Goal 2 End hunger, achieve food security and improved nutrition and promote sustainable agriculture

(Updated on 29 March 2016)

Table of Contents

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

From FAO:

1. Precise definition of the indicator

The Prevalence of Undernourishment (PoU) is defined as the probability that a randomly selected individual from the reference population is found to consume less than his/her calorie requirement for an active and healthy life. It is written as: $PoU = \int_{x<MDER} f(x)dx$ where f(x) is the probability density function of per capita calorie consumption and MDER is a Minimum Dietary Energy Requirement. The MDER threshold is computed on the basis of normative energy requirement standards referred to a minimum level of physical activity. Estimates of the number of undernourished (NoU) - calculated by multiplying the PoU by the size of the reference population - are used to monitor progress towards the World Food Summit goal of reducing by half the number of people suffering from undernourishment. The parameters needed for the calculation of the indicator are: the mean level of dietary energy consumption (DEC); a cut-off point defined as the Minimum Dietary Energy Requirement (MDER); the coefficient of variation (CV) as a parameter accounting for inequality in food consumption; and a skewedness (SK) parameter accounting for asymmetry in the distribution. The DEC as well as the MDER are updated annually, with the former calculated from the FAO Food Balance Sheets. The MDER is calculated as a weighted average of energy requirements according to sex and age class, and is updated each year from UN population ratio data. The inequality in food consumption parameters are derived from National Household Survey data when such data is available and reliable. Due to the limited number of available household surveys, the inequality in food access parameters are updated much less frequently over time than the DEC and MDER parameters[1].

2. How is the indicator linked to the specific TARGET as worded in the OWG Report?

The indicator refers to food available for consumption over a period on one year. It refers to a severe condition of lack of food. In this respect, it is fully consistent with the spirit of the developmental goal. Energy intake is a very specific aspect of food insecurity, which applies where conditions are more severe.

Ideally, undernourishment should be assessed at the individual level by comparing individual energy requirements with individual energy intakes. This would enable the classification of each person in the population as undernourished or not. However, this approach is not feasible for two reasons: individual energy requirements are practically unobservable with standard data collection methods; and individual food consumption is currently measured with precision in only a few countries and for relatively limited samples. The individual-level consumption data that can be estimated from National Household Survey data are largely approximated owing to disparities in intra-household food allocation, the variability of individual energy requirements, and the day-to-day variability of food consumption that can arise for reasons independent of food insecurity. The solution adopted by FAO has been to estimate the PoU with reference to the population as a whole, summarized through a representative individual, and to combine available micro-data on food consumption with macro-data.

The Prevalence of Undernourishment indicator is still one of the most reliable tools to monitor progress towards reducing global hunger. Recent innovations to the methodology, such as those presented in *Wanner et al.* (2014) allow to improve the quality of global monitoring, and to capture more accurately progress in reducing hunger and how the problem is currently distributed globally. In 2012 the functional form of habitual food consumption was modified. The Skewed Normal functional form was introduced to take into account the asymmetry of the distribution. This was a major improvement, as it allowed better capturing the characteristics of the distribution, and how this would change when calories consumption increases. At the same time, a strong increase was promoted in

[1] More detailed information on the indicator can be found in: Wanner N., C. Cafiero, N. Troubat, P. Conforti (2014), Refinements to the FAO Methodology for estimating the Prevalence of Undernourishment Indicator, FAO Statistics Division Working Papers Series 14-05, Rome 2014 (available at: http://www.fao.org/3/a-i4046e.pdf) and in: Cafiero, C. Advances in hunger measurement. Traditional FAO methods and recent innovations FAO Statistics Division Working Papers Series 14-04, Rome 2014 (available at http://www.fao.org/3/a-i4060e.pdf).

the number of Household Budget Survey employed in the calculation of the CV and SK parameter. Household Budget Survey now cover about 70 percent of the total number of undernourished estimated. Another main recent refinement, introduced in 2014, is a data-driven flexible selection criterion for the choice of the functional form of the distribution of per capita habitual calorie consumption that maintains the probability framework. Further improvements to the calculation of inequality in food access parameters, both directly and indirectly, have been made in 2014 to allow for time-varying parameters that take into account economic progress and demographic changes.

At the same time, the indicator does not convey information on the quality of food, nor on its nutritional value. The reason is that it focuses on the most severe aspect of hunger, and it is therefore solely based on the number of calories consumed through food. The parametric approach adopted by FAO allows obtaining reliable estimated for relatively large population groups.

Information about the sufficiency of calories from food for specific population groups, such as the poor and the vulnerable, can be derived if such groups can be identified within the population, and if sampling allows drawing inference on the habitual food consumption of these groups.

In principle, the indicator can be computed for specific population groups, such as the poor and the vulnerable. However, this requires that such groups are clearly identifiable in the population, and that sampling allows drawing inference on their habitual food consumption. In fact, such information is seldom available.

3. Does the indicator already exist, and is it regularly reported?

Yes, the indicator exists. FAO maintains the data and reports on it annually.

Metadata are available at the FAO Statistics website http://www.fao.org/economic/ess/ess-fs/ess-fadata/it/#.VM89cGjF-VM as Excel sheets associated with the data; and from the FAOSTAT website, at http://faostat3.fao.org/download/D/*/E.

4. Comment on the reliability, potential coverage, comparability across countries, and the possibility to compute the indicator at sub-national level.

Reliability

Reliability depends on the quality of the background data, specifically on Dietary Energy Supply, the distribution of habitual food consumption in the population – which is derived from household budget surveys whenever possible -- the population, its structure and height distribution. No statistical margin of error can be determined for the prevalence of undernourishment.

The ability of the indicator to approximate access to food depends upon the extent to which existing data allow characterizing effectively the probability distribution of habitual food consumption in the reference population. As mentioned, the FAO methodology combines available micro-data on food consumption derived from surveys with macro-data from food balance sheets. Food balance sheets provide information on the amount of food that is available for consumption after taking into account all the possible alternative uses of the food items; hence, they provide approximate measures of per capita consumption, which are available for a large number of countries and are homogenous. The methodology adopted for computing these data is currently under revision, together with the estimates of waste parameters employed to derive the DEC, so the level of accuracy is expected to increase in the next few years. Survey data, where available and reliable, are employed in the FAO methodology to compute the variability (CV) and skewedness (SK) parameters that characterize the distribution of food consumption f(x). It is therefore essential that surveys are improved to obtain more accurate measures of undernourishment. Such improvement will require promoting greater standardization across existing surveys, particularly household budget surveys, and conducting more refined surveys that capture food intake at the individual level.

Coverage

Consistent time series for the indicator exist from 1990-92 for about 140 countries. The indicator is regularly reported in the annual State of Food Insecurity in the World Report published by FAO, IFAD and WFP since 1999 and in the Millennium Development Goal Report of the UN Statistics Division. Data on the indicators are published on the FAO Statistics website, at http://www.fao.org/economic/ess/ess-fs/ess-fadata/it/#.VM89cGjF-VM and

updated every year. From year 2014 they are also available in FAOSTAT, at http://faostat3.fao.org/download/D/*/E.

Comparability across countries

Comparability across time and space is relatively strong. The only potential cause of lack of homogeneity is the quality of the background data. Not all countries monitored undertake regular and reliable surveys of food consumption. In countries where this information source is of poor quality or missing, the distribution of habitual food consumption is estimated indirectly, through an econometric exercise that relates the CV of food consumption to food prices, incomes and their distribution.

Sub-national estimates

In principle the indicator could be defined at sub-national level. However, reliable information has to be available on the amount and distribution of habitual food consumption in the population of the sub-national areas of interest. In fact, this information is frequently available only for wide population sub-groups – such as rural and urban areas and some major geographical areas. The global monitoring exercise has therefore always relied only on the Prevalence of Undernourishment at national level, and never used the indicator at sub-national levels.

5. Is there already a baseline value for 2015?

Yes. A target for 2030 can be identified in terms of a minimum level, allowing for the possibility that lack of food has become marginal in the reference population. The choice of the threshold should also reflect the ability of the indicator to be accurate at such level, and effectively capture changes in the level.

Indicator 2.1.2: Prevalence of moderate or severe food insecurity in the population, based on the Food Insecurity Experience Scale (FIES)

From FAO:

1. Precise definition of the indicator

These are in reality two related indicators, representing the percentage of individuals in the national adult population (15 or more years of age) that have experienced ***moderate or severe levels*** and ***severe levels of food insecurity*** respectively, during the previous year.

Severity of food insecurity is defined as the extent to which people have difficulties in accessing food of adequate quality and/or quantity due to lack of money or other resources. Difficulties include also psychological concerns associated with the struggle in accessing food.

2. How is the indicator linked to the specific TARGET as worded in the OWG Report?

This indicator is a direct implementation of the concept of "access to food" that informs the target. Experience-based food insecurity scales are the only available tools that address the effective ability to access food at the individual or household level, directly. Reliable measure at individual level, as afforded by these indicators, is crucial to respond to the need to ensure monitoring access "by all people" and that monitoring can be conducted "in particular for the poor in vulnerable situations".

3. Does the indicator already exist and is it regularly reported?

The indicators and the global reference standard necessary to ensure proper cross-country comparability of the measures are being developed and will be maintained by the FAO Statistics Division, "Voices of the Hungry" team." Metadata are available at: http://www.fao.org/economic/ess/ess-fs/voices/fiesscale/metadata/en/.

4. **Comment on the reliability, potential coverage, comparability across countries, and the possibility to compute the indicator at sub-national level.**

Reliability

Reliability of an experience-based measure of food security could be compromised by issues related to (a) the choice and performance of the items used to form the scale and (b) limited sample sizes.

(a) Choice and performance of the FIES items. Key results from the analysis of the data collected by FAO in 2014 in 145 countries through the GWP confirm the reliability of the FIES based measure of the prevalence of food security at different levels of severity even after relatively minor efforts of adaptation of the questions to local languages. Items' performance has been tested through the *infit* statistics and only in one case only one of the items showed an *infit* value outside the range 0.7-1.3 that is considered appropriate to ensure sufficient reliability. This confirms the appropriateness of the items chosen (a result of decades of experience with development and application of experience-based food security scales in North and Latin America and throughout the world.)

(b) Sample size: Samples of 1000 individuals, characteristic of the GWP, [2] have proven sufficient to ensure margins of errors lower than 2% for prevalence of moderate or severe food insecurity, and lower than 1% for prevalence of severe food insecurity at national level. Larger sample sizes might further reduce these margins of error.

Coverage

By leveraging on the GWP as a data collection vehicle, FAO can ensure global coverage (about 150 countries every year covering more than 95% of the world population) annually, for national level assessments.

Comparability across countries

The Voices of the Hungry project has successfully developed and tested the methodology to scale individual measures to a single global reference standard and to make estimates of the prevalence of food insecurity comparable across countries. The method is possible due to the reference to Item Response Theory for measurement and it inspired by existing practice in equating educational and psycho-attitudinal tests.

Possibility to compute the indicator at sub-national level

The indicators can be computed at any level of disaggregation. Reliability of the measure is of course conditioned by the available sample size and representativeness of the specific sample. FAO suggests that, for meaningful disaggregation at subnational level, the data should be collected with surveys that are designed to be representative of the target population.

5. **Is there already a baseline value for 2015?**

While SDG target 2.1 calls for an eradication of hunger, meaningful targets that would reflect bringing food insecurity to minimal "physiological" levels and the eradication of hunger could be offset for moderate and severe food insecurity and for developed countries and some transition economies.

Credible, yet ambitious targets for other countries could be defined based on an analysis of the 2014 benchmark that will be available in the first quarter of 2015.

[2] Larger samples were formed in India (N=3000) and China (N=5000).

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 5 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

From UNICEF:

Precise definition of the indicator
Number of under-fives falling below minus 2 standard deviations from the median height-for-age of the reference population
Children under 5 years of age in the surveyed population

How is the indicator linked to the specific TARGET as worded in the OWG Report?
The target in the OWG report refers to stunting directly (i.e. By 2030, end ***all forms of malnutrition,*** including achieving, by 2025, the internationally agreed targets on ***stunting*** and wasting…).

Does the indicator already exist and is it regularly reported?
Yes, the indicator exists and is reported on annually. There is a joint country level dataset and joint global and regional estimates through collaborative effort between UNICEF-WHO and World Bank Group.
Metadata are available at the UNICEF Statistics website: (uni.cf/jmedashbaord2015) as Excel sheets containing the associated data; and from an interactive dashboard available at the same link.

Comment on the reliability, potential coverage, comparability across countries, and the possibility to compute the indicator at sub-national level.
Reliability
In general the reliability of these data are high. At the global level, the confidence intervals for stunting prevalence have averaged about +/- 2 percentage points between 1990 and 2014.
At the national level, where reported, the confidence intervals for stunting prevalence are small in general. The joint dataset is being revised to include country level confidence intervals for stunting prevalence.

Potential coverage
At present the joint dataset contains 778 national surveys between 1983 and 2015, covering 150 countries (representing more than 90 per cent of the global under-five population). The number of national surveys is expected to increase annually and number of countries may also increase.

Comparability across countries
Stunting rates are computed using a global reference standard[3] on child growth which ensure proper cross-country comparability. Data accepted into the dataset have been collected and analysed using standard equipment and methods.

Sub national data
Subnational data are available in a majority of household surveys and UNICEF-WHO and World Bank Group have plans to publish a dataset that contains sub national estimates for the country level dataset.

Is there already a baseline value for 2015?
As of September 2015, global and regional estimates for 2014 were released; we will release 2015 estimates in September 2016.

[3] http://www.who.int/childgrowth/en/

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)

No metadata received on current indicator formulation.

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

From FAO:

1. Precise definition of the indicator?

The indicator refers to the value of production per labour unit operated by small scale producers in the farming, pastoral and forestry sectors. Data will be produced by classes of enterprise size.

2. How is the indicator linked to the specific TARGET as worded in the OWG report and copied above?

The indicator is directly linked with the target's formulation. An agreed international definition of "small scale producer" in each sector needs to be developed.

3. Does the indicator already exist and is it regularly reported?

FAO has been working in producing the indicator for agriculture using household survey data, within its program of work in "*small scale agriculture and development transformation*". To date, the indicator can be computed for nine developing countries in Asia, Africa and Latin America, based on data collected with the LSMS-ISA surveys. Results have not been disseminated yet.

Sources of information would be either agricultural surveys, or agricultural modules in integrated household surveys (e.g., LSMS-ISA) organized by the national statistical agencies, with the necessary support from the World Bank, FAO and other international agencies to ensure methodological rigor.

FAO Statistics, in collaboration with IFAD and the World Bank, are working towards the establishment of a harmonized program of Agricultural and Rural Integrated Surveys (AGRIS) that could form the basis for the collection of data on this, as well as on several other SDG indicators for the agricultural sector. Through the AGRIS program, methodological guidelines will be provided to countries on how to conduct enterprise surveys in agriculture. A special effort will also be made to support countries in the actual implementation of the farm surveys. This project, as well as the partnership with IFAD, the World Bank and the countries themselves, could substantially increase the availability of data to inform this indicator in the future.

4. Comment on the reliability, potential coverage, comparability across countries, and the possibility to compute the indicator at sub-national level.

<u>Reliability</u>

Reliability and accuracy of the estimates depend on sample size.

<u>Coverage</u>

Data collection or data sharing might be difficult in some countries (i.e. countries at war etc.). In general, due to the relatively high cost, a periodicity of 3-5 year is advisable.

<u>Sub-national estimates</u>

As long as farm or household level data are available, the indicator can be computed for specific population groups and geographical areas. The granularity of data disaggregation depends on the sample design and sample size in each specific country, but, in general, data can be tabulated by size of the farm, gender and age of the enterprise manager, etc.

<u>Comparability</u>

International comparability of the estimates depends on the adoption international standards. A crucial issue to be addressed concerns the appropriate definition of “small scale” producer based on the relevant concept of the economic size of the enterprise in each sector.

5. Is there already a baseline value for 2015?

A baseline value for 2015 can be established only for a limited number of countries. A global data collection initiative needs to be launched to ensure progressively broader country coverage of the indicator.

The target of doubling the productivity of small scale producers may be more difficult to achieve (or relevant) for developed countries, given that their productivity may already be relatively high.

Its achievement in developing countries depends on a number of factors (e.g. investment in irrigation, machineries and new farming practices) that may improve labour productivity of small scale enterprises. In addition good governance and appropriate policies to promote agriculture and rural development can increase the chances that the target is reached, including by creating employment opportunities in other sectors to absorb excess supply of labour in agriculture.

Indicator 2.3.2: Average income of small-scale food producers, by sex and indigenous status

No metadata received on current indicator formulation.

Target 2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality.

Indicator 2.4.1: Proportion of agricultural area under productive and sustainable agriculture

From FAO:

Definition and method of computation	The indicator is defined by the following formula: $$Percent\ of\ land\ under\ productive\ and\ sustainable\ agriculture = \frac{Area\ under\ productive\ and\ sustainable\ agriculture}{Agricultural\ area}$$ Where $$Agricultural\ area = arable\ land + permanent\ crops + permanent\ meadows\ and\ pastures$$ The **denominator**, agricultural area, is a well-known and established indicator that are collected by statistical bodies in countries and compiled internationally via a questionnaire by FAO. These data are available in FAO's database FAOSTAT. The **numerator** captures the three dimensions of sustainable production: environmental, economic and social. The measurement instrument – farm surveys – will give countries the flexibility to identify issues related to sustainability that are most relevant to priorities/challenges within these three dimensions. Land under productive and sustainable agriculture will be those farms that satisfy indicators selected across all three dimensions.
Rationale and interpretation	There has been considerable discussion over the past thirty years on how to define "sustainable agriculture." Sustainability was often understood mainly in its environmental dimension. Yet, it is well established that sustainability needs to be considered in terms of its social, environmental and economic dimensions. The indicator has been operationalized in order to capture its multidimensional nature. The main points on which the indicator is based are as follows: • Maintain the natural resource base in order to ensure sufficient productivity for the foreseeable future • Ensure the generation of a level of income which is sufficient to keep the livelihood of the entire family steadily above the poverty line, and in accordance with the development objectives of the country. • Provide access to safety nets, ensure flexibility in front of market and natural shocks and ensure clear ownership and tenure rights, with no discrimination on gender basis. Challenges to sustainable agriculture vary within and across countries, and by region and are affected by socio-economic and bio-physical conditions. By defining sustainability across its three dimensions, countries can select those metrics within their measurement instrument that best capture the priorities most relevant to them. A set of possible metrics for each sustainability dimension will be established in order to ensure relevance across the whole range of possible socio-economic and bio-physical conditions. Farm surveys will be designed on the basis of a limited set of these measurements, established at national level in order to cover the most relevant aspects of these three dimensions of sustainability. Each surveyed farm will be assessed against targets for each of these measurements, decided at national level. Farms or areas that

	satisfy the targets in the three dimensions would be considered as sustainable; otherwise no. Progress would be measured against a benchmark, which would show trends over time.
Sources and data collection	Data on sustainable production will most likely be collected through agricultural surveys or agricultural modules in integrated household surveys organized by the national statistical agencies, with the necessary support from FAO or other international agencies to ensure methodological rigor and harmonization. It is expected that land-based measurements will be integrated and complemented by earth observation technologies, either by or under the overall supervision of national statistical agencies.
Disaggregation	As long as farm or household level data are available, the indicator can be computed for specific population groups and geographical areas. The level of disaggregation depends on the sample design and sample size in each specific country, but, in general, data can be tabulated by geographical area, size of the farm, gender and age of the enterprise manager.
Comments and limitations	Data from farm surveys can be supplemented with information from other sources, including geospatial data/remote sensing or other techniques to capture environmental data. Data collection or data sharing may be difficult in some countries.
Data for global and regional monitoring	Data for global and regional monitoring will be obtained from aggregation of national data. They can be complemented or enhanced by the use of well selected earth observation data.
Supplementary information	The methodological development of the indicator could benefit from the support from the Global Strategy to improve agricultural and rural statistics, a program aiming at improving countries' capacities to produce agricultural and rural statistics in support to more effective food security and agricultural and rural development policies. As part of the program, FAO, in collaboration with IFAD and the World Bank, are working towards the establishment of a harmonized and cost-effective program of Agricultural and Rural Integrated Surveys (AGRIS) that could form the basis for the collection of data on indicator 2.4. Through this program, methodological guidelines on how to conduct enterprise surveys in agriculture will be developed and provided to countries, together with technical support in the implementation of the farm surveys. ___ The proposed indicator for 2.4 is directly linked – and may either draw from or provide information to – other proposed SDG targets: • 2.3 (agricultural productivity). The link between SDG 2.3 and 2.4 is especially strong. Data for these two indicators can be jointly collected through the same integrated survey. • 6.3 (Improving water quality) • 6.4 (water use efficiency) • 12.2 (efficient use of natural resources) • 15.2 (sustainable management of forests) • 15.3 (land degradation)
References	Land use data: http://faostat3.fao.org/download/R/RL/E Sustainable agriculture: - http://www.fao.org/sustainability/en/ - Building a Common Vision for Sustainable Food and Agriculture Global Strategy to Improve Agricultural and Rural Statistics: http://www.fao.org/3/a-i3940e.pdf

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 ensure 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

No metadata received for current indicator formulation.

Indicator 2.5.2: Proportion of local breeds classified as being at risk, not-at-risk or at unknown level of risk of extinction

From FAO:

1. Precise definition of the indicator

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.

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 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 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).
This indicator is also proposed for the Target 15.5 under SDG, 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.
Risk classes are defined as follows[4]:

- **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

[4] 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.

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.

2. How is the indicator linked to the specific TARGET as worded in the OWG Report?

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".

3. Does the indicator already exist and is it regularly reported?

Yes, the indicator exists. It is calculated by FAO/AGAG and reported biannually to the Commission of Genetic Resources of Food and Agriculture. The most recent report 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.
The underlying data base DAD-IS is maintained by FAO/AGAG (see http://dad.fao.org/). The contact person for DAD-IS is Ms Roswitha Baumung. Data are officially provided by countries. Data entry is possible all over the year.
Sustainability of the indicator production and its use within a meaningful global monitoring framework is strongly dependent on the maintenance and development of DAD-IS by FAO.

4. Comment on the reliability, potential coverage, comparability across countries, and the possibility to compute the indicator at sub-national level.

Reliability
The reliability of measures of population size for breeds varies across countries and species (similarly to what is the case for population size of livestock species provided in CountrySTAT). However, rough estimates on country level are considered to be sufficient to reliably detect global and regional trends.
Coverage
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 14 869 and from 131 countries to 182). The total number of mammalian national breed populations recorded in June 2014 was 11 062. The total number of avian national breed populations recorded in 2014 was 3 807. However, 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.
Comparability across countries
Completely comparable as calculation is done in the same way for all countries and the same definitions on risk classification is applied.

Sub-national estimates

Sub-national estimates can be obtained with regard to the risk status of each national breed population and species. Results can be presented at the national, regional and global levels.

5. Is there already a baseline value for 2015?

With regard to animal biodiversity, SDG target 2.5 has been formulated as "…the genetic diversity of farmed and domesticated animals is *maintained*" which is consistent with the target formulation of Aichi Target 13 under the CBD. However the future projections presented in the Global Biodiversity Outlook 4, Figure 131, page 91 (see http://www.cbd.int/gbo/gbo4/publication/gbo4-en-lr.pdf) suggest to maintain/halt the loss of animal biodiversity may be very challenging.

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

From FAO:

1. **Precise definition of the indicator**

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.

$$AOI = \frac{Agriculture\ Share\ of\ Government\ Expenditures}{Agriculture\ Share\ of\ GDP}$$

An 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.

Agriculture refers to the agriculture, forestry, fishing and hunting sector, 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 or purse, 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 or to the OECD.

The annual data and indicator, collected and compiled by the Food and Agriculture Organization of the UN (FAO), can be found on the FAOSTAT domain at: http://faostat3.fao.org/download/I/IG/E, covering the periods 2001-2012.

2. **How is the indicator linked to the specific TARGET as worded in the OWG Report?**

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.).

Government spending in agriculture is essential to address these market failures. 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 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% to C's GDP, and 10% 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.

3. Does the indicator already exist and is it regularly reported?

The indicator is maintained and reported by FAO in FAOSTAT, with metadata soon to be available at http://faostat3.fao.org/mes/methodology_list/E.

The underlying annual data is official country data, from 2001 to 2012, reported by countries through a questionnaire jointly developed by FAO and the IMF using the COFOG and GFSM classifications. The database currently covers 139 countries.

4. Comment on the reliability, potential coverage, comparability across countries, and the possibility to compute the indicator at sub-national level.

The use of the COFOG and GFSM classifications promotes international and inter-temporal comparisons. The expenditure data reported is typically based on administrative data based on a government's public accounts, while GDP and Agriculture Value Added is based on its National Accounts. The nature of the data typically prohibits indicators at sub-national level, as most countries do no compile sub-national GDP estimates, nor sub-national Government Expenditure figures.

Reliability: The numerator (Agriculture Share of Government Expenditures) is based on administrative data, which has no statistical margin of error. The denominator (Agriculture share of GDP) is based on a System of National Accounts, following international guidelines, in which either Agriculture Value-Added or GDP estimates can suffer from statistical errors, though it is difficult to measure. Errors and lack of reliability due to from non-statistical errors can arise, for example, as a result of the mapping between national concepts to international classifications (by respondents), the use of different measures of government across countries due to reporting issues (budgetary central, central, and general, as described above).

Coverage: It is relatively high for these particular indicators, with 139 countries included. However, some countries have not provided data for all 13 years from 2001 to 2012, and the level of government to which expenditures pertain can differ.

Comparability across countries: It is facilitated by use of the Agriculture share of Government Expenditures in the numerator , which mitigates difference that arise when some countries report expenditures for all levels of government, and others only for the central government. This does not rule out the fact that state and local governments may spend a different share on Agriculture than the central government. For this reason, analysis of the trends in this indicator may be more reliable, for comparison purposes, than just the indicator alone.

While COFOG and GFSM facilitate international comparisons, not all countries report expenditures covering all three levels of government (Central, State and Municipal). The three levels of reporting include (from smallest to

largest): 1) Budgetary Central Government; 2) Central Government, which includes Budgetary Central Government as well as extra-budgetary units ; and 3) General Government, which includes Central, State and Local Government. Countries that fully report General Government Expenditures may not report Central Government Expenditures.

Since not all countries collect or share data on all three levels of reporting, the level with the most complete time series is used is used for each country. To the extent that the Agriculture share of Government Expenditures differs across levels of government (Central, State and Local), differences in this indicator may reflect differences in reporting.

Sub-national estimates: It is not possible to compute sub-national or population group estimates, given the nature of the underlying data.

5. Is there already a baseline value for 2015?

There is no baseline value for this indicator for 2015. There is some precedent for using government expenditures as a target indicator for Agriculture. Signatories to the Maputo Declaration set a target of 10% for the Agriculture and Rural Development *Share of Government Expenditures*. However, as Rural Development is not a purpose listed under the COFOG classification, there has been considerable difficulty in consistently measuring this indicator. Furthermore, in setting a universal target, this Share indicator suffers from the problems listed above (comparison of economies of different size, with different levels of government expenditures, and with different agricultural shares of GDP).

Indicator 2.a.2: Total official flows (official development assistance plus other official flows) to the agriculture sector

From OECD:

Goal and target addressed

Goal 2: End hunger, achieve food security and improved nutrition, and promote sustainable agriculture.

Target 2a: Increase investment, including through enhanced international cooperation, in rural infrastructure, agricultural research and extension services, technology development, and plant and livestock gene banks to enhance agricultural productive capacity in developing countries, in particular in least developed countries.

Definition and method of computation

Total net official development assistance (ODA) to the agriculture (purpose code 311) and rural development (code 4304) sectors. Data expressed in US dollars at the average annual exchange rate.

Rationale and interpretation

ODA is the accepted measure of international development co-operation. Separate data are available on aid to support agricultural production and on broader rural development projects, but the sum of the two most closely matches the target.

Sources and data collection

Data are compiled by the Development Assistance Committee of the Organisation for Economic Co-operation and Development from returns submitted by its member countries and other aid providers. Data can be accessed here.

Disaggregation

The data are generally obtained on an activity level, and include numerous parameters. They can thus be disaggregated by provider and recipient country; by type of finance, and by type of resources provided. Some data are also available on the policy objectives targeted by individual projects.

Comments and limitations

The data only address concessional flows for development and welfare purposes provided by governments. The OECD and other organisations also collect data on broader investment flows to developing countries. However detailed sectoral information on such flows is lacking.

Gender equality issues

The data include a "gender equality" marker which identifies individual projects that have a clear gender dimension.

Data for global and regional monitoring

Data are available for essentially all high-income countries, and for an increasing number of middle-income aid providers.

Supplementary information

See Aid to Agriculture and Rural Development

References

OECD, 2010, Measuring Aid to 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: Producer Support Estimate

From OECD:

Definition and method of computation
The Percentage Producer Support Estimate (%PSE) represents policy transfers to agricultural producers, measured at the farm gate and expressed as a share of gross farm receipts. Transfers included in the PSE are composed of market price support, budgetary payments and the cost of revenue foregone by the government and other economic agents.

Rationale and interpretation
PSE Indicators show what share of support to agriculture can be considered to be highly production and trade distorting (as opposed to be only minimally influencing markets through more decoupled measures of support). The OECD Producer Support Estimate (PSE) indicators were developed in order to monitor and evaluate developments in agricultural policy, to establish a common base for policy dialogue among countries, and to provide economic data to assess the effectiveness and efficiency of policies. The indicators were mandated by OECD Ministers in 1987, and have since been calculated for OECD and an increasing number of non-OECD countries, and are widely referred to in the public domain. Domestic support notifications to the WTO are an obvious source for an indicator on target 2b as well; however, notifications often have a significant time lag and not all countries notify.

Sources and data collection
Annual data; original data is collected by the OECD secretariat in collaboration with capitals.

Disaggregation
Data are disaggregated by country. The online database provides tables to make cross-country comparisons and filter disaggregated policy-level data by commodity, policy implementation criteria and country.

Comments and limitations
None are identified.

Gender equality issues
None are identified.

Data for global and regional monitoring
Data are available for 49 countries (28 EU members treated as a single entity), including all OECD countries, as well as a number of non-member countries which are important agricultural producers – these include Brazil, China, Indonesia, Russia and South Africa.

Supplementary information
PSE manual: http://www.oecd.org/tad/agricultural-policies/psemanual.htm

References
Annual publication: Monitoring and Evaluation of agricultural policies

Indicator 2.b.2: Agricultural export subsidies

No metadata received on current indicator formulation.

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

From FAO:

DEFINITION AND METHOD OF COMPUTATION

Definition

The proposed indicator of food price anomalies measures the number of "Price Anomalies" that occur on a given food commodity price series over a given period of time.

Concepts

The volatility of a given food commodity price series is measured through the quarterly and annual Compound Growth Rates (CGR), of the monthly price level. The mean and standard deviation of the observed historic CGR values define what is considered to be "normal" volatility for the particular price series being considered. A "Price Anomaly" is then defined as the recording, in a given month, of a CGR that is greater than the historic mean CGR for that month by one standard deviation or more.

Method of computation

Computation of the indicator requires the availability of a series of monthly prices and involves three steps.

Step 1. Calculating the quarterly and annual compound growth rates.
A CGR is the growth rate in a time series over a certain amount of time.

It is computed as $CGR_{t_n} = \left(\frac{P_{t_n}}{P_{t_0}}\right)^{\frac{1}{t_n - t_0}} - 1$, where P_{t_n} is the price at time (month) t_n and P_{t_0} is the price at time (month) t_0.

A quarterly CGR (CQGR) is calculated by considering periods of three months between t_n and t_0, while an annual CGR (CAGR) is calculated by considering a period of 12 months. The importance to consider both CQGR and CAGR derives from the need to take into account the presence of marked seasonal variability in many agricultural prices, with prices growing more or less steadily over the year from their minimum, occurring at harvest period.

Step 2. Calculating the weighted average and standard deviation of both CQGR and CAGR.
The historic distributions of CGRs are characterized by the mean and the standard deviation of past CGR values. A different distribution of CGRs is computed per each calendar month. Time weights are used to make sure that the more recent past has a higher weight in the calculation of the mean and standard deviation of the distribution of CGRs, so that more

recent price dynamics are not overshadowed by past extreme events which could prevent the detection of significant market shocks on prices.

Step 4. Computing the indicator of price anomalies.
First, the difference between the monthly CGR and the historic average CGR is computed for each month and then normalized with respect to the historic standard deviation. Based on the results, a price anomaly is recorded in each month for which the normalized difference is equal or greater than one. Then, the frequency of price anomalies is computed for both the quarterly and the annual CGRs and the final indicator of price anomalies for month t (IPA_t) is computed as a weighted average of the frequency of price anomalies in the quarterly CGR and the frequency of price anomalies based on the annual CGR.

For further details, see Baquedano 2014 (2015?).

RATIONALE AND INTERPRETATION

The indicator aims at capturing the occurrence of episodes of abrupt price increases that could be indicative of malfunctioning food commodity markets, and as such can be used to monitor the "proper functioning" of food markets, as expressed by the Target.

Evidence from existing historic price series will need to be evaluated, on a case-by-case basis to determine which price series are more relevant in each country.

As this is a "means of implementation" indicator, there should be no need to set baseline values and numerical targets to be achieved by 2030, but only to report it.

SOURCES AND DATA COLLECTION

Price series have been collected over the years on several food commodities in many countries to inform the FAO Food Price Monitoring and Analysis (FPMA) tool as detailed at http://www.fao.org/giews/food-prices/data-partners/en/.

Adoption of this indicator will require that countries identify relevant, official monthly food price series to be used to inform the calculations, and that ensure data collection and publication on a monthly basis.

DISAGGREGATION

The indicator is applicable at the level of the relevant market for which price data are available. To the extent that different price data series are available for different markets in a country (e.g., regions or main cities), it can be computed at subnational level.

COMMENTS AND LIMITATIONS

The indicator is based on a methodologically sound method to measure the volatility of time series of prices by controlling for the presence of long-term trends and seasonal variability that might confound other proposed simpler measures. It is particularly suited for agricultural prices whose dynamics is conditioned by the presence of annual harvest period, and marked growth during the period from one harvest to the next.

The major limitation is linked to the need for available historic time series of monthly prices to establish the distribution of compound growth rates used to identify the occurrence of "anomalies". As of today, the indicator is only used by FAO Global Information and Early Warning (GIEWS). It has been tested on experimental basis in Bolivia and in Guatemala.

GENDER EQUALITY ISSUES

Not applicable.

DATA FOR GLOBAL AND REGIONAL MONITORING

The indicator can be applied also to global or regional food commodity price series on international markets.

SUPPLEMENTARY INFORMATION

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

EXAMPLES

See Baquedano 2015.

REFERENCES

Felix G. Baquedano. 2014. "Developing an indicator of price anomalies as an early warning tool: A technical compendium". Food and Agriculture Organization of the United Nations. Trade and Markets Division. Global Information and Early Warning System, June 2014. http://www.fao.org/fileadmin/user_upload/foodprice/docs/resources/1_GIEWS%20Food%20Price%20Methodology.pdf

1. FAO. Food Price Monitoring and Analysis (FPMA) tool. http://www.fao.org/giews/food-prices/home/en/