as a reaction to the fact that percentages of households reporting average daily consumption of less than 2,100.00 kcal per capita were implausibly high estimates of the prevalence of undernourishment.

Almost without exception, no consideration related to the presence of excess variability in the dietary energy consumption data is made, and the reports reveal limited or no progress in the reduction of PoU over time.

As discussed in the section on the method of computation, the results obtained through these alternative methods are highly unreliable and almost certainly biased toward overestimation. It is therefore advisable that a concerted effort is made to advocate for use of the FAO methods also in preparation of national reports. FAO stands ready to provide all necessary technical support.

Methods and guidance available to countries for the compilation of the data at the national level:

The main three sources of data at national level are:
a) Official reports on the production, trade and utilization of the major food crop and livestock productions.
b) Household survey data on food consumption
c) Demographic characteristics of the national population

Data sources for agricultural production are usually national surveys that are conducted by the Ministry of Agricultural/Livestock and/or the National Statistical Office. The surveys are usually annual, and in the

absence of direct measurements, use information on areas/animal numbers and crop yields/carcass weights to calculate crop or livestock product quantities. Agricultural censuses, which FAO recommends conducting every ten years, may complement these surveys by providing more updated measured data on crops and livestock, and thus enable more precise projections/revisions.

The data source for agricultural and food trade is almost exclusively the national customs office (with few exceptions where data may be obtained from the Central Bank). Countries often prepare these trade reports following international standard formats (commodity/country classifications, units of measurement, trading partner detail). While such trade data may be considered quite reliable, being the result of direct measurement/reporting by/to the customs office, issues of unreported border trade (and animal movement), misclassification of commodities, confidentiality, time-lag, to name a few, may necessitate some data analysis and validation (often by referring to ' mirror' trade statistics to cross-check quantities and values).

Data on the utilization of primary and processed crops and livestock may be obtained through specialized surveys (supplemented by research) through the national agri-food industry system. Utilizations of interest here are those quantities destined for, among others, animal feed, for industrial uses (e.g. biofuel production), for national/enterprise/farm stocks, for seed (sowing for the successive agricultural cycle) – to enable as accurate an assessment as possible of the quantities destined/available for potential human consumption.

These datasets (production, trade and utilizations), once cross-checked and validated, form the basis for the compilation of the Food Balance Sheets (FBS). The FBS are an accounting framework whereby supply (production + imports + stock withdrawals) should equal utilization (export + food processing + feed + seed + industrial use, etc.). It should be noted that, within the FBS framework, post-harvest/slaughter losses (up to the retail level) are considered as utilization, and thus a component in the balancing of the FBS. The FBS framework provides a snapshot of the agricultural supply situation at the national level, and allows for a cross-referenced structure whereby data, official or estimated/imputed, may be further analyzed and validated (e.g. animal numbers may result as being under-reported/estimated). The main result of the compilation of the FBS is the calculation of the Dietary Energy Supply (DES) in kilocalories per person (based on population figures) in a given year (quantities resulting as available for human consumption are converted into their caloric equivalents by using appropriate nutritive conversion factors by commodity). The DES, in the absence of direct consumption data from household surveys, is one of the key components in the calculation of the Prevalence of Undernourishment (PoU). FAO is presently embarking on a more focused program of providing FBS capacity to countries, including an updated compilation tool.

FAO obtains crop/livestock primary/processed production data, and principal utilization thereof, through country-tailored questionnaires that are dispatched to all countries annually. Official country trade statistics are obtained annually through bulk downloads of the United Nations trade database (countries are expected to report to UNSD annually). In some cases, when available, national FBS data are also used. These datasets are then validated and form inputs in the country FBS which FAO compiles. It should be noted that when data are not officially reported/available (as is frequently the case with commodity utilization data), and hence it is necessary to resort to imputations to fill the data gaps.

The new FBS Guidelines for national compilation (completed recently in collaboration with the Global Strategy) and new compilation tool (R-based 'shiny' application).

Detail on FBS methodology: http://www.fao.org/economic/ess/fbs/ess-fbs02/en/.
The FBS Handbook shown here should not be confused with the recently completed FBS Guidelines. The Handbook is of a more technical nature and explains the methodology followed by FAO in compiling country FBS. The Guidelines on the other hand, while based on the Handbook, provide countries with a more revised and practical guidance and recommendations for compilation at the national level.

Some FBS background text also available on FAOSTAT: http://www.fao.org/faostat/en/#data/FBS.

Quality assurance

FBS capacity development programme in cooperation with the Global Strategy (more details may be provided if required); capacity development in cooperation with the ESS Food Security team as a PoU/FBS package (financed by projects); and direct FBS capacity development based on specific direct country requests.

Data Sources

Description:

The ideal source of data to estimate the PoU would be a carefully designed and skilfully conducted individual dietary intake survey, in which actual daily food consumption, together with heights and weights for each surveyed individual, are repeatedly measured on a sample that is representative of the target population. Due to their cost, however, such surveys are rare..

In principle, a well-designed household survey that collects information on food acquisitions might be sufficient to inform a reliable estimate of the Prevalence of Undernourishment in a population, at a reasonable cost and with the necessary periodicity to inform the SDG monitoring process, provided that:

a) All sources of food consumption for all members of the households are properly accounted for, including, in particular, food that is consumed away from home;

b) Sufficient information is available to convert the data on food consumption or on food expenditures into their contribution to dietary energy intake;

c) The proper methods to compute the PoU are used, to control for excess variability in the estimated levels of habitual food consumption across households, allowing for the presence on normal variability in the distribution of food consumption across individuals, induced by the differences in energy requirements of the members of the population.

Examples of surveys that could be considered for this purpose include surveys conducted to compute economic statistics and conduct poverty assessments, such as Household Income and Expenditure Surveys, Household Budget Surveys and Living Standard Measurement Surveys.

In practice, however, it is often impossible, and notadvisable, to rely only on data collected through a household survey, as the information needed to estimate the four parameters of the PoU model is either missing or imprecise.

Household Survey food consumption data often must be integrated by
a) Data on the demographic structure of the population of interest by sex and age;
b) Data or information on the median height of individuals in each sex and age class;
c) Data on the distribution of physical activity levels in the population;
d) Alternative data on the total amounts of food available for human consumption, to correct for biases in the estimate of the national average daily dietary energy consumption in the population.

Data for a), b) and c) could be available through the same multipurpose survey that provides food consumption data, but are more likely available from other sources, such as National Demographic and Health Surveys (for a) and b)) and Time Use Surveys (for c)).

Correcting for bias in the estimated average daily dietary energy consumption might need to be based on alternative sources on food consumption, such as aggregate food supply and utilization accounts and food balance sheets.

To inform its estimate of PoU at national, regional and global level, in addition to all household surveys for which it is possible to obtain micro data on food consumption, FAO relies on:
a) UN Population Division's World Population Prospects (https://esa.un.org/unpd/wpp/Download/Standard/Population/), which provide updated estimates of the structures of the national population by sex and age every two years for most countries in the world;
b) FAO Food Balance Sheets (http://faostat3.fao.org/download/FB/*/E), which provides updated estimates of the national availability of food every year for most countries in the world;

Micro data from household surveys that collect food consumption data are sourced by FAO directly through the National Statistical Agencies' websites, or through specific bilateral agreements."

Collection process:

Official information on food commodity production, trade and utilization used by FAO to compile Food Balance Sheets is provided mainly by Statistical Units of the Ministry of Agriculture. FAO sends out a data collection questionnaire every year to an identified focal point.

Microdata of household surveys are generally owned and provided by National Statistical Agencies. When available, data is sourced by FAO directly through the NSA' website. In several cases, when microdata is not available in the public domain, bilateral agreements have been signed, usually in the contexts of technical assistance and capacity development programs.

Data on the population size and structure for all monitored countries is obtained from the UN Population Division's World Population Prospects.

Data Availability

Description:

In 2015 FAO has reported separate estimates of PoU for 115 countries, distributed as follows:
World 115
Developing countries 115
Africa 44
Northern Africa 4
Sub-Saharan Africa 40
Eastern Africa 12
Middle Africa 7

Southern Africa 5
Western Africa 16
Asia 39
Caucasus and Central Asia 8
Eastern Asia 4
Southern Asia 8
South-Eastern Asia 10
Western Asia 9
Latin America and the Caribbean 27
Caribbean 7
Latin America 20
Central America 8
South America 12
Oceania 5
Developed countries 0"

Time series:

1991 - current

Calendar

Data collection:

Continuing

Data release:

December 2016

Data providers

Given the various data sources, national data providers vary. Official information on food commodity production, trade and utilization used by FAO to compile Food Balance Sheets is provided mainly by Statistical Units of the Ministry of Agriculture. Microdata of household surveys are generally owned and provided by National Statistical Agencies.

Data compilers

Food and Agriculture Organization of the United Nations, Statistics Division, Food Security and Nutrition Statistics Team

References

URL:

http://www.fao.org/economic/ess/ess-fs/en/

References:

http://www.fao.org/docrep/012/w0931e/w0931e16.pdf
http://www.fao.org/docrep/005/Y4249E/y4249e06.htm#bm06
http://www.fao.org/3/a-i4060e.pdf
http://www.fao.org/3/a-i4046e.pdf

Related indicators

2.2, 2.2.1

Comments:

Links with Target 2.2, to the extent that hunger is the extreme form of malnutrition, and Target 2.2 cannot be considered achieved unless Target 2.1 is achieved too.

Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture
Target 2.1: By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round
Indicator 2.1.2: Prevalence of moderate or severe food insecurity in the population, based on the Food Insecurity Experience Scale (FIES)

Institutional information

Organization(s):
Food and Agriculture Organisation of the United Nations (FAO)

Concepts and definitions

Definition:
The indicator measures the percentage of individuals in the population who have experienced food insecurity at moderate or severe levels during the reference period. The severity of food insecurity, defined as a latent trait, is measured on the Food Insecurity Experience Scale global reference scale, a measurement standard established by FAO through the application of the Food Insecurity Experience Scale in more than 140 countries worldwide, starting in 2014.

Rationale:
Food insecurity at moderate levels of severity is typically associated with the inability to regularly eat healthy, balanced diets. As such, high prevalence of food insecurity at moderate levels can be considered a predictor of various forms of diet-related health conditions in the population, associated with micronutrient deficiency and unbalanced diets. Severe levels of food insecurity, on the other hand, imply a high probability of reduced food intake and therefore can lead to more severe forms of undernutrition, including hunger.

Short questionnaires like the FIES are very easy to administer at limited cost, which is one of the main advantages of their use. The ability to precisely determine the food insecurity status of specific individuals or households, however, is limited by the small number of questions, a reason why assignment of individual respondents to food insecurity classes is best done in probability terms, thus ensuring that estimates of prevalence rates in a population are sufficiently reliable even when based on relatively small sample sizes.

As with any statistical assessment, reliability and precision crucially depend on the quality of the survey design and implementation. One major advantage of the analytic treatment of the data through the Rasch model based methods is that it permits testing the quality of the data collected and evaluating the likely margin of uncertainty around estimated prevalence rates, which should always be reported.

Concepts:
Extensive research over more than 25 years has demonstrated that the inability to access food results in a series of experiences and conditions that are fairly common across cultures and socio-economic contexts and that range from being concerned about the ability to obtain enough food, to the need to

compromise on the quality or the diversity of food consumed, to being forced to reduce the intake of food by cutting portion sizes or skipping meals, up to the extreme condition of feeling hungry and not having means to access any food for a whole day. Typical conditions like these form the basis of an experience-based food insecurity measurement scale. When analysed through sound statistical methods rooted in Item Response Theory, data collected through such scales provide the basis to compute theoretically consistent, cross country comparable measures of the prevalence of food insecurity. The severity of the food insecurity condition as measured by this indicator thus directly reflects the extent of households' or individuals' inability to regularly access the food they need.

Comments and limitations:
An average of less than three minutes of survey time is estimated to collect FIES data in a well-conducted face-to-face survey, which should make it possible to include the FIES-SM in a nationally representative survey in every country in the world, at a very reasonable cost. FAO provides versions of the FIES-SM adapted and translated in each of the more than 200 languages and dialects used in the Gallup World Poll.

When used in the Gallup World Poll, with sample sizes of only about 1000 individuals, the width of confidence intervals rarely exceeds 20% of the measured prevalence (that is, prevalence rates of around 50% are estimated with margins of errors of plus or minus 5%). Obviously, confidence intervals are likely to be much smaller when national prevalence rates are estimated using larger samples.

Compared to other proposed non-official indicators of household food insecurity, the FIES based approach has the advantage that food insecurity prevalence rates are directly comparable across population groups and countries. Even if they use similar labels (such as "mild", "moderate" and "severe" food insecurity) other approaches have yet to demonstrate the formal comparability of the thresholds used for classification, due to lack of the definition of a proper statistical model that links the values of the "indexes" or "scores" used for classification, to the severity of food insecurity. For this reason, care should be taken when comparing the results obtained with the FIES with those obtained with these other indicators, even if, unfortunately, similar labels are used to describe them.

Methodology

Computation Method:
Data at the individual or household level is collected by applying an experience-based food security scale questionnaire within a survey. The food security survey module collects answers to questions asking respondents to report the occurrence of several typical experiences and conditions associated with food insecurity. The data is analysed using the Rasch model (also known as one-parameter logistic model, 1-PL), which postulates that the probability of observing an affirmative answer by respondent i to question j, is a logistic function of the distance, on an underlying scale of severity, between the position of the respondent, a_i, and that of the item, b_j.

$$\text{Prob}\{X_{i,j} = \text{Yes}\} = \frac{\exp(a_i - b_j)}{1 + \exp(a_j - b_j)}$$

Parameters a_i and b_j can be estimated using maximum likelihood procedures. Parameters a_i, in particular, are interpreted as a measure of the severity of the food security condition for each respondent and are used to classify them into classes of food insecurity.

The FIES considers the three classes of (a) food security or mild food insecurity; b) moderate or severe food insecurity, and (c) severe food insecurity, and estimates the probability of being moderately or severely food insecure ($p_{\text{mod+sev}}$) and the probability of being severely food insecure (p_{sev}) for each respondent, with $0 < p_{\text{sev}} < p_{\text{mod+sev}} < 1$. The probability of being food secure or mildly food insecure can be obtained as $p_{\text{fs}} = 1 - p_{\text{mod+sev}}$.

Given a representative sample, the prevalence of food insecurity at moderate or severe levels (FImod+sev), and at severe levels (FIsev) in the population are computed as the weighted sum of the probability of belonging to the moderate or severe food insecurity class, and to the severe food insecurity class, respectively, of all individual or household respondents in a sample:

$$(1) \quad \text{FI}_{\text{mod+sev}} = \sum_i p_{i\,\text{mod+sev}} \times w_i$$

and

$$(2) \quad \text{FI}_{\text{sev}} = \sum_i p_{i\,\text{sev}} \times w_i$$

where w_i are post-stratification weights that indicate the proportion of individual or households in the national population represented by each element in the sample.

It is important to note that if w_i are individual sampling weights, then the prevalence of food insecurity refers to the total population of individuals, while if they are household weights, the prevalence refers to the population of households. For the calculation of the indicator 2.1.2, objective is to produce a prevalence of individuals. This implies that:

if a survey is at household level, and provides household sampling weights, they should be transformed to individual sampling weights by multiplying the weights by the household size. This individual weighting system can then be used to calculate the individual prevalence rates in formulas (1) and (2)

If the survey includes only adults, then the adult weights applied to the probabilities in formulas (1) and (2) provide the adult prevalence rates (FI^{Adults}). In this case, to calculate the prevalence in the total population, then the proportion of children who live in households where at least one adult is food insecure must also be calculated. This can be done by dividing the adult weights by the number of adults in the household and multiplying those approximate household weights by the number of children in the household. Once the approximate child weights are obtained, the prevalence of food insecurity of children who live in households where at least one adult is food insecure ($FI^{Children}$) can be calculated by applying these weights to the probabilities of food insecurity in formulas (1) and (2). The prevalence of food insecurity in the total population is finally calculated as:

$$FI_{mod+sev} = \frac{FI_{mod+sev}^{Adults} * N^{Adults} + FI_{mod+sev}^{Children} * N^{Children}}{N^{Adults} + N^{Children}}$$

and

$$FI_{sev} = \frac{FI_{sev}^{Adults} * N^{Adults} + FI_{sev}^{Children} * N^{Children}}{N^{Adults} + N^{Children}}$$

Where N^{Adults} and $N^{Children}$ are the adult and children populations in the country.

When applied to the country total population, the prevalence of food insecurity in the total population provides the number of individuals who live in food insecure households (or in households where at least one adult is food insecure) in a country, at different levels of severity ($N_{mod+sev}$ and N_{sev}). In the database, the number of food insecure people are expressed in thousands.

Disaggregation:
As the FIES or any other compatible experience-based food security questionnaire is applied through surveys, the prevalence of food insecurity can be measured in any population group for which the survey used to collect data is representative.

If applied at household level, disaggregation is thus possible based on household characteristics such as location, household income, composition (including for example presence and number of small children, members with disabilities, elderly members, etc.), sex, age and education of the household head, etc. If applied at the individual level, proper disaggregation of the prevalence of food insecurity by sex is possible as the prevalence of food insecurity among male and among female members of the same population group can be measured independently.

When producing disaggregated statistics, attention must be devoted to verifying the validity of the application by estimating the Rasch model with the data from each specific subpopulation group and, if necessary, perform the appropriate equating of the measure before comparing results.

Treatment of missing values:

- At country level
  The indicator is not computed if no country data are available.

- At regional and global levels
  Missing values for individual countries are implicitly imputed to be equal to the population weighted average of the estimated values of the countries present in the same region.

Regional aggregates:

Regional and global aggregates of FImod+sev and FIsev are computed as:

$$FI_a = \frac{\sum_c FI_{a,c} \times N_c}{\sum_c N_c}$$

Where a = {mod+sev, sev} and $FI_{a,c}$ is the values of FIa estimated for country c in the region and Nc is the corresponding population size.

Sources of discrepancies:

In the few cases where indicators of food insecurity based on experience-based food security scales have been reported by countries (U.S., Canada, Mexico, Guatemala and Brazil), these have been based on nationally set thresholds that do not correspond to the international thresholds proposed by the FIES. See Annex I and Table A3 in http://www.fao.org/3/i4830e.pdf for a description of the differences. In the future, it is desirable that country would start reporting prevalence estimates using also the internationally set thresholds for moderate and severe and severe levels, in addition to those based on national thresholds.

FAO is ready to provide assistance on the analytic methods needed to estimate prevalence based on the FIES global reference thresholds.

Methods and guidance available to countries for the compilation of the data at the national level:

Experience-based food security scales data are collected through population surveys (either household or individual surveys) using questionnaires/modules that are adapted to the country language and condition.

Examples are provided below:
U.S.A.: Household Food Security Survey Module (https://www.ers.usda.gov/media/8271/hh2012.pdf)
Brazil: Escala Brasileira de Insegurança Alimentar
(http://biblioteca.ibge.gov.br/visualizacao/livros/liv91984.pdf , Quadro 5, page 30)
Mexico: Escala Mexicana de Seguridad Alimentaria
(http://www.beta.inegi.org.mx/contenidos/proyectos/enchogares/regulares/enigh/tradicional/2012/doc/c_tra_enigh12_hogares.pdf, pages 13-14)
Guatemala: Escala Latino Americana y Caribena de Seguridad Alimentaria
(http://www.ine.gob.gt/sistema/uploads/2015/12/11/DDrIEuLOPuEcXTcLXab1yOkiOV2HQreq.pdf , pagina 3)
FAO – Food Insecurity Experience Scale (http://www.fao.org/3/a-bl404e.pdf)

Inclusion of the FIES survey module in a questionnaire is a simple matter of adapting the questions to the local language by following guidelines provided in the following documents.
http://www.fao.org/3/a-be898e.pdf
http://www.fao.org/3/a-be898f.pdf
http://www.fao.org/3/a-be898s.pdf
http://www.fao.org/3/a-be898r.pdf
http://www.fao.org/3/a-be898a.pdf
http://www.fao.org/3/a-be898c.pdf

Quality assurance
FIES data are validated through testing of adherence to the Rasch model assumption of equal discrimination of the items and absence of residual correlation and measurement of Rasch reliability indexes. Such test would reveal whether the data is of sufficient quality to produce reliable estimates of the prevalence of food insecurity according to the FIES standard.
Then, item severity parameters are compared with the FIES global reference standard to verify the possibility of calibrating the measures against such standard and thus produce estimates of the prevalence of food insecurity that can be considered comparable across countries.

Relevant material is available here http://www.fao.org/3/a-i4830e.pdf, http://www.fao.org/3/b-i4830s.pdf, http://www.fao.org/3/c-i4830f.pdf and here http://www.fao.org/3/a-i3946e.pdf.

National data used to compile the indicator is obtained directly from the microdata dissemination websites of countries, when available (e.g. USA, Mexico), or by direct request to the national statistical offices responsible for data collection (e.g. Brazil, Canada, Guatemala).

For data collected by FAO through the Gallup World Poll, the results of the analysis of the 2014, 2015 and 2016 round of data collection have been shared with all national statistical offices in the world in May 2017 through an email communication sent by the FAO Chief Statistician, requesting feedback. By October 2017, positive feedback was received by 57 countries.

Data Sources

Description of sources and collection process:
Data can be collected using the Food Insecurity Experience Scale survey module (FIES-SM) developed by FAO, or any other experience-based food security scale questionnaires, including:

- the Household Food Security Survey Module (HFSSM) developed by the Economic Research Service of the US Department of Agriculture, and used in the US and Canada,
- the Latin American and Caribbean Food Security Scale (or Escala Latinoamericana y Caribeña de Seguridad Alimentaria – ELCSA), used in Guatemala and tested in several other Spanish speaking countries in Latin America,
- the Mexican Food Security Scale (or Escala Mexicana de Seguridad Alimentaria, - EMSA), an adaptation of the ELCSA used in Mexico,
- the Brazilian Food Insecurity Scale (Escala Brasileira de medida de la Insegurança Alimentar – EBIA) used in Brazil, or
- the Household Food Insecurity Access Scale (HFIAS),

or any adaptation of the above that can be calibrated against the global FIES.

Two versions of the FIES-SM are available for use in surveys of individuals or households respectively, and the difference stands in whether respondents are asked to report only on their individual experiences, or also on that of other member of the household.
The current FIES-SM module include eight questions as in the table below.

GLOBAL FOOD INSECURITY EXPERIENCE SCALE	
Now I would like to ask you some questions about food.	
Q1. During the last 12 MONTHS, was there a time when you (or any other adult in the household) were worried you would not have enough food to eat because of a lack of money or other resources?	0 No 1 Yes 98 Don't Know 99 Refused
Q2. Still thinking about the last 12 MONTHS, was there a time when you (or any other adult in the household) were unable to eat healthy and nutritious food	0 No

because of a lack of money or other resources?	1 Yes 98 Don't Know 99 Refused
Q3. And was there a time when you (or any other adult in the household) ate only a few kinds of foods because of a lack of money or other resources?	0 No 1 Yes 98 Don't Know 99 Refused
Q4. Was there a time when you (or any other adult in the household) had to skip a meal because there was not enough money or other resources to get food?	0 No 1 Yes 98 Don't Know 99 Refused
Q5. Still thinking about the last 12 MONTHS, was there a time when you (or any other adult in the household) ate less than you thought you should because of a lack of money or other resources?	0 No 1 Yes 98 Don't Know 99 Refused
Q6. And was there a time when your household ran out of food because of a lack of money or other resources?	0 No 1 Yes 98 Don't Know 99 Refused
Q7. Was there a time when you (or any other adult in the household) were hungry but did not eat because there was not enough money or other resources for food?	0 No 1 Yes 98 Don't Know 99 Refused
Q8. Finally, was there a time when you (or any other adult in the household) went without eating for a whole day because of a lack of money or other resources?	0 No 1 Yes 98 Don't Know 99 Refused

The questions should be adapted and administered in the respondents' preferred language and enumerators instructed to make sure that respondents recognize the reference period and the qualifier according to which experiences should be reported only when due to "lack of money or other resources" and not, for example, for reasons related to health or other cultural habits (such as fasting for religious credos).

The FIES-SM can be included in virtually any telephone-based or personal interview based survey of the population, though face to face interview is preferred.

Since 2014, the individual referenced FIES-SM is applied to nationally representative samples of the population aged 15 or more in all countries covered by the Gallup World Poll (more than 140 countries every year, covering 90% of the world population). In most countries samples include about 1000 individuals (with larger samples of 3000 individuals in India and 5000 in mainland China).

Other national surveys exist that already collect FIES compatible data. In the United States, the HFSSM is included every year in the Current Population Survey Food Security Supplement (CPS-FSS) by the US Bureau of Census since 1995. (The CPS-FSS reached about 83,000 individuals aged 15 or more in about 42,000 households in 2014.)

In Brazil, data have been collected every five years, since 2004, in the Pesquisa Nacional de Amostra de Domicílios (PNAD) conducted by the Instituto Brasileiro de Geografía y Estadística (IBGE) using the Escala Brasileira de medida de Insegurança alimentar (EBIA). (In 2013, the simple included more than 280,000 individuals aged 15 or more in more than 116,000 households.)

In Mexico, the Escala Mexicana de Seguridad Alimentaria (EMSA) has been included in the Encuesta Nacional de Ingresos y gastos de los Hogares (ENIGH) by the Instituto Nacional de Estadística y Geografía (INEGI) since 2008. (In 2012, the sample included almost 24,000 individuals aged 15 or more in 9,000 households.)

Finally, in Guatemala, the Escala Latinoamericana y Caribena de Seguridad Alimentaria (ELCSA) has been included for the first time in the Encuesta de Condiciones de Vida (ENCOVI) in 2011, covering a sample of almost 13,000 households and a total of about 40,000 individuals aged 15 or more.

Obtaining internationally comparable data for global monitoring:

To ensure comparability of the FImod+sev and FIsev indicators computed for different populations, universal thresholds are defined on the FIES global reference scale and converted into corresponding values on the "local" scales obtained as a result of application of the Rasch model on any specific population, through a process of "equating".

Equating is a form of standardization of the metric based on identification of the subset of items that can be considered common to the global FIES and the specific scale used for measurement in each context. The severity levels associated with the common items are used as anchoring points to adjust the global FIES thresholds to the local scales. The standardization process ensures that the mean and standard deviation of the set of common items is the same when measured on the global FIES or on the national scale. Compatibility with the global FIES and the possibility to compile this indicator requires that at least four of the eight FIES items are identified as common.

The Statistics Division at FAO has developed the RM.weights package under R, which provides routines for estimating the parameters of the Rasch model using conditional maximum likelihood, with the possibility to allow for the complex survey design.

Data Availability

Description:
Data for 2014, 2015 and 2016 are available from FAO for 141 countries, areas and territories included in the Gallup World Poll. Regional and sub regional aggregates are computed for all regions, with the exceptions of the Caribbean and the Oceania regions (as most small island states in the Caribbean and in the South Pacific are not covered by the GWP). Data have been subject to a validation process and only results validated by national statistical offices are published at country level.

FIES compatible data from official national surveys are already available from the US, Canada, Mexico, Guatemala, Brazil, Ecuador and Seychelles. In addition, since 2015 the FIES has already been included in official surveys in Burkina Faso, Kenya, Pakistan, Indonesia and St. Lucia, and, on a pilot basis, in surveys conducted by national authorities in Malawi, Rwanda, El Salvador, Dominican Republic, Bolivia, and Uganda, from which it might be possible to receive official data on a regular basis in the future. In several other countries, the FIES or similar scales have been tested on limited size sample, confirming the feasibility of their use and conversations are on-going to promote their inclusion in national surveys. A partial list includes Bangladesh, Cameroon, Ethiopia, Ghana, India, Nicaragua, Niger, Palestine, South Africa and Swaziland.

Breakdown of the number of countries covered by region is as follows:

World	141
Africa	40
Northern Africa	6
Sub-Saharan Africa	34
Eastern Africa	4
Middle Africa	6
Southern Africa	4
Western Africa	12
Americas	23
Latin America and the Caribbean	21
Caribbean	3
Latin America	18

Northern America	2
Asia	38
Central Asia	4
Eastern Asia	6
Southern Asia	8
South-Eastern Asia	7
Western Asia	13
Europe	38
Eastern Europe	9
Northern Europe	10
Southern Europe	12
Western Europe	7
Oceania	2
Australia and New Zealand	2
Melanesia	0
Micronesia	0
Polynesia	0

Time series:
Only the 3-year average (2014-2016) is provided.

Calendar

Data collection:
Continuing

Data release:
January 2018

Data providers

National data providers will be the National Statistical Authorities that are responsible for the survey in which the FIES or similar scale is included. FAO will provide data for countries where the FIES or compatible module is not included in any national survey.

Data compilers

Organization(s) responsible for compilation and reporting on this indicator at the global level: Food and Agriculture Organization of the United Nations, Statistics Division, Food Security and Nutrition Statistics Team.

References

URL: http://www.fao.org/in-action/Voices-of-the-Hungry/

http://www.fao.org/3/i4830e.pdf

Related indicators

NA.

Goal 2: End hunger, achieve food security and improved nutrition, and promote sustainable agriculture
Target 2.2: by 2030 end all forms of malnutrition, including achieving by 2025 the internationally agreed targets on stunting and wasting in children under five years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women, and older persons
Indicator 2.2.1: Prevalence of stunting (height for age <-2 standard deviation from the median of the World Health Organization (WHO) Child Growth Standards) among children under 5 years of age

Institutional information

Organization(s):

United Nations Children's Fund (UNICEF)
World Health Organization (WHO)
World Bank (WB)

Concepts and definitions

Definition:
Prevalence of stunting (height-for-age <-2 standard deviation from the median of the World Health Organization (WHO) Child Growth Standards) among children under 5 years of age.
(French: pourcentage de sous-alimentation; Spanish: porcentaje de sub-alimentación)

Rationale:
Child growth is an internationally accepted outcome reflecting child nutritional status. Child stunting refers to a child who is too short for his or her age and is the result of chronic or recurrent malnutrition. Stunting is a contributing risk factor to child mortality and is also a marker of inequalities in human development. Stunted children fail to reach their physical and cognitive potential. Child stunting is one of the World Health Assembly nutrition target indicators.

Concepts:
NA.

Comments and limitations:
Survey estimates come with levels of uncertainty due to both sampling error and non-sampling error (e.g. mesasurement technical error, recording error etc.,). None of the two sources of errros have been fully taken into account for deriving estimates neither at country nor at regional and global levels.

Methodology

Computation Method:
Survey estimates are based on standardized methodology using the WHO Child Growth Standards as described elsewhere (Ref: Anthro software manual). Global and regional estimates are based on methodology outlined in UNICEF-WHO-The World Bank: Joint child malnutrition estimates - Levels and trends (UNICEF/WHO/WB 2012)

Disaggregation:
Global and regional estimates refer to the age group of children under 5 years, sexes combined. Disaggregated country data are available in a majority of household surveys and UNICEF - WHO- The World Bank Group are expanding the joint data set to include sub national and stratified estimates (e.g. sex, age groups, wealth, mothers' education, residence) in 2017.

Treatment of missing values:

- At country level
  No imputation methodology is applied to derive estimates for countries or years where no data is avaialble.

- At regional and global levels
  Countries and years are treated as missing randomly following a multilevel modeling approach (International Journal of Epidemiology 2004;33:1260-70).

Regional aggregates:
Regional aggregates are available for the following classifications: UN, MDG, UNICEF, WHO, The World Bank regions and income groups.

Sources of discrepancies:
The standard analysis approach to construct the joint data set aims for a maximum comparability of country estimates. For the inclusion of survey estimates into the JME dataset, the inter-agency group applies survey quality assessment criteria. When there is insufficient documentation, the survey is not included until information becomes available. When raw data are available, and there is a question about the analysis approach, data re-analysis is performed following the standard methodology. Discrepancies between results from standardised approach and those reported may occur for various reasons, for example, the use of different standards for z-score calculations, imputation of the day of birth when missing, the use of rounded age in months, the use of different flagging systems for data exclusion. For surveys based on the previous NCHS/WHO references, and for which raw data are not available, a method for converting the z-scores to be based on the WHO Child Growth Standards is applied (Yang and de Onis, 2008). In addition, when surveys do not cover the age interval 0-<5 years, or are only representative of the rural areas, an adjustment based on other surveys for the same country, is performed. Any adjustment or conversion is transparently stated in the annotated joint data set.

Data Sources

Description:
For the majority of countries, nationally representative household surveys constitute the data source. For a limited number of countries data from surveillance systems is used if sufficient population coverage is documented (about 80%). For both data sources, the child's height and weight measurements have to be collected following recommended standard measuring techniques (WHO 2008).

Collection process:
UNICEF, WHO and the World Bank group jointly review new data sources to update the country level estimates. Each agency uses their existing mechanisms for obtaining data.
For WHO, see published database methodology (de Onis et al. 2004). For UNICEF, the cadre of dedicated data and monitoring specialists working at national, regional and international levels in 190 countries routinely provide technical support for the collection and analysis of data. For the past 20 years UNICEF has undertaken an annual process to update its global databases, called Country Reporting on Indicators for Goals (CRING). This exercise is done in close collaboration with UNICEF country offices with the purpose of ensuring that UNICEF global databases contain updated and internationally comparable data. UNICEF country offices are invited to submit, through an online system, nationally representative data for over 100 key indicators on the well-being of women and children, including stunting. The country office staff work with local counterparts to ensure the most relevant data are shared. Updates sent by the country offices are then reviewed by sector specialists at UNICEF headquarters to check for consistency and overall data quality of the submitted estimates and re-analysis where possible. This review is based on a set of objective criteria to ensure that only the most reliable information is included in the databases. Once reviewed, feedback is made available on whether or not specific data points are accepted, and if not, the reasons why. UNICEF uses these data obtained through CRING to feed into the joint dataset. The World Bank Group provides estimates availabe through the Living Standard Measurement Surveys (LSMS) which ussually requires re-analysis of datasets given theat the LSMS reports often do not tabulate the stunting data.

Data Availability

Description:
More than 150 countries.

Time series:
At country level, data are provided for the years where surveys are included in the joint dataset. Survey years range from 1983 to 2016. For the global and regional levels, estimates for the years 1990 to the latest available estimate upon release each year (i.e. in Sept 2016 edition of the Joint Malnutrition Estimates the latest available estimate was for 2015).

Calendar

Data collection:
Data sources are currently being updated to feed into the 2017 production of global and regional estimates and updated country level dataset to be released in May 2017.

Data release:
The next planned release fo global/regional estimates as well as the updated country dataset is May 2017. Global and regional estimates are released annually every May starting in 2017. The country level dataset is updated and released more often than the global/regional estimates. Although a set schedule has not yet been established, there have been at least two annual updates (one coinciding with the annual release of the regional/global estimates and at least one other update at another time of the year).

Data providers

Data providers vary and most commonly are ministries of health, national offices of statistics or national institutes of nutrition.

Data compilers

UNICEF, WHO and the World Bank group

References

Please provide links to all references for this indicator.

URL:
data.unicef.org/nutrition/malnutrition.html; http://www.who.int/nutgrowthdb/estimates2014/en/; http://datatopics.worldbank.org/child-malnutrition;

References:
United Nations Children's Fund, World Health Organization, The World Bank (2012). UNICEFWHO-World Bank Joint Child Malnutrition Estimates. (UNICEF, New York; WHO, Geneva; The World Bank, Washington, DC; 2012).
de Onis M, Blössner M, Borghi E, et al. (2004), Methodology for estimating regional and global trends of childhood malnutrition. Int J Epidemiol, 33(6):1260-70.
Yang H and de Onis M. Algorithms for converting estimates of child malnutrition based on the NCHS reference into estimates based on the WHO Child Growth Standards
BMC Pediatrics 2008, 8:19 (05 May 2008)
(http://www.biomedcentral.com/1471-2431/8/19).
World Health Organization (2008). Training Course on Child Growth Assessment. Geneva, WHO, 2008.
International Journal of Epidemiology 2004;33:1260-70
International Journal of Epidemiology 2003;32:518-26
http://www.biomedcentral.com/1471-2431/8/19

Related indicators

Goal 2: End hunger, achieve food security and improved nutrition, and promote sustainable agriculture
Target 2.2: by 2030 end all forms of malnutrition, including achieving by 2025 the internationally agreed targets on stunting and wasting in children under five years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women, and older persons
Indicator 2.2.2: Prevalence of malnutrition (weight for height >+2 or <-2 standard deviation from the median of the WHO Child Growth Standards) among children under 5 years of age, by type (wasting and overweight)

Institutional information

Organization(s):

United Nations Children's Fund (UNICEF)
World Health Organization (WHO)
World Bank (WB)

Concepts and definitions

Definition:
Prevalence of overweight (weight for height >+2 standard deviation from the median of the World Health Organization (WHO) Child Growth Standards) among children under 5 years of age.

Rationale:
Child growth is an internationally accepted outcome area reflecting child nutritional status. Child overweight refers to a child who is too heavy for his or her height. This form of malnutrition results from expending too few calories for the amount of food consumed and increases the risk of noncommunicable diseases later in life. Child overweight is one of the World Health Assembly nutrition target indicators.

Concepts:
The official MDG indicator is overweight as assessed using weight for height. Overweight can however also be assessed with other indicators such body mass index for age. In general BMI for age is not used in the joint dataset but has been considered in absence of any other available estimates.

Comments and limitations:
Survey estimates come with levels of uncertainty due to both sampling error and non-sampling error (e.g. mesasurement technical error, recording error etc.,). None of the two sources of errros have been fully taken into account for deriving estimates neither at country nor at regional and global levels. Of particular concern for overweight is the fact that data for high income countries are scarce yet the rates are generally higher among the high income countries with data and so the lack of representation from high income countries may affect the global and even regional rates.

Methodology

Computation Method:
Survey estimates are based on standardized methodology using the WHO Child Growth Standards as described elsewhere (Ref: Anthro software manual). Global and regional estimates are based on methodology outlined in UNICEF-WHO-The World Bank: Joint child malnutrition estimates - Levels and trends (UNICEF/WHO/WB 2012)

Disaggregation:
Global and regional estimates refer to the age group of children under 5 years, sexes combined. Disaggregated country data are available in a majority of household surveys and UNICEF - WHO- The World Bank Group are expanding the joint data set to include sub national and stratified estimates (e.g. sex, age groups, wealth, mothers' education, residence) in 2017.

Treatment of missing values:

- At country level
  No imputation methodology is applied to derive estimates for countries or years where no data is avaialble.

- At regional and global levels
  Countries and years are treated as missing randomly following a multilevel modeling approach (International Journal of Epidemiology 2004;33:1260-70).

Regional aggregates:
Regional aggregates are available for the following classifications: UN, MDG, UNICEF, WHO, The World Bank regions and income groups.

Sources of discrepancies:
The standard analysis approach to construct the joint data set aims for a maximum comparability of country estimates. For the inclusion of survey estimates into the JME dataset, the inter-agency group applies survey quality assessment criteria. When there is insufficient documentation, the survey is not included until information becomes available. When raw data are available, and there is a question about the analysis approach, data re-analysis is performed following the standard methodology. Discrepancies between results from standardised approach and those reported may occur for various reasons, for example, the use of different standards for z-score calculations, imputation of the day of birth when missing, the use of rounded age in months, the use of different flagging systems for data exclusion. For surveys based on the previous NCHS/WHO references, and for which raw data are not available, a method for converting the z-scores to be based on the WHO Child Growth Standards is applied (Yang and de Onis, 2008). In addition, when surveys do not cover the age interval 0-<5 years, or are only representative of the rural areas, an adjustment based on other surveys for the same country, is performed. Any adjustment or conversion is transparently stated in the annotated joint data set.

Data Sources

Description:
For the majority of countries, nationally representative household surveys constitute the data source. For a limited number of countries data from surveillance systems is used if sufficient population coverage is documented (about 80%). For both data sources, the child's height and weight measurements have to be collected following recommended standard measuring techniques (WHO 2008).

Collection process:
UNICEF, WHO and the World Bank group jointly review new data sources to update the country level estimates. Each agency uses their existing mechanisms for obtaining data.
For WHO, see published database methodology (de Onis et al. 2004). For UNICEF, the cadre of dedicated data and monitoring specialists working at national, regional and international levels in 190 countries routinely provide technical support for the collection and analysis of data. For the past 20 years UNICEF has undertaken an annual process to update its global databases, called Country Reporting on Indicators for Goals (CRING). This exercise is done in close collaboration with UNICEF country offices with the purpose of ensuring that UNICEF global databases contain updated and internationally comparable data. UNICEF country offices are invited to submit, through an online system, nationally representative data for over 100 key indicators on the well-being of women and children, including stunting. The country office staff work with local counterparts to ensure the most relevant data are shared. Updates sent by the country offices are then reviewed by sector specialists at UNICEF headquarters to check for consistency and overall data quality of the submitted estimates and re-analysis where possible. This review is based on a set of objective criteria to ensure that only the most reliable information is included in the databases. Once reviewed, feedback is made available on whether or not specific data points are accepted, and if not, the reasons why. UNICEF uses these data obtained through CRING to feed into the joint dataset. The World Bank Group provides estimates availabe through the Living Standard Measurement Surveys (LSMS) which ussually requires re-analysis of datasets given theat the LSMS reports often do not tabulate the stunting data.

Data Availability

Description:
More than 150 countries.

Time series:
At country level, data are provided for the years where surveys are included in the joint dataset. Survey years range from 1983 to 2016. For the global and regional levels, estimates for the years 1990 to the latest available estimate upon release each year (i.e. in Sept 2016 edition of the Joint Malnutrition Estimates the latest available estimate was for 2015).

Calendar

Data collection:
Data sources are currently being updated to feed into the 2017 production of global and regional estimates and updated country level dataset to be released in May 2017.

Data release:
The next planned release fo global/regional estimates as well as the updated country dataset is May 2017. Global and regional estimates are released annually every May starting in 2017. The country level dataset is updated and released more often than the global/regional estimates. Although a set schedule has not yet been established, there have been at least two annual updates (one coinciding with the annual release of the regional/global estimates and at least one other update at another time of the year).

Data providers

Data providers vary and most commonly are ministries of health, national offices of statistics or national institutes of nutrition.

Data compilers

UNICEF, WHO and the World Bank group

References

Please provide links to all references for this indicator.

URL:
data.unicef.org/nutrition/malnutrition.html; http://www.who.int/nutgrowthdb/estimates2014/en/; http://datatopics.worldbank.org/child-malnutrition;

References:
United Nations Children's Fund, World Health Organization, The World Bank (2012). UNICEFWHO-World Bank Joint Child Malnutrition Estimates. (UNICEF, New York; WHO, Geneva; The World Bank, Washington, DC; 2012).
de Onis M, Blössner M, Borghi E, et al. (2004), Methodology for estimating regional and global trends of childhood malnutrition. Int J Epidemiol, 33(6):1260-70.
Yang H and de Onis M. Algorithms for converting estimates of child malnutrition based on the NCHS reference into estimates based on the WHO Child Growth Standards
BMC Pediatrics 2008, 8:19 (05 May 2008)
(http://www.biomedcentral.com/1471-2431/8/19).
World Health Organization (2008). Training Course on Child Growth Assessment. Geneva, WHO, 2008.
International Journal of Epidemiology 2004;33:1260-70

International Journal of Epidemiology 2003;32:518-26
http://www.biomedcentral.com/1471-2431/8/19

Related indicators

Goal 2: End hunger, achieve food security and improved nutrition, and promote sustainable agriculture
Target 2.2: by 2030 end all forms of malnutrition, including achieving by 2025 the internationally agreed targets on stunting and wasting in children under five years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women, and older persons
Indicator 2.2.2: Prevalence of malnutrition (weight for height >+2 or <-2 standard deviation from the median of the WHO Child Growth Standards) among children under 5 years of age, by type (wasting and overweight)

Institutional information

Organization(s):

United Nations Children's Fund (UNICEF)
World Health Organization (WHO)
World Bank (WB)

Concepts and definitions

Definition:
Prevalence of wasting (weight for height <-2 standard deviation from the median of the World Health Organization (WHO) Child Growth Standards) among children under 5 years of age.

Rationale:
Child growth is an internationally accepted outcome reflecting child nutritional status. Child wasting refers to a child who is too thin for his or her height and is the result of recent rapid weight loss or the failure to gain weight. A child who is moderately or severely wasted has an increased risk of death, but treatment is possible. Child wasting is one of the World Health Assembly nutrition target indicators.

Concepts:
The official MDG indicator is wasting as assessed using weight for height. Wasting can however also be assessed with mid upper arm circumference (MUAC). Estimates of wasting based on MUAC are not considered for the joint dataset. In addition, while wasting constitutes the major form of moderate acute malnutrition (MAM), there are acutely malnourished children who would not be picked up with weight-for-height or MUAC, namely those presenting bilateral pitting odema (characterized by swollen feet, face and limbs). For Surveys that report oedema cases, in the joint data set these are included in the prevalence of low weight-for-height.

Comments and limitations:
Survey estimates come with levels of uncertainty due to both sampling error and non-sampling error (e.g. mesasurement technical error, recording error etc.,). None of the two sources of errros have been fully taken into account for deriving estimates neither at country nor at regional and global levels. Surveys are carried out in a specific period of the year, usually over a few months. However, this indicator can be affected by seasonality, factors related to food availability (e.g. pre-harvest periods), disease (e.g. rainy season and diarrhoea, malaria, etc.), and natural disasters and conflicts. Hence, country-year estimates may not necessarily be comparable over time. Consequently, only latest estimates are provided.

Methodology

Computation Method:
Survey estimates are based on standardized methodology using the WHO Child Growth Standards as described elsewhere (Ref: Anthro software manual). Global and regional estimates are based on methodology outlined in UNICEF-WHO-The World Bank: Joint child malnutrition estimates - Levels and trends (UNICEF/WHO/WB 2012)

Disaggregation:
Global and regional estimates refer to the age group of children under 5 years, sexes combined. Disaggregated country data are available in a majority of household surveys and UNICEF - WHO- The World Bank Group are expanding the joint data set to include sub national and stratified estimates (e.g. sex, age groups, wealth, mothers' education, residence) in 2017.

Treatment of missing values:

- At country level
  No imputation methodology is applied to derive estimates for countries or years where no data is avaialble.

- At regional and global levels
  Countries and years are treated as missing randomly following a multilevel modeling approach (International Journal of Epidemiology 2004;33:1260-70).

Regional aggregates:
Regional aggregates are available for the following classifications: UN, MDG, UNICEF, WHO, The World Bank regions and income groups.

Sources of discrepancies:
The standard analysis approach to construct the joint data set aims for a maximum comparability of country estimates. For the inclusion of survey estimates into the JME dataset, the inter-agency group applies survey quality assessment criteria. When there is insufficient documentation, the survey is not included until information becomes available. When raw data are available, and there is a question about the analysis approach, data re-analysis is performed following the standard methodology. Discrepancies between results from standardised approach and those reported may occur for various reasons, for example, the use of different standards for z-score calculations, imputation of the day of birth when missing, the use of rounded age in months, the use of different flagging systems for data exclusion. For surveys based on the previous NCHS/WHO references, and for which raw data are not available, a method for converting the z-scores to be based on the WHO Child Growth Standards is applied (Yang and de Onis, 2008). In addition, when surveys do not cover the age interval 0-<5 years, or are only representative of the rural areas, an adjustment based on other surveys for the same country, is performed. Any adjustment or conversion is transparently stated in the annotated joint data set.

Data Sources

Description:
For the majority of countries, nationally representative household surveys constitute the data source. For a limited number of countries data from surveillance systems is used if sufficient population coverage is documented (about 80%). For both data sources, the child's height and weight measurements have to be collected following recommended standard measuring techniques (WHO 2008).

Collection process:
UNICEF, WHO and the World Bank group jointly review new data sources to update the country level estimates. Each agency uses their existing mechanisms for obtaining data.
For WHO, see published database methodology (de Onis et al. 2004). For UNICEF, the cadre of dedicated data and monitoring specialists working at national, regional and international levels in 190 countries routinely provide technical support for the collection and analysis of data. For the past 20 years UNICEF has undertaken an annual process to update its global databases, called Country Reporting on Indicators for Goals (CRING). This exercise is done in close collaboration with UNICEF country offices with the purpose of ensuring that UNICEF global databases contain updated and internationally comparable data. UNICEF country offices are invited to submit, through an online system, nationally representative data for over 100 key indicators on the well-being of women and children, including stunting. The country office staff work with local counterparts to ensure the most relevant data are shared. Updates sent by the country offices are then reviewed by sector specialists at UNICEF headquarters to check for consistency and overall data quality of the submitted estimates and re-analysis where possible. This review is based on a set of objective criteria to ensure that only the most reliable information is included in the databases. Once reviewed, feedback is made available on whether or not specific data points are accepted, and if not, the reasons why. UNICEF uses these data obtained through CRING to feed into the joint dataset. The World Bank Group provides estimates availabe through the Living Standard Measurement Surveys (LSMS) which ussually requires re-analysis of datasets given theat the LSMS reports often do not tabulate the stunting data.

Data Availability

Description:
More than 150 countries.

Time series:
At country level, data are provided for the years where surveys are included in the joint dataset. Survey years range from 1983 to 2016. For the global and regional levels, estimates are provided only for the latest available estimate upon release each year (i.e. in Sept 2016 edition of the Joint Malnutrition Estimates the only estimate available for was for 2015 and no time series were provided).

Calendar

Data collection:
Data sources are currently being updated to feed into the 2017 production of global and regional estimates and updated country level dataset to be released in May 2017.

Data release:
The next planned release fo global/regional estimates as well as the updated country dataset is May 2017. Global and regional estimates are released annually every May starting in 2017. The country level dataset is updated and released more often than the global/regional estimates. Although a set schedule has not yet been established, there have been at least two annual updates (one coinciding with the annual release of the regional/global estimates and at least one other update at another time of the year).

Data providers

Data providers vary and most commonly are ministries of health, national offices of statistics or national institutes of nutrition.

Data compilers

UNICEF, WHO and the World Bank group

References

Please provide links to all references for this indicator.

URL:
data.unicef.org/nutrition/malnutrition.html; http://www.who.int/nutgrowthdb/estimates2014/en/; http://datatopics.worldbank.org/child-malnutrition;

References:
United Nations Children's Fund, World Health Organization, The World Bank (2012). UNICEFWHO-World Bank Joint Child Malnutrition Estimates. (UNICEF, New York; WHO, Geneva; The World Bank, Washington, DC; 2012).
de Onis M, Blössner M, Borghi E, et al. (2004), Methodology for estimating regional and global trends of childhood malnutrition. Int J Epidemiol, 33(6):1260-70.
Yang H and de Onis M. Algorithms for converting estimates of child malnutrition based on the NCHS reference into estimates based on the WHO Child Growth Standards
BMC Pediatrics 2008, 8:19 (05 May 2008)
(http://www.biomedcentral.com/1471-2431/8/19).
World Health Organization (2008). Training Course on Child Growth Assessment. Geneva, WHO, 2008.

International Journal of Epidemiology 2004;33:1260-70
International Journal of Epidemiology 2003;32:518-26
http://www.biomedcentral.com/1471-2431/8/19

Related indicators

Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture
Target 2.3: By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment
Indicator 2.3.1: Volume of production per labour unit by classes of farming/pastoral/forestry enterprise size

Institutional information

Organization(s):
Food and Agriculture Organization (FAO)

Concepts and definitions

Definition:
Volume of agricultural production of small-scale food producer in crop, livestock, fisheries, and forestry activities per number of days.

The indicator is computed as a *ratio of annual output to the number of working days in one year*.

FAO proposes to define small-scale food producers as producers who:

- operate an amount of land falling in the first two quintiles (the bottom 40 percent) of the cumulative distribution of land size at national level (measured in hectares); and
- operate a number of livestock falling in the first two quintiles (the bottom 40 percent) of the cumulative distribution of the number of livestock per production unit at national level (measured in Tropical Livestock Units – TLUs); and
- obtain an annual economic revenue from agricultural activities falling in the first two quintiles (the bottom 40 percent) of the cumulative distribution of economic revenues from agricultural activities per production unit at national level (measured in Purchasing Power Parity Dollars) not exceeding 34,387 Purchasing Power Parity Dollars.

Rationale:
The 2030 Sustainable Development Agenda has emphasized the importance of enhancing productivity of small-scale food producers, as these producers play an important role in the global production of food. The indicator monitors progress in this area, where the target is to double productivity by year 2030. The enhancement of labour productivity in small-scale production units also has implications on poverty reduction, as small-scale food producers are often poor, and are frequently found to be close to subsistence conditions.

Concepts:

- The following concepts are adopted for the computation of indicators 2.3.1:
- Small-scale food producers are defined as those falling in the intersection of the bottom 40 percent of the cumulative distribution of land, livestock and revenues.

- Tropical Livestock Units are a conversion scale used for standardization and measurement of the number of livestock heads. One TLU is the metabolic weight equivalent of one cattle in North America. The complete list of conversion factors can be found in the Guidelines for the preparation of livestock sector Reviews
- The concept of productivity is standardized by OECD's Manual for Measuring Productivity. This defines productivity as "a ratio of a volume measure of outputs to a volume measure of input use." More information on possible definitions can be found in "Productivity and Efficiency Measurement in Agriculture: Literature Review and Gaps Analysis".

Comments and limitations:
A major limitation is data availability. In reality, surveys collecting all the required information simultaneously at the farm level are very few. The most appropriate data source for collecting information on total volume of agricultural production and on labour input adopted on the agricultural holding would be agricultural surveys. However, in many countries, especially in a developing context, agricultural surveys are seldom conducted.

Methodology

Computation Method:

$$\text{SDG } 2.3.1 = I^t_{2.3.1} = \sum_{j=1}^{n} \left(\frac{\sum_i V^t_{ij} p^t_{ij}}{Ld^t_j}\right)/n$$

where:
V^t_{ij} is the physical volume of agricultural product i sold by the small-scale food producer j during year t;
p^t_{ij} is the constant sale price received by the small-scale food producer j for the agricultural product i during same year t;
Ld^t_j is the number of labour days utilized by the small-scale food producer j during year t;
n is the number of small-scale food producer.

As the indicator is referred to a set of production units – those of a small scale — the denominator needs to summarize information on the entire production undertaken in each unit. This requires that volumes of production are reported in a common numeraire, given that it is impossible to sum up physical units. The most convenient numeraire for aggregating products in the numerator is a vector of constant prices. When measured at different points in time, as required by the monitoring of the SDG indicators, changes in constant values represent aggregated volume changes.

Disaggregation:
Indicator 2.3.1 must be disaggregated by classes of farming/pastoral/forestry enterprise size. The overall SDG Target 2.3 requires specific focus on women, indigenous peoples, family farmers, pastoralists and fishers. For this reason, the indicator must be disaggregated by *sex, type of enterprise and by community of reference*.

Treatment of missing values:

- At country level

To be determined.

- At regional and global levels

To be determined.

Regional aggregates:
Not yet applicable.

Sources of discrepancies:
Not yet applicable.

Methods and guidance available to countries for the compilation of the data at the national level:
Information is currently not available.

Quality assurance
Information is currently not available.

Data Sources

Sources and collection process:
Given that indicator 2.3.1 is measured on a target population of producers – those considered as small-scale – the ideal data source for measuring them is a single survey that collects all the information required with reference to individual production units. The most appropriate data source for collecting information on total volume of agricultural production and on labour input adopted on the agricultural holding would be agricultural surveys. Other possibilities to be explored in absence of an agricultural surveys are:

1) household surveys integrated with an agricultural module,
2) agricultural censuses,
3) administrative data.

Data Availability

Data is still not available in a systematic and harmonized fashion. The following data availability information is provided based on available suitable surveys in selected countries.

Breakdown of the number of countries covered by region is as follows:

	Number of countries	Nature of data
World	8	E
Africa	7	E
Northern Africa		
Sub-Saharan Africa		
Eastern Africa	4	E
Middle Africa		
Southern Africa		
Western Africa	3	E

Americas		
Latin America and the Caribbean		
Caribbean		
Latin America		
Northern America		
Asia	1	E
Central Asia		
Eastern Asia		
Southern Asia	1	E
South-Eastern Asia		
Western Asia		
Europe		
Eastern Europe		
Northern Europe		
Southern Europe		
Western Europe		
Oceania		
Australia and New Zealand		
Melanesia		
Micronesia		
Polynesia		

Time series:
By 2030.

Calendar

Data collection:
To be determined.

Data release:
To be determined.

Data providers

National Statistical Offices

Data compilers

Food and Agricultural Organization of the United Nations

References

- Note on “Proposed Methodology for Computing and Monitoring the sustainable Development Goal Indicator 2.3.1 and 2.3.2”, Office of the Chief Statistician and Statistics Division, FAO, Rome

- Defining Small Scale Food producers to Monitor Target 2.3 of the 2030 Agenda for Sustainable Development. FAO Statistics Division Working Paper available at http://www.fao.org/3/a-i6858e.pdf

Related indicators

Not applicable.

Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture
Target 2.3: By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment
Indicator 2.3.2: Average income of small-scale food producers, by sex and indigenous status

Institutional information

Organization(s):
Food and Agriculture Organization (FAO)

Concepts and definitions

Definition:
SDG indicator 2.3.2 measures income from on-farm production activities, which is related to the production of food and agricultural products. This includes income from crop production, livestock production, fisheries and aquaculture production, and from forestry production.
The indicator is computed as *annual income*.

FAO proposes to define small-scale food producers as producers who:

- operate an amount of land falling in the first two quintiles (the bottom 40 percent) of the cumulative distribution of land size at national level (measured in hectares); and
- operate a number of livestock falling in the first two quintiles (the bottom 40 percent) of the cumulative distribution of the number of livestock per production unit at national level (measured in Tropical Livestock Units – TLUs); and
- obtain an annual economic revenue from agricultural activities falling in the first two quintiles (the bottom 40 percent) of the cumulative distribution of economic revenues from agricultural activities per production unit at national level (measured in Purchasing Power Parity Dollars) not exceeding 34,387 Purchasing Power Parity Dollars.

Rationale:
The 2030 Sustainable Development Agenda has emphasized the importance of enhancing income of small-scale food producers, as these producers play an important role in the global production of food. The indicator monitors progress in this area, where the target is to double income by year 2030.
The enhancement of income of small-scale production units also has implications on poverty reduction, as small-scale food producers are often poor, and are frequently found to be close to subsistence conditions.

Concepts:
The following concepts are adopted for the computation of indicators 2.3.2:

- Small-scale food producers are defined as those falling in the intersection of the bottom 40 percent of the cumulative distribution of land, livestock and revenues.

- Tropical Livestock Units are a conversion scale used for standardization and measurement of the number of livestock heads. One TLU is the metabolic weight equivalent of one cattle in North America. The complete list of conversion factors can be found in the Guidelines for the preparation of livestock sector Reviews
- The computation of income is based on the resolution adopted by the 17th International Conference of Labour Statisticians (ICLS). Income should be computed by deducting from revenues the operating costs and the depreciation of assets.

Comments and limitations:

Methodology

Computation Method:
Given *i* agricultural activities, including crops, livestock, fisheries and forestry activities, and *j* [1,…,n] small scale food producers defined as in the first section as a subset of all *N [1,…,k]* food producers, the SDG indicator 2.3.2 must be computed using the following formula:

$$\text{SDG } 2.3.2 = I^t_{2.3.2} = \sum_{j=1}^{n} \left(\sum_i (V^t_{ij} p^t_{ij} - C^t_{ij} \right) / n$$

where:

- V^t_{ij} is the physical volume of agricultural product i sold by the small-scale food producer j during year t;
- p^t_{ij} is the constant sale price received by the small-scale food producer j for the agricultural product i during year t;
- C^t_{ij} is the production cost of agricultural product i supported by the small-scale food producer j during year t;
- n is the number of small-scale food producer.

In details, physical volumes V^t_{ik} are derived, for each k producer, from the following items:

- Crop revenues: crop sold, crop for own consumption, crop used as feed, crop saved for seed, crop stored, crop used for by-products, crop given as gift, crop used for paying labour, crop used for paying rent, crop used for paying inputs, crop given out in sharecropping agreement (sharecrop out), crop wasted. Similar criteria apply for the computation of revenues from tree crops and forestry products.
- Livestock revenues: livestock sold (alive), livestock gifts given away (component can only be kept if stock variation is possible to construct), livestock by-/products sold, livestock products self-consumed, livestock by-products self-used (also a cost in crop, for example dung used as fertilisers), livestock by-/products pay away, livestock by-/products credit away.
- Forestry revenues: products sold, forestry products for own consumption, forestry products stored, forestry products used for paying labour, forestry products used for paying rent, forestry products used for paying inputs, forestry products given out in sharecropping agreement, Forestry products wasted.

- Fisheries revenues: captured fresh fish sold, captured processed fish sold, captured fresh fish for own consumption, captured processed fish for own consumption, traded fresh fish sold, traded processed fish sold.

Production costs C_{ij}^{t} are meant to include operating costs. These comprise all variable costs (payments in cash and kind of agricultural inputs as fertiliser, seeds, and occasional labour) and fixed costs (hired labour, land rent and technical assistance costs).

In more details, costs C_{ij}^{t} generally include the following items:

- Costs of crop activities: inputs paid in cash, land rent, technical assistance/extension costs, crop saved for seed, crop used for paying labour, crop used for paying rent, crop used for paying inputs, crop given out in sharecropping agreement (sharecrop out), crop wasted, crop used for producing by-products, total value of input purchased, including those reimbursed in kind
- Costs of livestock activities: livestock bought, livestock additional expenditures, crop used as feed, technical assistance/extension costs for livestock,
- Costs of forestry activities: input costs (seedlings, fertilisers, hired labour, etc.), machine rental costs, land rental costs, other related costs.
- Costs of fisheries and aquaculture activities: fishing gear expenditures, hired labour expenditures, trading activities, fresh fish purchases, processed fish purchases, other related costs

To obtain comparable results across countries in the case of income, values must necessarily be expressed in International Dollars at Purchasing Power Parity (PPP $), based on the conversion provided by the World Bank International Comparison Project.

Disaggregation:
Indicator 2.3.2 must be disaggregated by classes of farming/pastoral/forestry enterprise size. The overall SDG Target 2.3 requires specific focus on women, indigenous peoples, family farmers, pastoralists and fishers. For this reason, the indicator must be disaggregated by *sex, type of enterprise and by community of reference*.

Treatment of missing values:

- At country level

To be determined.

- At regional and global levels

To be determined.

Regional aggregates:
Not yet applicable.

Sources of discrepancies:
Not yet applicable.

Methods and guidance available to countries for the compilation of the data at the national level:
Information is currently not available.

Quality assurance
Information is currently not available.

Data Sources

Sources and data collection:
Given that indicator 2.3.2 is measured on a target population of producers – those considered as small-scale – the ideal data source for measuring them is a single survey that collects all the information required with reference to individual production units. The most appropriate data source for collecting information on agricultural production and the associated costs are agricultural surveys. Other possibilities to be explored in absence of an agricultural surveys are:

1) household surveys integrated with an agricultural module,
2) agricultural censuses,
3) administrative data.

Data Availability

Data is still not available in a systematic and harmonized fashion. The following data availability information is provided based on available suitable surveys in selected countries.

Breakdown of the number of countries covered by region is as follows:

	Number of countries	Nature of data
World	36	E
Africa	15	E
Northern Africa		
Sub-Saharan Africa		
Eastern Africa	5	E
Middle Africa	1	E
Southern Africa	1	E
Western Africa	8	E
Americas	7	E
Latin America and the Caribbean		
Caribbean		
Latin America	3	E
Northern America	4	E
Asia	9	E
Central Asia	1	E
Eastern Asia	1	E
Southern Asia	4	E
South-Eastern Asia	2	E
Western Asia	1	E
Europe	5	E
Eastern Europe	5	E

Northern Europe		
Southern Europe		
Western Europe		
Oceania		
Australia and New Zealand		
Melanesia		
Micronesia		
Polynesia		

Time series:
By 2030.

Calendar

Data collection:
To be determined.

Data release:
To be determined.

Data providers

National Statistical Offices

Data compilers

Food and Agricultural Organization of the United Nations

References

Note on “Proposed Methodology for Computing and Monitoring the sustainable Development Goal Indicator 2.3.1 and 2.3.2”, Office of the Chief Statistician and Statistics Division, FAO, Rome

Defining Small Scale Food producers to Monitor Target 2.3 of the 2030 Agenda for Sustainable Development. FAO Statistics Division Working Paper available at http://www.fao.org/3/a-i6858e.pdf

Related indicators

Not applicable.

Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture
Target 2.5: By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed
Indicator 2.5.1: Number of plant and animal genetic resources for food and agriculture secured in either medium or long-term conservation facilities

Institutional information

Organization(s):
Food and Agriculture Organization of the United Nations (UN FAO)

Concepts and definitions

Definition:
The conservation of plant and animal genetic resources for food and agriculture (GRFA) in medium or long term conservation facilities (*ex situ* in genebanks) represents the most trusted means of conserving genetic resources worldwide. Plant and animal GRFA conserved in these facilities can be easily used in breeding programmes as well, even directly on-farm.

The measure of trends in *ex situ* conserved materials provides an overall assessment of the extent to which we are managing to maintain and/or increase the total genetic diversity available for future use and thus protected from any permanent loss of genetic diversity which may occur in the natural habitat, i.e. *in situ*, or on-farm.

The two components of the indicator, plant and animal GRFA, are separately counted.

Plant genetic resources
The plant component is calculated as the number of accessions of plant genetic resources secured in conservation facilities under medium or long term conditions, where an 'accession' is defined as a distinct sample of seeds, planting materials or plants which is maintained in a genebank. Genebank Standards for Plant Genetic Resources for Food and Agriculture (accessible at http://www.fao.org/documents/card/en/c/7b79ee93-0f3c-5f58-9adc-5d4ef063f9c7/), set the benchmark for current scientific and technical best practices for conserving plant genetic resources, and support key international policy instruments for the conservation and use of plant genetic resources. These voluntary standards have been endorsed by the FAO Commission on Genetic Resources for Food and Agriculture at its Fourteenth Regular Session (http://www.fao.org/docrep/meeting/028/mg538e.pdf).

Animal genetic resources
The animal component is calculated as the number of local breeds stored within a genebank collection with an amount of genetic material stored which is required to reconstitute the breed (based on the Guidelines on Cryconservation of Animal Genetic Resources, FAO, 2012, accessible at

http://www.fao.org/docrep/016/i3017e/i3017e00.htm). The guidelines have been endorsed by the Commission on Genetic Resources for Food and Agriculture at its Thirteenth Regular Session (http://www.fao.org/docrep/meeting/024/mc192e.pdf).

Rationale:
Genetic resources for food and agriculture provide the building blocks of food security and, directly or indirectly, support the livelihoods of every person on earth. As the conservation and accessibility to these resources is of vital importance, medium or long term conservation facilities (genebanks) to preserve and make accessible these resources and its associated information for breeding and research have been established at country, regional and global levels. Inventories of genebank holdings provide a dynamic measure of the existing plant and animal diversity and its level of preservation. Data relevant to this indicator facilitate the monitoring of diversity secured and accessible through genebanks and support the development and updating of strategies for the conservation and sustainable use of genetic resources.

The indicator is related to a monitoring framework endorsed by the FAO Commission on Genetic Resources for Food and Agriculture in which the status and trends of plant and animal genetic resources are described through globally agreed indicators and regular country-driven assessments.

The number of materials conserved under medium or long term storage conditions provides an indirect measurement of the total genetic diversity which we are managing to secure for future use. Overall, positive variations are therefore approximated to an increase in the agro-biodiversity secured, while negative variations to a loss of it.

Caution needs to be paid in interpreting the indicator. In the case of plant genetic resources, an uncontrolled addition of accessions which in fact are duplicates of samples already conserved and accounted for, or, *viceversa*, the deletion from the reported collections of redundant duplicates may lead to wrong interpretations. Another example that needs to be monitored both while reporting and interpreting the results include the grouping or splitting of accessions, as in both cases the variation in the accounted number does not reflect a variation in the genetic diversity conserved and secured. Therefore, it is crucial that reporting countries and stakeholders together with the accession level information requested explain also the reason for the decrease or increase in the number of accessions when this does not reflect a real loss or gain in the genetic diversity conserved and secured.

Concepts:
Plant genetic resources
Plant genetic resources for food and agriculture (PGRFA): Any genetic material of plant origin of actual or potential value for food and agriculture.

Accession: An accession is defined as a sample of seeds, planting materials or plants representing either a wild population, a landrace, a breeding line or an improved cultivar, which is conserved in a genebank. Each accession should be distinct and, in terms of genetic integrity, as close as possible to the sample provided originally.

Active collection: An active collection is defined as a set of distinct accessions that is used for regeneration, multiplication, distribution, characterization and evaluation. Active collections are maintained in short to medium-term storage and usually duplicated in a base collection.

Base collection: A base collection is defined as a set of unique accessions to be preserved for a medium to long-term period.

Medium or long term conservation facilities: Biological diversity is often conserved *ex situ*, outside its natural habitat, in facilities called genebanks. In the case of plant genetic resources, genebanks conserve base collections under medium or long term storage conditions, in the form of seeds in cold rooms, plants in the field and tissues *in vitro* and/or cryopreserved.

For the purpose of this indicator, in order to avoid duplicate counting at the national level, primarily base collections should be reported. An active collection could be exceptionally reported, only when, in the absence of a base collection, it also serves the function of the base collection.

Animal genetic resources
Breed: A breed is either a sub-specific group of domestic livestock with definable and identifiable external characteristics that enable it to be separated by visual appraisal from other similarly defined groups within the same species, or a group for which geographical and/or cultural separation from phenotypically similar groups has led to acceptance of its separate identity.
Medium or long term conservation facilities: Biological diversity is often conserved *ex situ*, outside its natural habitat, in facilities called genebanks. In the case of domestic animal diversity, *ex situ* conservation includes both the maintenance of live animals (*in vivo*) and cryoconservation. Cryoconservation is the collection and deep-freezing of semen, ova, embryos or tissues for potential future use in breeding or regenerating animals.

Comments and limitations:
Plant genetic resources
Broadly, two issues are of concern in using the “number of accessions” as an indicator of diversity in *ex situ* collections:

Undetected duplicates of accessions may contribute to an increase of the indicator, as each accession is a managed unit, kept and recorded as distinct. The detection of such duplicates will therefore result in a reduction in the number of accession previously reported. This can occur at different levels, for example within genebank collections and also at international level.

A loss of viability of the material(s) conserved that is not promptly detected may as well not be reflected in the number of accessions, contributing to an overestimate of the actual number of accessions.

Additional information could be provided by other indicators measuring *ex situ* conservation, which are part of the monitoring of the Global Plan of Action for PGRFA.

Animal genetic resources
To collect data on a regular base the Domestic Animal Diversity Information System DAD-IS needs to be amended.

Methodology

Computation Method:

Plant genetic resources

The plant component of the indicator is calculated as the total number of unique accessions of plant genetic resources secured in medium to long term conservation facilities. This should include all the accessions in base collections, and unique accessions stored in medium term conservation facilities, as active collections, only when these accessions should be considered to become part of the national base collections.

Animal genetic resources

For the animal component the indicator is calculated as the number of local breeds stored within a genebank collection with an amount of genetic material stored which is required to reconstitute the breed (based on the Guidelines on Cryconservation of animal genetic resources, FAO, 2012, http://www.fao.org/docrep/016/i3017e/i3017e00.htm).

Disaggregation:

For both, plant and animal, components geographic disaggregation (national, regional, global) is possible. Grouping by income, sex, age etc. is not applicable.

Treatment of missing values:

- At country level
  For both components, plants and animals, missing values are treated as such and not replaced by estimates.

- At regional and global levels
  For both components, plants and animals, missing values are treated as such and not replaced by estimates.

Regional aggregates:

For both components, plants and animals, aggregates are the sum of country values.

Sources of discrepancies:

There are no internationally estimated data. Data on this indicator are all country produced.

Methods and guidance available to countries for the compilation of the data at the national level:

For the plant component of the indicator genebank holdings are just counted based on the germplasm lists reported by countries and regional/international centres according to descriptors agreed by the Commission on Genetic Resources for Food and Agriculture (question 6.2 in the reporting format http://www.fao.org/3/a-mm294e.pdf).

For the animal component the National Coordinators for the Management of Animal Genetic Resources provide the type of material (e.g. semen samples, embryos, somatic cells) cryo-conserved within the framework of a cryconservation programme, as well as the number of the respective male and female donors to the Domestic Animal Diversity Information System DAD-IS.

Quality assurance

FAO. 2012. Cryoconservation of animal genetic resources. FAO Animal Production and Health Guidelines No. 12. Rome. (available at http://www.fao.org/docrep/016/i3017e/i3017e00.pdf)

FAO 2014. Genebank Standards for Plant Genetic Resources for Food and Agriculture. Rome. (http://www.fao.org/3/a-i3704e.pdf)

Officially appointed National Focal Points for plant and animal genetic resources, as well as regional and international centres are invited to report on this indicator on an annual basis directly to FAO DAD-IS (http://dad.fao.org/) for the animal component, and, for plant genetic resources either directly to FAO (http://www.fao.org/wiews) or through regional/international systems which apply the same standards for information exchange e.g. EURISCO (http://eurisco.ipk-gatersleben.de) or Genesys (https://www.genesys-pgr.org).

Data Sources

Description:

Plant genetic resources

Country data are stored in the World Information and Early Warning System for plant genetic resources for food and agriculture (WIEWS), the FAO information system established to facilitate information exchange as well as periodic assessments of the state of the world's plant genetic resources for food and agriculture.

Officially appointed National Focal Points (NFP) (see http://www.fao.org/agriculture/crops/thematic-sitemap/theme/seeds-pgr/gpa/national-focal-points/en/) report directly to FAO through the WIEWS Reporting System, according to the Reporting Format for monitoring the implementation of the Second Global Plan of Action for Plant Genetic Resources for Food and Agriculture (CGRFA-15/15/Inf.9, accessible at http://www.fao.org/3/a-mm294e.pdf), which is based on the 63 indicators agreed by the Commission on Genetic Resources for Food and Agriculture (CGRFA-15/15/Report, Appendix C). Indicator 20, 'Number of accessions conserved *ex situ* under medium or long-term conditions', is one of those 63 indicators and also the equivalent of the plant component of SDG indicator 2.5.1. It is compiled with data from question 6.2 of the Reporting Format for monitoring the implementation of the Second Global Plan of Action for Plant Genetic Resources for Food and Agriculture. Data on this indicator is sourced from NFP either directly or through published information systems which comply with the standard of the FAO/Bioversity Multi-crop Passport Descriptor List (MCPD) v. 2 (see References), e.g. EURISCO (http://eurisco.ipk-gatersleben.de/) and Genesys (https://www.genesys-pgr.org). Besides NFP, regional and international agricultural research centres holding PGRFA *ex situ* collections also provide information on those collections.

The frequency of data reporting is decided by the Commission on Genetic Resources for Food and Agriculture in the framework of the monitoring of the Global Plan of Action for Plant Genetic Resources for Food and Agriculture and the preparation of the periodic assessment of the State of the World's plant genetic resources for food and agriculture. It could be complemented by annual reporting on this specific indicator.

For the indicator, countries are requested to provide the name of the genebank (or holding institute code), the accession number and the scientific name of the accession[1] (name of taxon, including genus, species and lower taxonomic ranking). Optionally, information on several other descriptors is provided (see Reporting Format for the list of descriptors). This allows to analyse changes in different types of diversity concerned, including changes in the type and origin of the material secured (e.g. biological status; country of origin; locations of safety duplications; etc.) and better describe the composition of the secured materials. The indicator applies the FAO/Bioversity Multi-Crop Passport Descriptor (MCPD) v. 2, an international standard for PGRFA information exchange.

Animal genetic resources
National Coordinators for Management of Animal Genetic Resources, nominated by their respective government, provide data to the Domestic Animal Diversity Information System (DAD-IS) (http://dad.fao.org/). DAD-IS could be amended to collect the required information. Currently a project for DAD-IS development is ongoing. The updated version of DAD-IS will allow countries the storage of data on animal genetic resources being secured in either medium or long term conservation facilities as needed for the indicator.

Collection process:
The indicator is related to a monitoring framework endorsed by the FAO Commission on Genetic Resources for Food and Agriculture in which the status and trends of plant and animal genetic resources are described through globally agreed indicators and regular country-driven assessments. Officially appointed National Focal Points / National Coordinators report directly to FAO, using a format agreed by the Commission on Genetic Resources for Food and Agriculture.

Sessions of the intergovernmental technical working groups on plant and on animal genetic resources for food and agriculture allow for formal consultation processes.

Data Availability

Description:
Plant genetic resources
The most recent data collected for the implementation of the Second Global Plan of Action for PGRFA will serve as baseline (number of accessions as of June 2014).

As of March 2016, data on about 3.6 million accessions were gathered from 71 countries and 12 international centres. The data collection is ongoing and expected to be finalized by December 2017. Efforts are made to improve the coverage of countries.

Animal genetic resources
The analysis of country reports to FAO provided by 128 countries for the preparation of 'The Second Report on the State of the World's Animal Genetic Resources for Food and Agriculture' provides a first baseline with regard to the number of national breed populations where sufficient material is stored.

[1] Accession number: The unique identifier for the accession within the genebank, and is assigned when a sample is entered into the genebank collection.

Time series:

Plant genetic resources

Accession level information which includes the acquisition date in country reporting also allows to roughly estimate the status of the indicators of the plant component in previous years.

Animal genetic resources

Base line of data are country reports provided in 2014.

Calendar

Data collection:

Plant genetic resources

Data collection can be on an annual basis. This frequency appears realistic for countries with datasets already published on internet (mainly developed countries). Next data collection round within the context of the FAO Commission on Genetic resources for Food and Agriculture is planned in January 2020. Efforts are being made to organize annual data collections on a global level.

Animal genetic resources

Data collection is continuous, no specific date planned.

Data release:

Plant genetic resources

First semester 2017

Animal genetic resources

First quarter 2018

Data providers

The officially nominated National Focal Points / National Coordinators. For information by country see for plant genetic resources http://www.fao.org/agriculture/crops/thematic-sitemap/theme/seeds-pgr/gpa/national-focal-points/en/ and for animal genetic resources http://dad.fao.org/cgi-bin/EfabisWeb.cgi?sid=-1,contacts.

Data compilers

Food and Agriculture Organization of the United Nations (UN FAO)

References

Plant genetic resources

National Focal Points for the monitoring of the Second Global Plan of Action for Plant Genetic Resources for Food and Agriculture and the preparation of country reports for The Third Report on the State of the World's Plant Genetic Resources for Food and Agriculture:
http://www.fao.org/agriculture/crops/thematic-sitemap/theme/seeds-pgr/gpa/national-focal-points/en/

Second Global Plan of Action for Plant Genetic Resources for Food and Agriculture: http://www.fao.org/docrep/015/i2624e/i2624e00.htm
Second Report on the State of the World's Plant Genetic Resources for Food and Agriculture http://www.fao.org/docrep/013/i1500e/i1500e00.htm
Genebank Standards for Plant Genetic Resources for Food and Agriculture, FAO, 2014 http://www.fao.org/documents/card/en/c/7b79ee93-0f3c-5f58-9adc-5d4ef063f9c7/
Targets and Indicators for Plant Genetic Resources for Food and Agriculture, In: Report of the Fourteenth Regular Session of the Commission on Genetic Resources for Food and Agriculture, CGRFA-14/13/Report, Appendix C, http://www.fao.org/docrep/meeting/028/mg538e.pdf
Reporting Format for Monitoring the Implementation of the Second Global Plan of Action for Plant Genetic Resources for Food and Agriculture, CGRFA-15/15/Inf.9, http://www.fao.org/3/a-mm294e.pdf
FAO/Bioversity Multi-Crop Passport Descriptor (MCPD) v. 2 http://www.bioversityinternational.org/fileadmin/user_upload/online_library/publications/pdfs/FAO-Bioversity_multi_crop_passport_descriptors_V_2_Final_rev_1526.pdf

Animal genetic resources
Preparation of the First Report on the State of the World's Animal Genetic Resources Guidelines for the Development of Country Reports. Annex 2. Working definitions for use in developing country reports and providing supporting data. http://www.fao.org/docrep/004/y1100m/y1100m03.htm
Guidelines on Cryconservation of Animal Genetic Resources, FAO, 2012, accessible at http://www.fao.org/docrep/016/i3017e/i3017e00.htm
National Coordinator for Management of Animal Genetic Resources: http://dad.fao.org/cgi-bin/EfabisWeb.cgi?sid=-1,contacts
Status of Animal Genetic Resources – 2016, CGRFA/WG-AnGR-9/16/Inf.3, http://www.fao.org/3/a-mq950e.pdf
Guidelines on In vivo Conservation of Animal Genetic Resources, FAO, 2013, http://www.fao.org/docrep/018/i3327e/i3327e.pdf
The Second Report on the State of the World's Animal Genetic Resources for Food and Agriculture http://www.fao.org/3/a-i4787e.pdf

Related indicators

The component on animal genetic resources has linkages with indicator 2.5.2

Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture
Target 2.5: By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed
Indicator 2.5.2: Proportion of local breeds classified as being at risk, not-at-risk or at unknown level of risk of extinction

Institutional information

Organization(s):

Food and Agriculture Organization of the United Nations (FAO)

Concepts and definitions

Definition:

The indicator presents the percentage of livestock breeds classified as being at risk, not at risk or of unknown risk of extinctions at a certain moment in time, as well as the trends for those percentages.

Rationale:

The indicator has a direct link to “biodiversity” as animal or livestock genetic resources represent an integral part of agricultural ecosystems and biodiversity as such. Further there are indirect links to “malnutrition”: Animal genetic resources for food and agriculture are an essential part of the biological basis for world food security, and contribute to the livelihoods of over a thousand million people. A diverse resource base is critical for human survival and well-being, and a contribution to the eradication of hunger: animal genetic resources are crucial in adapting to changing socio-economic and environmental conditions, including climate change. They are the animal breeder’s raw material and amongst the farmer’s most essential inputs. They are essential for sustainable agricultural production.

No increase of the percentage of breeds being at risk or being extinct is directly related to “halt the loss of biodiversity”.

Concepts:

This indicator was originally proposed for the Target 15.5, and it serves also as an indicator for the Aichi Target 13 “Genetic Diversity of Terrestrial Domesticated Animals” under the Convention on Biological Diversity (CBD). It is described on the webpage of the Biodiversity Indicators Partnership (BIP), a network of organizations, which have come together to provide the most up-to date biodiversity information possible for tracking progress towards the Aichi Targets (http://www.bipindicators.net/domesticatedanimals). Further, it is presented in the Global Biodiversity

Outlook 4, page 91 (see http://www.cbd.int/gbo/gbo4/publication/gbo4-en-lr.pdf) which is an output of the processes under the CBD.

Comments and limitations:

Breed-related information remains far from complete. For almost 60 percent of all reported breeds, risk status is not known because of missing population data or lack of recent updates.

Generally, data collection should be possible in all countries. Updating of population size data at least each 10 years is needed for the definition of the risk classes.

Methodology

Computation Method:

The indicator is based on the most up to date data contained in FAO's Global Databank for Animal Genetic Resources DAD-IS (http://dad.fao.org/) at the time of calculation. Risk classes are defined based on population sizes of breeds reported to DAD-IS. The risk class is considered to be "unknown" if (i) no population sizes are reported or (ii) the most recent population size reported refers to a year more than 10- years before the year of calculation (10 year cut off point).

Links to official definitions/descriptions of the indicator are reported below:

The indicator is one out of a set of 3 sub-indicators which are defined in the document CGRFA/WG-AnGR-7/12/7 "Targets and indicators for animal genetic resources" (http://www.fao.org/docrep/meeting/026/me514e.pdf) and that are endorsed in their current form by the Commission on Genetic Resources for Food and Agriculture at its the 14th Session (see par 28 CRRFA-14/13/Report at http://www.fao.org/docrep/meeting/028/mg538e.pdf).

The indicator serves to monitor the implementation of the Global Plan of Action for Animal Genetic Resources. In this respect the indicator is presented in the "Status and Trends of Animal Genetic Rescources-2014" (see http://www.fao.org/3/a-mm278e.pdf).

Risk classes are defined as follows (see also FAO. 2007. The State of the World's Animal Genetic Resources for Food and Agriculture, edited by Barbara Rischkowsky & Dafydd Pilling. Rome. Accessible at http://www.fao.org/docrep/010/a1250e/a1250e00.htm.):

- Extinct: a breed is categorized as extinct when there are no breeding males or breeding females remaining. Nevertheless, genetic material might have been cryo-conserved which would allow recreation of the breed. In reality, extinction may be realized well before the loss of the last animal or genetic material.
- Critical: a breed is categorized as critical if the total number of breeding females is less than or equal to 100 or the total number of breeding males is less than or equal to five; or the overall population size is less than or equal to 120 and decreasing and the percentage of females being bred to males of the same breed is below 80 percent, and it is not classified as extinct.
- Critical-maintained: are those critical populations for which active conservation programmes are in place or populations are maintained by commercial companies or research institutions.

- Endangered: a breed is categorized as endangered if the total number of breeding females is greater than 100 and less than or equal to 1 000 or the total number of breeding males is less than or equal to 20 and greater than five; or the overall population size is greater than 80 and less than 100 and increasing and the percentage of females being bred to males of the same breed is above 80 percent; or the overall population size is greater than 1 000 and less than or equal to 1 200 and decreasing and the percentage of females being bred to males of the same breed is below 80 percent, and it is not assigned to any of above categories.
- Endangered-maintained: are those endangered populations for which active conservation programmes are in place or populations are maintained by commercial companies or research institutions.
- Breed at risk: a breed that has been classified as either critical, critical-maintained, endangered, or endangered-maintained.

Disaggregation:

Data are available by country.

Methods and guidance available to countries for the compilation of the data at the national level:

Livestock census on breed level or data derived from national herdbooks or national surveys.

FAO. 2011. Surveying and monitoring of animal genetic resources. FAO Animal Production and Health Guidelines. No. 7. Rome. (available at http://www.fao.org/docrep/014/ba0055e/ba0055e00.htm)

Quality assurance

Described in section 7 of FAO. 2011. Surveying and monitoring of animal genetic resources. FAO Animal Production and Health Guidelines. No. 7. Rome. (available at http://www.fao.org/docrep/014/ba0055e/ba0055e00.htm)

The guidelines were presented to and endorsed by the Commission on Genetic Resources for Food and Agriculture at its Thirteenth Regular Session in July 2011.

Data Sources

Description:

The Global Databank for Animal Genetic Resources currently contains data from 182 countries and 38 species. The total number of national breed populations recorded in the Global Databank has increased dramatically since 1993 (from 2,716 national breed populations to 14,915 and from 131 countries to 182).

The total number of mammalian national breed populations recorded in February 2016 was 11,116. The total number of avian national breed populations recorded in 2016 was 3,799.

List:

Global Databank for Animal Genetic Resources

Data Availability

See the biannually reports to the Commission of Genetic Resources of Food and Agriculture. The most recent report is available at: http://www.fao.org/AG/AGAInfo/programmes/en/genetics/angrvent-docs.html

Calendar

Data collection:

The underlying data base DAD-IS is maintained by FAO/AGAG (see http://dad.fao.org/). Data entry is possible all over the year.

Data providers

Name:

National Coordinators for the Management of Animal Genetic Resources (NCs)

Description:

The data are provided by the National Coordinators for the Management of Animal Genetic Resources (NCs). The NC is officially nominated by the country (usually by the Ministry of Agriculture). FAO provides the password for entering/updating the country's data within the global data information system DAD-IS directly to the NC, but only after having received the official nomination letter.

Data compilers

FAO

References

URL:

http://dad.fao.org/

References:

The indicator is calculated by FAO/AGAG and reported biannually to the Commission of Genetic Resources of Food and Agriculture. The report from 2014 is available at: http://www.fao.org/3/a-

mm278e.pdf. The links to the BIP and CBD are provided above. FAO is a partner in the BIP and provides information on the indicator directly to the partnership.