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FOOD SECURITY AND SUSTAINABLE DEVELOPMENT GOAL INDICATORS: CHALLENGES FOR NATIONAL STATISTICS OFFICES (NSOs) AND MINISTRIES OF AGRICULTURE (MoA)

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Summary

On 25 September 2015, the 193 Member States of the United Nations adopted the 2030 Agenda for Sustainable Development. It includes 17 Sustainable Development Goals (SDGs) and 169 targets that will guide the actions of governments, international agencies, civil society and other institutions over the next 15 years. The 2030 Agenda provides a global vision covering the entire development spectrum and is as relevant for developed countries as it is for developing countries.

The 2030 Sustainable Development Goal 2 is "End Hunger, achieve food security and improved nutrition and promote sustainable agriculture". It has five targets spanning many dimensions of food security. The first target focuses specifically on access to food: "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." Under this target, two FAO indicators have been included: the Prevalence of Undernourishment (PoU – SDG 2.1.1) and the Prevalence of Food Insecurity based on the Food Insecurity Experience Scale (FIES – SDG 2.1.2).

A significant factor in the success of the SDGs will be new and effective ways of collecting data, monitoring targets and measuring progress. In March 2016, the UN Statistical Commission identified as a "practical starting point" 230 indicators to monitor the SDGs' targets. The SDGs depart from the MDGs in that all governments have contributed to their design and are committed to their achievement. According to the principle of national ownership, countries are chiefly responsible for gathering data.

International agencies will lend assistance by strengthening national capacities and by ensuring that data are comparable and aggregated at sub-regional, regional and global levels. FAO is recognized as having a fundamental global role in developing methods and standards for food and agriculture statistics, and in providing technical assistance that can help countries meet the new monitoring challenges.

I. Introduction

The first target of the second Sustainable Development Goal (SDG 2) target adopted in context of the 2030 Agenda calls on countries to "*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 by 2030.*". To monitor progress towards this target, two indicators were adopted: SDG indicator 2.1.1 corresponding to the FAO's traditional indicator of the extent of hunger, the **prevalence of undernourishment** (PoU) and the SDG 2.1.2 on the **prevalence of moderate and severe food insecurity***,* which is estimated based on data collected from adult individuals worldwide using the **Food Insecurity Experience Scale** (FIES). A new tool developed by FAO, the FIES is based on direct interviews and provides a measure of people's ability to access food.

The PoU is an estimate of the proportion of the population facing serious food deprivation. It is derived from national-level information on 1) food supply 2) distribution of food consumption and 3) population characteristics such as the age/ sex structure and levels of physical activity. The indicator has been used by FAO since 1996 to monitor the World Food Summit Target and, later, the MDG Target 1c at national, regional and global levels.
The FIES provides estimates of the proportion of the population facing difficulties in obtaining enough food, based on direct interviews with adults. Building on two decades of experience with use of similar tools in various countries, FAO´s Voices of the Hungry (VoH) Project developed the analytical methodology for computing indicators of the prevalence of food insecurity at moderate and severe levels that are comparable across countries and cultures.

New evidence based on these two indicators shows that hunger is on the rise since 2015 and the need for countries to effectively monitor their progress towards target 2.1 is essential. The role of FAO as custodian agency is to lead the countries provide countries with all the tools and capacity to produce these indicators so that they can report on their own progress toward eradication of hunger.

The next section briefly describes the underlying methodologies used to estimate these two indicators followed by a discussion of the strengths and limitations of these indicators. FAO's strategy for improving the capacity of countries to collect data and provide estimates on SDG target 2.1 indicators is presented in last section,together with some concrete examples of what has been done.

II. Introduction to SDG indicators 2.1.1 and 2.1.2

The Prevalence of undernourishment (PoU), adopted by the United Nations Economic and Social Council as an indicator for monitoring SDG Target 2.1 at the global level is a well internationally established indicator to measure hunger and food insecurity. The PoU has been published by FAO since 1974 and has been adopted in 2000 as one of the indicator to monitor progress towards the Millennium Development Goals.

To complement the information provided by the PoU, FAO has recently developed a new tool: the FIES. Based on data collected directly from representative samples of individuals in almost

150 countries across the world, this tool measures people's ability to obtain adequate food. The prevalence of moderate and severe food insecurity based on the FIES has been adopted as indicator the second indicator to measure progress towards target 2.1.

These two indicators reflect the extent of food deprivation; however, they are based on different sources of data and methodologies. The FIES estimates are more up-to-date – with the latest observed estimates available for 2016 – while the PoU is derived from data typically available only after a delay of several years.

Prevalence of undernourishment (PoU) – SDG 2.1.1

The prevalence of undernourishment (PoU), is an estimate of the proportion of the population that has been in a condition of undernourishment over the period in reference (usually one year). Where undernourishment is defined as the condition in which an individual's habitual food consumption is insufficient to provide the amount of dietary energy required to maintain a normal, active, healthy life.

To compute an estimate of the prevalence of undernourishment in a population, a probability distribution of habitual daily dietary energy intake levels (expressed in Kcal) for an average individual is modelled through a parametric probability density function (pdf), *f(x)*. Once the pdf has been characterized, the indicator is obtained as the cumulative probability that daily habitual dietary energy intakes (*x*) are below minimum dietary energy requirements (MDER) (i.e. below the lowest acceptable range in the distribution of energy requirements) for a representative average individual, as in the formula below:

$$PoU = \int_{x<MDER} f(x|DEC; CV; Skew)dx,$$

where DEC (mean dietary energy consumption), CV (coefficient of variation, which reflects the spread of the distribution, or inequality in access to food) and Skew (skewness, which determines the asymmetry in the distribution) characterize the distribution of habitual dietary energy consumption levels in the population (see http://www.fao.org/3/a-i4046e.pdf for a detailed description).
Different data sources can be used to estimate the different parameters of the model.

> ***Dietary energy consumption (DEC).*** The mean of the distribution of DEC levels for the average individual in a population corresponds 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. DEC can also be estimated from accounts of the total supply and utilization of all food commodities in a given country, where the contribution of each commodity to the availability of food for human consumption is expressed through its dietary energy content and the total 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/).

> ***The coefficient of variation (CV) and skewness (Skew).*** The most common sources of data to estimate CV and Skew are multipurpose household surveys, such as Living Standard Measurement Surveys or Household Incomes and Expenditure Surveys (Household Budget Surveys), which also collect information on food consumption.

> ***Minimum dietary energy requirements (MDER).*** Human energy requirements are computed by multiplying normative requirements for basic metabolic rate (BMR, expressed per kilogram of body mass) by the ideal weight of a healthy person of given height, and then multiplied by a coefficient of physical activity level. Ranges of normal energy requirements are thus computed

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

Challenges and limitations: While the state of being undernourished applies to individuals, due to conceptual and data-related considerations, the indicator can only refer 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; it is not based on identification of which individuals in the population are undernourished.

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. While it is not possible to calculate margins of error around PoU estimates, these would likely exceed 5 percent in most cases. For this reason, FAO does not consider national level PoU estimates lower than 2.5 percent as sufficiently reliable to be reported.

The prevalence of moderate and severe food insecurity based on the FIES – SDG 2.1.2
The prevalence of moderate and severe food insecurity based on the Food Insecurity Experience Scale (FIES) is an indicator that refers to limited **access to food,** at the level of individuals or households, due to lack of money or other resources.

The Food Insecurity Experience Scale (FIES) is an experience-based metric of the severity of food insecurity, relying on direct yes/no responses to eight questions regarding access to adequate food. Inspired by evidence from two decades of applying similar measurement tools in many countries, FAO developed this analytical methodology to obtain valid and reliable population estimates of food insecurity that are comparable across different countries and cultures.

Respondents are asked about experiences associated with the inability to access food, including whether they have at any time during the previous 12 months, due to lack of money or other resources: been worried about not being able to obtain enough food; been forced to decrease the quality or quantity of the food they eat; gone for entire days without eating.

The questions refer to experiences associated with different levels of food-insecurity severity, forming a measurement scale when analytical tools based on Item Response Theory are applied.

FAO calculates two indicators based on the FIES methodology: one of the prevalence of food insecurity in the population that includes both moderate and severe levels, and one that refers to severe levels only. People experiencing moderate levels of food insecurity will typically have lower-quality diets and may at times during the year have been forced to also reduce the quantity of food they would normally eat; those experiencing severe levels would have gone for entire days without eating due to lack of money or other resources.

The ideal source of FIES data is large population surveys conducted by national institutions, enabling more detailed, policy-relevant analyses of the food-insecurity situation by income, gender, age, race, ethnicity, migratory status, disability, geographic location, or other policy-relevant characteristics.

The data were validated and used to construct a scale of food-insecurity severity using the Rasch model, 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.

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

By applying the Rasch model to the FIES data, it is possible to estimate the probability of being severely food insecure (p_{sev}) for each respondent, with. $0 \le p_{\text{sev}} \le 1$.

The prevalence of food insecurity at severe levels in the population is computed as the weighted sum of the probability of being food insecure for all respondents in a sample using as weights the post-stratification weights that indicate the proportion of individuals or households in the national population represented by each element in the sample.

Comparability of food insecurity prevalence estimates can be achieved by **calibrating the scales on a common metric**, in a process called **equating**. This is done by adjusting all measures obtained at the country level to the **global standard reference scale,** which is based on results from over 140 countries covered by the Gallup World Poll in 2014, 2015, and 2016. Universal thresholds are then defined on the FIES global standard scale and converted into corresponding values on local scales. Equating to the global standard permits the production of **internationally comparable** measures of food insecurity severity for individual respondents, as well as comparable national prevalence rates.

The FIES has many advantages, including simplicity and low cost of application within different types of population surveys, the possibility to disaggregate data by gender or other characteristics, the timeliness of results produced, and the fact that it provides a direct measure of people's access to food, information that is highly policy relevant.

Challenges and limitations: The major challenge that lies ahead is to build countries' capacity to apply the FIES with national surveys, properly analyze the data collected, interpret results and report them effectively. The methods used for analyzing FIES data are somewhat more complicated than those used in the past by countries with existing experience-based food security scales, so communicating the need for this more precise, yet more complex approach, as well as instructing countries on how to carry it out, will be key to the success of the tool.

III. The way forward

A significant factor in the success of the SDGs will be new and effective ways of collecting data, monitoring targets and measuring progress. In March 2016, the UN Statistical Commission identified as a "practical starting point" 230 indicators to monitor the SDGs' targets. The SDGs depart from the MDGs in that all governments have contributed to their design and are committed to their achievement. According to the principle of national ownership, countries are chiefly responsible for gathering data.

While the **UN General Assembly has officially approved** the monitoring framework and the list of indicators, countries are pointing to the need for **SDG indicators to be informed by official national data.**

It is internationally recognized that monitoring food security in the context of the SDGs will represent a challenge for countries and that they will need some guidance. That is why each indicator is associated with a custodian agency to help countries go through the process and provide them the assistance they need to inform their SDG monitoring framework.

FAO is recognized as having a fundamental global role in developing methods and standards for food and agriculture statistics, and in providing technical assistance to help countries meet the new monitoring challenges.

As FAO is custodian of both SDG Target 2.1 indicators, one of its roles is to promote the adoption of the FIES and PoU methodologies by national governmental institutions. The full potential of the FIES and PoU to generate statistics that can inform policy is achieved when the tools are applied in national population surveys. In particular, depending on the national survey vehicle chosen for the FIES, it is possible to conduct detailed analyses of the food insecurity situation according to income, gender, age, race, ethnicity, migratory status, disability, geographic location, or other policy-relevant characteristics, as is already the case for a number of countries.

The food security and nutrition team of the FAO Statistic Division is committed to provide countries the assistance needed in:

- Building capacities of national statistics offices to collect data needed to inform SDG indicators 2.1.1 and 2.1.2 ;
- Building capacities of national statistics offices to conduct data analysis and produce SDG indicators 2.1.1 and 2.1.2 ;
- Strengthening the capacities of national policy makers to use the information to guide food security policy.
- Leveraging on the capacities of countries already using these indicators

The Capacity development strategy revolves around two main activities:

➢ **Production and dissemination of tools and training material at no cost via the web**
  o Development of software for processing FIES data (RM weights package in R) to produce SDG 2.1.2
  o Development of ADePT-FSM software to analyze food consumption data collected in surveys and produce SDG 2.1.1
  o Development of FIES survey modules translated into 150 languages and dialects
  o E-learning courses (late 2017) to build countries' capacities to produce SDG 2.1.1 and 2.1.2
  o Development of user manuals and various video tutorials
  o Data dissemination portal with links to all existing available FIES datasets for which countries have authorized dissemination.

➢ **Capacity development**
  Conduct regional and country-level workshops, missions and technical assistance (on-site and remote); to be conducted by the technical advisors placed in the FAO Regional Offices with technical support from FAO-HQ as needed.

Activities have already started in Africa with the recent organization of two regional workshops held in Addis Ababa from the 2nd to the 10th of October 2017 targeting 20 English and French African countries. These regional workshops were successful in taking stocksof where countries stand in terms of developing their own SDG monitoring framework and the main challenges confronting their national institutions. A preliminary road map on country needs for assistance was also drawn during the workshop to serve as a basis for the future CD activities to be conducted in the region.

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