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New approaches to the measurement of food security

Contributed by: *FAO Statistics Division*

1. Introduction

This paper reports on efforts to improve the measurement of food insecurity underway in the FAO Statistics Division. The State of Food Insecurity in the World (SOFI) 2013 report has adopted some of these improvements. More improvements are forthcoming and will be included in future editions of the report. Section 2 of this paper discusses the multiple dimensions of food insecurity and how they were analyzed in the SOFI 2013 report. Section 3 describes work underway within the Voices of the Hungry project. Section 4 proposes recommendations for discussion.

2. The multiple dimensions of food insecurity

The SOFI 2013 report emphasized the need to consider multiple dimensions when analyzing food insecurity. The prevalence of undernourishment (PoU) indicator is the most important single indicator of hunger, computed in a comparable manner across a broad range of countries since 1990. However, the PoU is, in fact, a measure of dietary energy deprivation. Despite its importance in global monitoring, as a standalone indicator the PoU is not able to

capture the complexity and multidimensionality of food security, as defined by the 2009 Declaration of the World Summit on Food Security: "Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food, which meets their dietary needs and food preferences for an active and healthy life."

Based on this definition, four food security dimensions can be identified: food availability, economic and physical access to food, food utilization, and stability (vulnerability and shocks) over time. Each food security dimension is described by specific indicators. Measuring the complexity of food security is part of a broader debate that currently takes place in the preparation process of the post-2015 development agenda.

The list below provides an overview of the suite of indicators and their organization into the four dimensions of food security.

Dimension: Availability

- Average Dietary Energy Supply Adequacy
  (source: FAOSTAT)
  - Dietary Energy Supply as a percentage of the Average Dietary Energy Requirement (ADER) of the country.
  - Measures adequacy of the national food supply in terms of calories
  - Helps understanding whether undernourishment is mainly due to insufficient food supply or to bad distribution
- Average Value of Food Production
  (source: FAOSTAT)
  - The total value of Annual Food Production (as estimated by FAO) expressed in International Dollars per caput.
  - A cross-country comparable measure of the relative economic size of the food production sector in the country.
- Share of dietary energy supply derived from cereals, roots and tubers
  (source: FAOSTAT)
  - Energy supply provided by cereals, roots and tubers divided by total Dietary Energy Supply (DES) (in kcal/caput/day)
- Average protein supply
  (source: FAOSTAT)
  - National average protein supply (expressed in grams per caput per day)
- Average supply of protein of animal origin
  (source: FAOSTAT)
  - National average protein supply (expressed in grams per caput per day)

The last three are indicators of the diversity of food supply.

Dimension: Access

Physical Access:

- Transport infrastructures
  (source: World Bank, Transport Division)
  - Percent of paved roads over total roads
  - Rail-lines density; Total length of rail lines in km per 100 sq. km of land area
  - Road density: Total length of roads in km per 100 sq. km of land area

Economic Access:

- Domestic Food Price Level Index
  (source: FAO computation on ILO data)
  - Price of food in the country relative to the price of the generic consumption basket. The indicators allows comparing the relative price of food across countries and over time.
- Prevalence of undernourishment
  (source: FAO)
  - Proportion of population estimated to be at risk of caloric inadequacy; this isone of the official MDG indicators to monitor the "hunger" target.
- Share of food expenditure of the poor
  (source: FAO elaboration on Household survey data)
  - Ratio of food expenditure to total consumption expenditure for the lowest income class in the country.
- Depth of the food deficit
  (source: FAO)
  - Average food consumption of the undernourished, multiplied by the number of undernourished and divided by the total population. It indicates calories needed to lift the undernourished from their status, all else constant.
- Prevalence of food inadequacy
  (source: FAO)
  - Proportion of population at risk of not covering the food requirements associated with normal physical activity. It includes people who, though not considered chronically undernourished, are likely being conditioned in their economic activity by insufficient access to food.

Dimension: Utilization

- Access to improved water sources
  (source: UNICEF/WHO)
  - Percentage of the population with access to an adequate amount of water from an improved source.
- Access to improved sanitation facilities
  (source: UNICEF/WHO)
  - Percentage of the population with adequate access to excreta disposal facilities that can effectively prevent human, animal, and insect contact with excreta.
  - Both water and sanitation are crucial to ensure hygiene, proper food preservation and preparation and therefore effective utilization of food.
- Indicators of anthropometric failures
  (source: WHO / UNICEF)
  - Percentage of children under 5 years of age who are stunted. Proportion below 2 standard deviations from the median height-for-age of the reference population.

- Percentage of children under 5 years of age affected by wasting: Proportion below 2 standard deviations from the median weight-for-height of the reference population.
- Percentage of children under 5 years of age who are underweight: Proportion below 2 standard deviations from the median weight-for-age of the reference population.
- Percent of adults who are underweight: Percentage of adults with a Body Mass Index (BMI) below the international reference standard.

More indicators will be added to this section in the coming months, particularly on micro-nutrients deficiencies: Prevalence of Anemia among pregnant women; Prevalence of Anemia among children under 5 years of age; Prevalence of vitamin A deficiencies; Prevalence of iodine deficiencies.

Dimension: Stability

Indicators of shocks:

- Domestic food price volatility index
  (source: FAO computation on ILO data)
  - Variability of the Domestic Food Price Index across countries and time.
- Per Capita food production variability
  (source: FAO)
  - Variability of the net food production value.
- Per Capita food supply variability
  (source: FAO)
  - Variability of the total food supply.
- Political stability/absence of violence/terrorism
  (source: Brookings Inst./WB)
  - Political stability and absence of violence measures perceptions of the likelihood the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism.

Indicators of vulnerability:

- Value of food imports in total merchandise exports (source: UNCTAD)
  - Percentage of imports of food over total exports of merchandise. This is an indicator of exposure of the country to changes in international trade conditions.
- Percent of arable land equipped for irrigation
  (source: FAO)
  - Share of land irrigated over total land area. This is a proxy to measure the potential impact of drought in a country.
- Cereal import dependency ratio
  (source: FAO)
  - Proxy to measure the cereal self sufficiency of a country and the potential impact of shocks in the international trade market.

Considering different dimensions of food insecurity allows a better understanding of both food insecurity and its underlying dynamics.

In terms of food availability, over the last two decades, food supplies grew faster than the population in developing countries, resulting in rising food availability per person. Average dietary energy supply adequacy rose by almost 10 percent over the last two decades in developing regions as a whole. Improvements in economic access to food were reflected by reduction in poverty rates, which fell from 47 percent to 24 percent between 1990 and 2010 in the developing regions as a whole. Economic access to food, based on food prices and people's purchasing power has, however, fluctuated in recent years.

Outcome indicators of food utilization convey the impact of inadequate food intake and poor health. Wasting, for instance, is the result of short-term inadequacy of food intake, an illness or an infection, whereas stunting is often caused by prolonged inadequacy of food intake, repeated episodes of infections and/or repeated episodes of acute under-nutrition. Prevalence rates for stunting and underweight in children under five years of age have declined in all regions since 1990, indicating improved nutrition resulting from enhanced access to and availability of food, although progress has varied across regions.

Concerning vulnerability to food insecurity, newly available data suggest that changes in prices on international commodity markets have had less impact on consumer prices than previously assumed. Food supplies have also seen larger-than-normal variability in recent years, reflecting the increased frequency of extreme events such as droughts and floods, but consumption has varied less than both production and price variability. Nevertheless, smallholder farmers, pastoralists and poor consumers remain particularly vulnerable.

Considering simultaneously different dimensions of food security allows gaining useful policy making insights. For instance, improved access to food also means better utilization in many countries, though not everywhere. A low level of dietary energy intake, as shown by a high prevalence of undernourishment, commonly corresponds to high rates of other forms of malnutrition. A reduction in undernourishment is generally associated with improvements in the overall nutritional status of the population, although in a rather weak fashion.

There are frequent exceptions to the low-undernourishment/ low-stunting rule, especially in Northern Africa, Southern Asia and sub-Saharan Africa. One such outlier is Ghana, where the prevalence of undernourishment was less than 5 percent in 2011–13, but more than 29 percent of children under five years of age were reported to be stunted. Mali provides another outlier: the prevalence of undernourishment was estimated at 7 percent in 2011–13, while 38 percent of children under five years of age were stunted. The same is true for Viet Nam, with a prevalence of undernourishment of 8 percent in 2011–13, but with more than 32 percent of children under five years old experiencing stunting.

Instances of relatively low undernourishment but high malnutrition may call for policy measures and related programmes aimed at improving access to safe and nutritious food, promoting dietary diversity, improving food safety and supporting hygiene. Stunting, in particular, could be the outcome of repeated episodes of wasting, which may have occurred recently enough for the impacts to still be visible, despite an overall improvement in food security. Such conditions may arise in countries in which undernourishment has declined significantly in a short period of time.

3. "Voices of the Hungry"

Monitoring food insecurity in a timely, reliable and consistent way worldwide is crucial to help countries and development partners assess progress in fighting hunger, to establish baselines and targets for hunger reduction and to monitor the impact of policies and programs on food security.

The FAO Prevalence of Undernourishment (PoU) estimates the proportion of individuals in a country that is likely to have had access to amounts of food that are insufficient to conduct an active and healthy life.[1] However, a recent report from the High Level Panel of Experts of Food Security and Nutrition highlights the following:

> "*These estimates give no sense of the severity of hunger – they make no distinction between someone with dietary energy consumption (DEC) slightly below the daily energy requirement (DER) and someone whose DEC is 30% below. Also, the POU is a measure of chronic food insecurity, but hunger and food insecurity can also be cyclical or seasonal (the annual* 'soudure' *in the West African Sahel) or transitory (food crises like the Somalia famine of 2011).* (FAO, 2012, p. 22)[2]

One interesting avenue to improve global monitoring of hunger and contribute towards producing more accurate measures of food insecurity is offered by so-called experience scales[3]. These have been used for many years in the US and Canada, extensively tested in Latin America, piloted in several other countries in various continents in recent years, and proven to be an

[1] The PoU is calculated as the area under an estimated distribution of average per capita habitual food consumption for the representative individual in the population, below a certain level of minimum requirement. The distribution of food consumption is estimated from both national food balance sheets (providing an indication of the distribution's mean) and expenditure and consumption surveys, recording households' acquisition of food. It thus reflects the recorded differences among households in securing access to food.

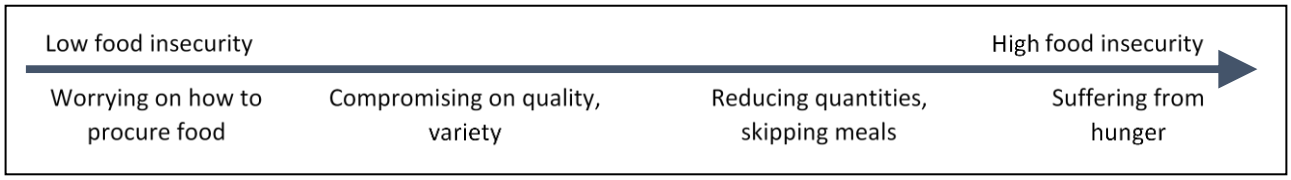
[2] FAO (2012) Social protection for food security Report of The High Level Panel of Experts on Food Security and Nutrition June

[3] The term describes sets of questions aimed at revealing *experiences* that people have had when exposed to various food security conditions. Existing scales include the U.S. Household Food Security Survey Module (US-HFSSM), the *Escala Latino Americana y Caribeña de Segurida Alimentaria* (ELCSA), and the Household Food Insecurity Access Scale (HFIAS) developed by the Food and Nutrition Technical Assistance Project.

effective tool to monitor food insecurity[4]. They include the U.S. Household Food Security Survey Module (US-HFSSM), the *Escala Latino Americana y Caribena de Segurida Alimentaria* (ELCSA), and the Household Food Insecurity Access Scale (HFIAS) developed by the Food and Nutrition Technical Assistance Project. The time is ripe to bring these efforts up to the global scale by applying a harmonized version of a Food Insecurity Experience Scale (FIES) at the global level.

The "Voices of the Hungry" is the project through which FAO aims at scaling up the application of these methods using a harmonized version of the FAO Food Insecurity Experience Scale to measure the prevalence of food insecurity at various levels of severity in virtually all countries in the world.

Figure 1. The Food Insecurity Experience Scale



The assessment can be conducted in a timely and cost-effective manner using a questionnaire composed of a limited number of questions, administered through personal or phone interviews, with quickly analyzable results. This will provide the basis for a true worldwide monitoring of the state of food insecurity using direct measures, consistent and sound methodologies, and a practical approach that results in internationally comparable results across countries. Indicators derived from this scale will measure the prevalence of people experiencing food insecurity at different degrees of severity (mild, moderate and severe) in various populations.

As a result of the review of existing experiences by a panel of international experts, it was found that an adaptation of the 15-item ELCSA provides the basis for the development of a food insecurity experience module that can be potentially included in any survey of individuals throughout the world, after proper linguistic and cultural adaptation to preserve the underlying concept scale..

There are several immediate positive spillovers of the project:

- The percentage of households experiencing *severe* food insecurity could be effectively used as an indicator of "hunger" to monitor the impact of the growing number of initiatives developed to reduce hunger. Particularly attractive is the possibility that the foreseen "zero hunger" goal

[4] See Perez-Escamilla (2012).

could be viably approached in terms of a very low proportion (say less than three percent) of households found to experience severe food insecurity.

- The extent of *moderate* food insecurity, on the other hand, could be used as a leading indicator of child and adult malnutrition, of which household food insecurity has been proven to be a crucial determinant.
- Finally, *mild* food insecurity, which has been usually neglected in traditional analyses, is increasingly being considered as a symptom resulting from other phenomena, such as increasing food price; reduced incomes; reduced nutritional quality of diets with resulting problems of obesity or of micronutrient deficiency, known as "hidden hunger;" and other welfare costs such as the reallocation to food purchases from other important expenditures on health and education. The proportion of households experiencing mild food insecurity could thus prove useful as an indicator of various other ways in which household struggle to cope with food insecurity, and possibly serve as an indicator of the increased risk of experiencing more severe food insecurity in the future.

The suggested indicators would be produced at a national level for more than 140 countries in the world, thanks to inclusion of the FIES module in an the Gallup World Poll, and established worldwide survey. This broad household survey collects information on a host of demographic characteristics, experiences and perceptions allowing analysis of the severity of food insecurity in relation to demographic, social and economic conditions, as well as the conditions that lead to food security,

Additional outputs of the project are a series of country specific, culturally and linguistically adapted versions of the module that can be included in virtually any other large national-level household survey being planned or conducted for other purposes. If included in national surveys that are designed to be representative at a sub-national level, the standards developed would allow for differential analysis of the severity of food security in various parts of the country, or among different socio-economic groups. The data collected to inform the indicators would also help to identify who the food insecure are, where they live, and how they struggle to maintain diets sufficient in quality and quantity.

There are five major expected outcomes from inclusion of the FAO-FIES module in the Gallup World Poll:

1. New indicators of food insecurity available at the national level for more than 140 countries every year

   This will provide the basis for a significant expansion of FAO's global food security monitoring system in the immediate future, and possibly as early as 2014, thus providing the opportunity to set benchmark levels of food insecurity in all countries of the world in 2015, and to establish the possibility of continuing to better monitor progress in the reduction of food insecurity.

2. Better understanding of the determinants and consequences of food insecurity

   Access to the large set of data collected on other characteristics of surveyed households will allow FAO and its research partners to analyze the severity of food insecurity in relation to demographic, social and economic conditions. This will greatly contribute to a better understanding of the conditions that lead to, and those that exacerbate the consequences of, food insecurity.

3. Culturally and linguistically adapted versions of the questionnaire in more than 100 languages

   FAO will make a comprehensive set of country specific, culturally and linguistically adapted versions of the questionnaire publicly available. It shall thus be possible to include the module in virtually any larger scale national survey, already planned or being conducted in specific countries for various purposes.

4. Establishment of the FAO-FIES as a new standard for food security measurement

   Through FAO leadership and capacity development activities, FAO will promote the establishment and use of the proposed scale as a standard for food security monitoring worldwide, enabling countries to readily adapt, own and implement the module, including within their own large-scale national surveys.

5. Increased monitoring ability and food security governance
   - The percentage of households experiencing *severe* food insecurity could be used as an indicator to monitor the impact of the growing number of initiatives to eradicate hunger. Particularly attractive is the possibility that the foreseen "zero hunger" goal could be viably approached in terms of a "very low proportion of individuals found to be experiencing *severe* food insecurity".
   - The extent of *moderate* food insecurity can be used as a *leading indicator* of potential child and adult malnutrition, of which household food insecurity is arguably a crucial determinant.
   - Finally, monitoring the presence of *mild* food insecurity, which is one of the largely unnoticed consequences of increased food price or reduced incomes.

4. Conclusions and recommendations

Multiple indicators pointing to different dimensions of food security, and experience-based food security indicators, should both be considered as useful steps in improving the international information base on food security. In turn, better information is crucial to promote evidence-based policy decision making, at international, regional and global levels. Based on the results obtained to date, two main recommendations are in order.

First, developments underway in FAO in terms of enlarging the suite of indicators should be communicated and proposed to colleagues from other institutions around the world with a view to collecting reactions, insights and constructive criticism. This is necessary to improve on the methodologies and to enlarge consensus on food security monitoring. Collaboration should be especially fostered among the three Rome-based agencies – IFAD, WFP and FAO – on improving

their information systems for food security. As shown by the positive results obtained in producing the SOFI report, collaboration improves the quality of the results and promotes a more coherent policy approach at all levels.

Second, the experience-based food security indicators collected by the Voices of the Hungry project should be collected in a wide set of countries and integrated in the FAO Suite of indicators, as a necessary supplement to other indicators. In this connection, it would be important to obtain from AFCAS member countries on actual and potential data collection issues, challenge and sensitivities that may arise with respect to the implementation of an experience based module within their national surveys. Feedback would be important in order to understand the likely timing and frequency of such modules, as well as to prioritize the preparation of culturally and linguistically appropriate versions of the questionnaires.