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A Methodological Proposal

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Selecting a Core Set of Indicators for Monitoring Global Food Security

- A Methodological Proposal -

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Abstract

Appropriate measures to track progress towards global food security are critical for designing and evaluating policies and programs as well to enhance the accountability of the policy process. However, finding an agreement on a common framework for the monitoring of countries' and global food security is nonetheless challenging for various reasons. Ultimately, this exercise relates to the selection of the most appropriate informational basis for the monitoring of global food security and of which criteria should inform this choice.

This paper proposes a methodology to select indicators in multidimensional assessments, such as the ones required for the measurement of food security. By linking the overarching objectives of the evaluation to the nature of the indicators, this methodology is able to discriminate among the hundreds of indicators proposed in the literature. The proposed methodology provides the conceptual framework underpinning the selection of the suite of core food security indicators first presented in the 2012 *State of Food Insecurity in the World* (FAO 2012), and, while this specific application focuses on the monitoring of global food security, it is more generally suitable for the measurement of other multidimensional phenomena.

Key words: Global food security, Multidimensional Measurement, Suites of indicators.

JEL codes: I32; Z19

1. Background and Motivation

> *"There is no best indicator, best measure of an indicator, or best analysis of an indicator in a generic sense. The definition of "best" depends ultimately on what is most appropriate for the decision that must be made."*
> (Habicht and Pelletier 1990, p.1519)

In the past five years, the international policy and academic communities have reached consensus[1] on the imperative of developing appropriate measures for the monitoring of food security across countries and over time and for the promotion of policy accountability. Such agreement follows the widespread recognition of a global evidence gap in terms of both a common monitoring framework to monitor food security and lack of internationally comparable data to target areas of need, track progress and enhance accountability (Sumner & Lawo 2010; De Haen et al 2011; Masset 2011, Headey 2011; Swinnen & Guicciarini; Banerjee & Duflo 2011).

The development of a common framework for the assessment of countries' progress towards food security is nonetheless challenging. Food security is a multifaceted phenomenon that is suited to multidimensional assessment (De Haen 2003; Heidheus & Von Braun 2004; CFS 2011). In the last two decades, the complexity of the concept, compounded by the impossibility of observing food security outcomes directly (Barrett 2010), led to a veritable proliferation of indicators (Hoddinnott 1999, CFS 2011). Accordingly, a common framework for the monitoring of food security – on the model of the Millennium Development Goals indicators (UN, 2003) – requires the international food security community to select and reach agreement on a core set of indicators that alone can provide an exhaustive, yet synthetic, picture of countries' and global food security. Ultimately, this overall objective relates to the selection of the most appropriate *informational basis* (Sen 1999) for the assessment of food security and to which criteria should underline the choice of a limited set of measures among the hundreds proposed in the literature. Clearly, the selection of the informational basis for the evaluation is inextricably linked to the formulation of value judgments, which need to be transparently conveyed to each of the relevant stakeholders of the assessment in order for it to be accepted by its final users (JRC-OECD 2008).

By acknowledging these critical issues, this paper presents a methodological proposal to select indicators in multidimensional assessments. The proposed methodology provides the theoretical underpinning behind the selected indicators that were included in the suite of core food security indicators presented in the 2013 *State of Food Insecurity in the World* (FAO 2013). Also, while this specific application is focused on the monitoring of global food security, it can nonetheless be applied to the measurement of other multidimensional phenomena. Building on the literature on social indicators (UN 2003, Jannuzzi 2001, 2005; JRC-OECD 2008, Maxwell &

[1] Most notable of these being the 2011 Committee of Food Security Roundtable on Monitoring Food Security & the 2012 International Symposium on Food and Nutrition Security Information.

Frankerbengen 1992; FAO-FSAU 2009), the proposed methodology links different objectives of an evaluative exercise (i.e. monitor levels and progress *viz*. modeling associations and change) to the category to which each different indicator belongs (i.e. outcome *viz*. input indicators). By exploiting this conceptual distinction, the present methodology aims at avoiding the typical problem of 'laundry lists' of indicators, which tend to assemble tens of indicators without clearly distinguishing their role in the process of achievement of the concept under investigation. As they fail to recognise this critical methodological distinction, "shopping lists" of indicators tend to mix the "inputs" with the "outcomes" of the phenomenon, or the "means" with the "ends" of development (Sen 1999), which leads to difficulties in analysis and communication to the policy-makers and the public.

The paper is structured in five main parts: while section 2 briefly reviews some critical features characterising the concept of food security and provides the operational definition of food security that will be used as basis for the assessment. Later, Section 3 presents the methodology proposed in this paper, while Section 4 applies it to the problem of selecting a core set of food security indicators. Finally, Section 5 concludes.

2. Concepts drive measurement: unfolding the concept of food security

"What is badly defined is likely to be badly measured"
(JRC-OECD 2008, p. 22)

Much of the dissatisfaction related to the monitoring of food security measurement is due to the widespread confusion around the ultimate meaning of the concept. Misunderstandings pertain to both the *terminology* commonly used to describe a state of food insecurity and to the same *analytical concept* of food security[2] (CFS 2011). With regards to the former, terms such as "hunger", "undernourishment", "undernutrition", "food deprivation", or "food crisis", are used interchangeably as if they are synonyms for the same underlying concept. Yet, they are not, as each of them describes a specific and different aspect of the broader phenomenon of food security (and the lack of it)[3] (CFS 2011). While the variety of terms underscores the complexity involved in food security analysis and measurement, semantic confusion is also related to a more general lack of clarity regarding the very concept of food security. It is therefore vital to clarify the concept of food security before undertaking any evaluative exercise: concepts guide indicators selection, and consequently the

[2] Misunderstandings on the concept of food security and on the terminology used in analysis and measures has probably strongly contributed to the proliferation of "shopping lists" of indicators, which, in turn, has fostered further confusion on the nature of the concept.

[3] For instance, hunger is the feeling of discomfort caused by the lack of food, and somebody that is suffering from involuntary hunger is classified as food insecure. However, the reverse situation is not necessarily true: even though an individual may have access to food in sufficient quantities, she could still be food insecure due to the poor nutritional content of her diet, also known as hidden hunger.

outcomes and policy implications of the assessment. By acknowledging such a pressing need for conceptual clarity, the present Section aims to provide an overview of the concept of food security, by highlighting three key elements that characterise the concept: its multidimensionality, dynamics, the different levels of analysis at which policy can intervene and the interdependencies across them

a. Multidimensionality

The 1996 World Food Summit (WFS) definition of food security - "A situation in which all people at all times have social access to sufficient, safe, nutritious food to maintain a healthy and active life" (WFS 1996) - explicitly acknowledged the multidimensionality of food security by highlighting four underlying pillars: availability, access, utilization, and stability. In particular, availability[4] refers to the "physical supply of food from all possible sources" (e.g. all forms of domestic production, commercial imports, food aid, etc.). Access represents the "economic, physical, and social ability to acquire adequate amounts of food[5]" (WFP 2009, p. 17) through a combination of different sources (e.g. own stocks, home production and collection, purchases, barter, gifts, borrowing, remittances, food aid, etc.). Food security outcomes, however, do not only depend on the access to food, but also on the ability of the individuals in converting acquired food into adequate nutrition for a "healthy and active life". The utilisation points to the "households' use of the food to which they have access, and to the individual efficiency in biologically converting nutrients in order to meet their specific nutritional and health needs" (WFP 2009, *ibidem*). The ability to convert the acquired food into good nutrition depends on mainly three elements (Drèze & Sen 1989): (i) individual heterogeneities related to age, gender, health status, activity levels etc.; (ii) nutrient adequacy of the diet (in terms of balance between essential macro and micronutrients), in order to minimize the risk of nutrient deficit and of hidden hunger (FAO 2008); and, finally, (iii) non-food elements, such as prevailing health and sanitary conditions (i.e. access to good quality basic health and sanitation services, eradication of infectious diseases, *etc*), education and nutritional knowledge, care and feeding practices (i.e. related to infants and children, the elderly, sick people etc) and availability of adequate food storage and processing facilities. These factors – which condition the "requirement, absorption, assimilation, and utilization of the nutrients of the diet" (Gopalan 1993, p. 3) - are critical policy leverages to promote food security outcomes.

It is also interesting to note that there is a hierarchical interdependency among those dimensions (Barrett 2010): availability is a necessary, yet insufficient, condition for

[4] Although it can be measured at different levels of aggregation, the dimension of availability mostly refers to food supplies at the national or sub-national levels.

5 This definition underscores the multifaceted nature of the same concept of access, the following sub-dimensions can be distinguished: (i) physical access: the food is accessible at the location where people need it (e.g. through good infrastructure facilities, proximity to markets etc.); (ii) economic/financial access: the financial ability to acquire adequate food to meet requirements; (iii) social access: food is acquired and/or consumed in socially acceptable ways (WFP 2009).

access, which in turn is necessary, however insufficient, to reach adequate nutritional outcomes. The fourth dimension of stability emphasises the permanency and sustainability of the three dimensions over time (Maxwell & Frankerbengen 1992; Barrett 2010).

b. Dynamics

The explicit reference to food security at "all times" in the WFS definition emphasizes the dynamic component of food security: time is an inherent characteristic of the concept. There are two main ways in which time enters in the analysis of food security. On the one hand, there is a *valuation* component: food security can be assessed by taking both an *ex post* and an *ex ante* perspective. As of yet, most measures of food security have been mainly focused on providing *ex post* assessments of food security levels, instead of estimating *ex ante* probability functions of vulnerability to food insecurity in the future[6].

On the other hand, time also enters in the analysis of food security as *duration* of the food security status, which could be either chronic or transitory, which in turn has different implications in terms of policy design and responses (Barrett 2002). In the former case, food insecurity persists over time, and such persistence is linked to some underlying structural economic, institutional, and social conditions. Transitory food insecurity can be further characterized as temporary or seasonal, where the former occurs for a limited period of time due to a shock (e.g. weather-related, or civil unrest) that exacerbates longer-term deprivation, while the latter points to cyclical patterns of food and nutrition deprivation in agrarian low-income economies and is generally linked to weaknesses in the food storage and marketing systems, as well as to the seasonality of employment patterns (Chambers *et al.* 1981).

c. Different levels of analysis and of potential policy intervention

Although food security is intrinsically a 'micro' concept, as it points to the dietary requirements for maintaining a healthy and active life of *individuals*, food security outcomes can be analysed at a plurality of levels, spanning from global and national levels of availability of food, to individual nutritional outcomes, through the assessment of households' access to food entitlements.

d. Interdependencies across dimensions and levels of analysis

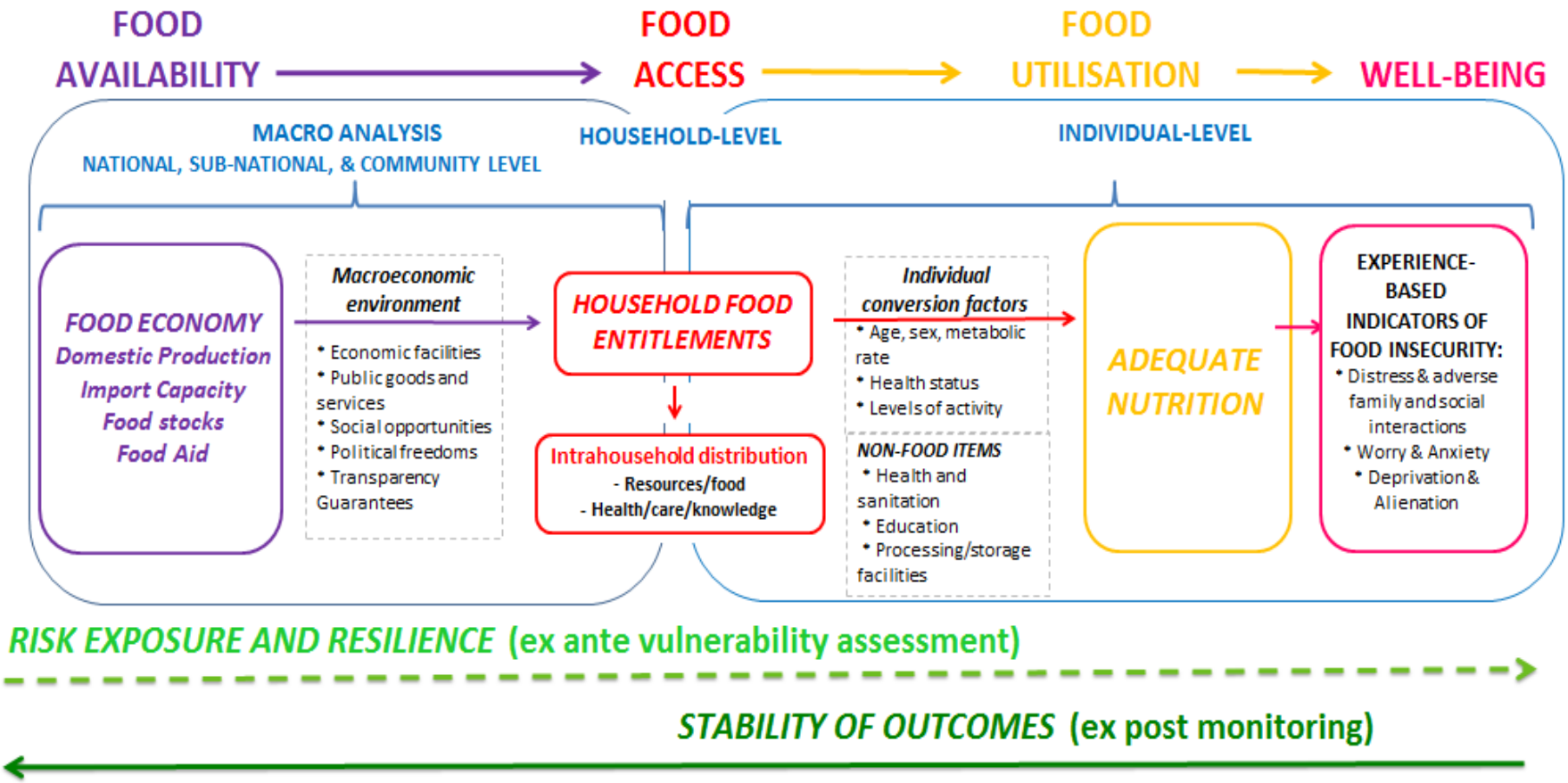
Food security is not only multidimensional, but it is also the outcome of a *process of achievement*, in which the dimensions of food security are interdependent rather than merely additive. As such, 'the capability to be food secure' is the result of the joint and complex interaction of macroeconomic and social constraints, functional

6 This is mostly due to a lack of longitudinal data necessary to address these issues empirically (Barrett 2002).

limitations and other contextual characteristics of the household environment, as well as heterogeneous individual factors (Drèze & Sen 1989; Burchi & De Muro 2012b).

Figure 1 provides the conceptual framework for the assessment by emphasising the multidimensionality, dynamics, and interdependencies existing both across dimensions and levels of analysis that characterise the concept of food security and highlights the hypothesised relationships between the various determinants of foodavailability, access and utilisation. Regarding the latter, Figure 1 stresses the relevance of economic, institutional, social and environmental factors at the macroeconomic level in providing an 'enabling environment' for food security outcomes to occur and to be sustained over time. At the microeconomic level, it shows that the complex 'capability to be food secure' (Burchi & De Muro 2012b) depends on a series of other basic human development dimensions (i.e. health, education, etc.), the intra-household distribution of resources and the individual conversion factors that allow people to transform the food they access into adequate nutritional outcomes (Drèze & Sen 1989). These factors are fundamental in the process of determination of food security outcomes and will be play a fundamental role in the choice of the indicators for the assessment.
Least, but not last, by incorporating experienced consequences of food insecurity such as psychological distress and alienation from the community (Wunderlich & Norwood 2006), the framework stresses that food security is not an end in itself, but a fundamental component of the broader concept of human well-being.

Figure 1. Conceptual framework



Source: Author

2.1Operational definition of food security adopted in this paper

In order to incorporate the complexity and all the possible characterizations of food security, the WFS definition is deliberately general. However, such universality is inevitably in tension with the operational clarity necessary for measurement: is the definition referring to, say, global, national, household or individual outcomes? To chronic deprivation or temporary food crisis? To ex post outcomes or ex ante vulnerability to food insecurity? It is hence essential to provide a clear operational definition of food security that is tailored to the aims of the assessment before starting with the latter. This paper operationalises the WFS definition along three main axes: (i) duration; (ii) perspective of assessment; and (iii) level of disaggregation. Accordingly, food security is defined in this paper as a *chronic* deprivation of human well-being, which is evaluated *ex post* and measured at the *country level*.

3. Methodology

According to OECD-DAC, an indicator is "*a quantitative or qualitative factor or variable that provides a simple and reliable means to measure achievement, to reflect changes connected to an intervention, or to help assess the performance of a development actor"* (OECD-DAC 2011). In order to be used for monitoring and evaluation of public policies, indicators selection should be critically guided by their adherence to a set of desirable properties and on the overall purpose of the evaluative exercise (Jannuzzi 2001). This section focuses on the former element, while the core of the methodology, which will be presented in the next section, on the latter.
In particular, each indicator that could be potentially included in the assessment should fulfil a set of desirable properties (Jannuzzi 2001, 2005; UN 2003; Darcy & Hofmann 2003; JRC-OECD 2008), which relate to:

a. Relevance to the policy objective;
b. Validity in the conceptual representation of the underlying phenomenon;
c. Sensitivity to change;
d. Unambiguity and easiness of interpretation;
e. Robustness of the resulting measures;
f. Methodological transparency in its construction.
g. Timeliness: be produced or updated on a regular basis;
h. Coverage: be representative of the population in the sample;
i. Comparability across countries and over time;
j. Accessibility by the general public;
k. Quality: Be based to the greatest extent possible on international standards, recommendations and best practices;
l. Reliability: be constructed from well-established data sources;
m. Consistency with other global lists;

In addition to these desirable characteristics, indicators can be also distinguished on the basis of judgments related to their nature (Booysen 2002, Burchi & De Muro

2012). Specifically, *input indicators* relate to human, physical, or financial resources allocated to a process or a program that affects some social phenomena. *Process* or *flow indicators* are intermediate indicators, which translate in quantitative terms a process of allocation of human, physical, and financial resources that aims at affecting an ultimate policy objective. They describe the dynamics that lead to the outcome, and represent actionable policy levers to affect the ultimate policy goal. Finally, *outcome indicators* are the ones that are more directly linked to the final goals of public action, or to policy objectives. For instance, in the case of a policy aimed at increasing rice availability through higher yields varieties, provision of improved seeds represent the input of the program, while increased rice yields and the quantity of rice available per capita are respectively the process through which the objective is achieved and its outcome[7]. Unfortunately, such a conceptual distinction is not always straightforward, in particular when policy objectives are either very specific or extremely general. Nonetheless, it is always possible to distinguish between indicators more related to policy efforts, and those who refer to the effects (or the lack of them) of such policies (Jannuzzi 2005).

3.1 A Taxonomy to Guide Indicator Selection in Multidimensional Assessments

After having established that each of the potential indicators to be included in the assessment satisfies some formal quality requirements, this section focuses on how to choose among them. Specifically, the taxonomy that is proposed in this section rests on two main elements, which are critically interconnected: (i) the reference to the purpose of the evaluative exercise (ii) the 'nature' of the indicator (i.e. whether is a measure of outcome, process, or input).

Regarding the former, indicator selection is intrinsically related to the overall objective(s) of the assessment and its final users (Frankerbergen 1992; Jannuzzi 2001). As noted by Frankerbergen (1992): "Whether the goal is to evaluate a project, set up a monitoring system or to develop a household food security strategy for the country will to a large extent dictate the choice of the indicator. The user of the information on indicators also will drive the choice of the indicator" (Frankerbergen 1992, p. 83). In particular, indicator selection relies on whether the evaluative exercise relates to *monitoring* over time and/or across space, or to *modelling* underlying causal nexuses. Indeed, while in the former case the relevant research question is "how much?", in the latter it will be "why?". This question is also inextricably related to who will receive the selected information, as different types of users may be interested in knowing different aspects of the same phenomenon, or have the information presented in different ways.

Once the purposes of the evaluation are clear, the choice among candidate indicators will ultimately depend upon the specific role indicators play in the determination of the phenomenon they are trying to measure. As noted previously, it would be better

[7] There is an additional category of indicators, i.e., *impact* indicators, which refer to the general impacts of programs on the policy dimension (Jannuzzi 2005).

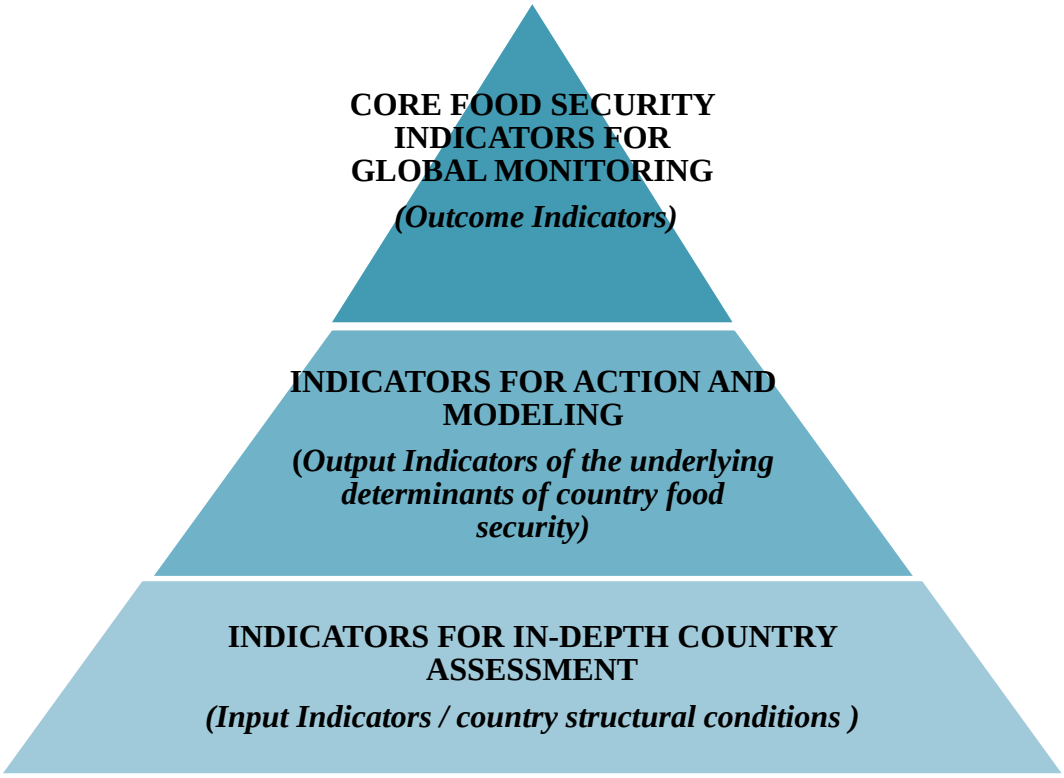
to avoid presenting shopping lists of indicators that include all the available indicators, failing to recognise the critical link between the objectives of the evaluative exercise with the category to which the indicator belongs. In doing so, simple lists would mix the "inputs" with the "outcomes" of a given process, or the "means" with the "ends" of development (Sen 1999). In turn, such a methodological confusion would increase the difficulties in interpreting and synthetise the informative content of the assessment for evidence-based policy-making. Conversely, linking the nature of the indicators to the overall purposes of the analysis provides a powerful criterion to discriminate among indicators. As it will be clear in the next section, outcome indicators are particularly suitable for key indicators in a monitoring exercise, while input and process indicators are apt to be used when the goal of the analysis relates to the modelling of the associations between the outcomes of a given policy or programme and its inputs.

4. Application of the Proposed Methodology to the Selection of Food Security Indicators

A useful starting point for the selection of a suite of food security indicators is thus to distinguish among three distinct potential focuses for the assessment, which in turn correspond to as many categories of indicators. Graphically, this can be represented as a "pyramid"[8] , as in **Error! Reference source not found.** 2 below.

[8] This follows the suggestion provided by Jannuzzi at the CFS Roundtable in September 2011 (Jannuzzi 2011).

Figure 2. Different conceptual levels for the analysis of food security and corresponding categories of indicators



The purpose of the higher analytical layer, which is represented by the top of the pyramid, is to provide a general and objective assessment of food insecurity, while at the same time to ensure analytical simplicity. At this level, the fewest possible number of indicators should be selected, in order to avoid the generation of lengthy and confusing "shopping lists". Given these purposes, indicator selection should focus on measures of outcomes in the distinct dimensions of food insecurity. The focus on outcomes, rather than on process or input indicators, is essential to ensure comparability over space and time as well as accountability of policy-making. In this way, it is possible to monitor progress upon a limited set of goals agreed by the international community, irrespectively of the uniqueness of each country's background (FAO/FSAU 2009). It is for this reason that the indicators selected for the monitoring of the multiple dimensions of food security in the 2012 SOFI all fall in this category (FAO 2012).

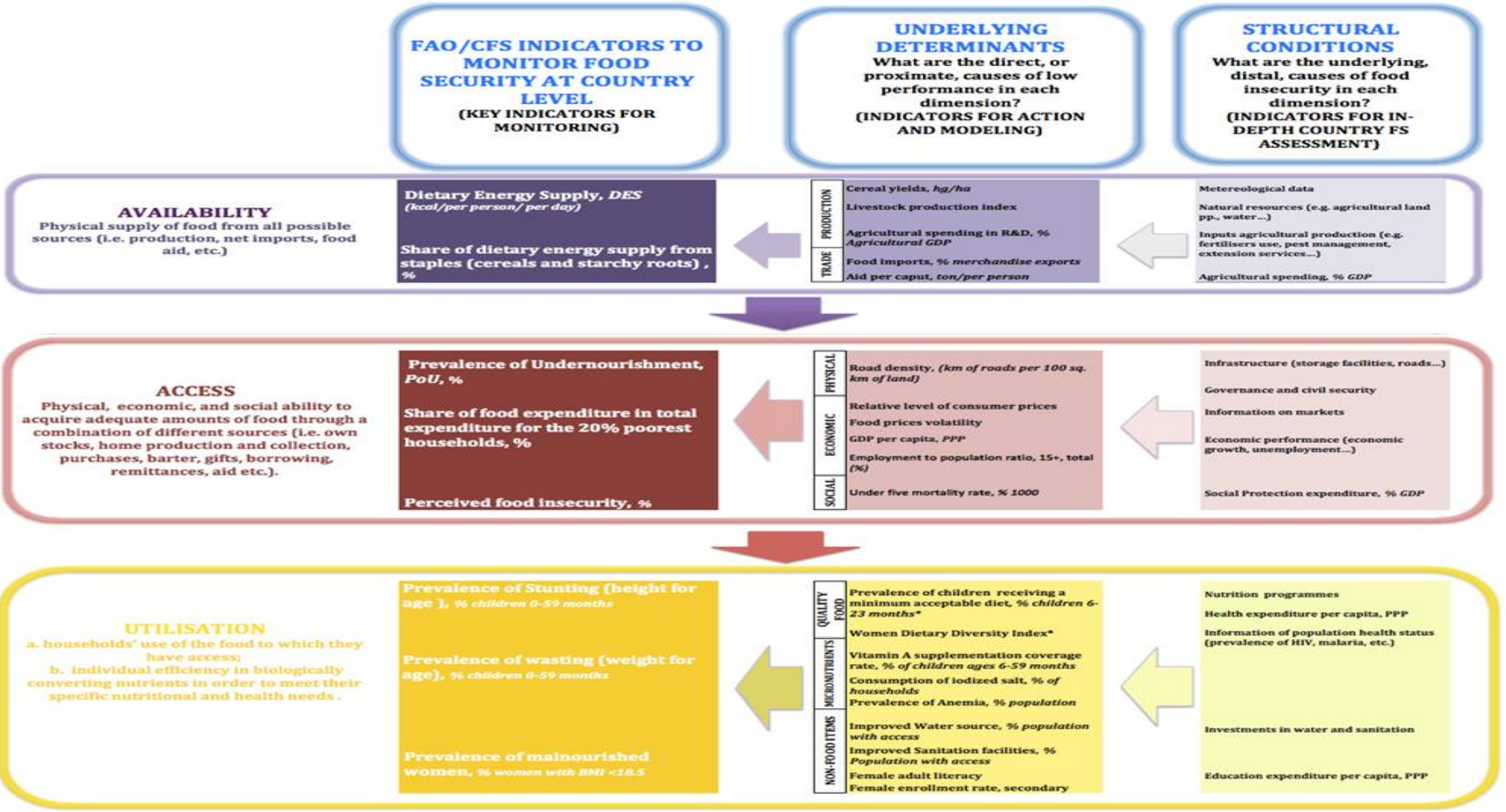
In turn, the second and third levels of the pyramid represent the underlying structural determinants of the food security outcomes. Of these two levels of analysis, the first provides information on the most immediate factors that contribute to countries' performances in terms of food security, while the second on structural, country-specific conditions. Use of these two additional levels is complementary to the core set of indicators: depending on the purposes of the evaluation and on the level of

detail required, these additional layers of analysis provide a broader perspective to understand levels and variation over space and time in the set of core indicators.

In particular, the second analytical layer, the ones of "*indicators for modelling and action"*, aims at identifying a set of direct and proximate factors that are associated to the performances revealed by the indicators belonging to the core set. It provides a conceptual framework for understanding levels and variations in the core set of food security indicators and, as such, is particularly useful for policy-making as it focuses on the performance of a set of potential policy levers. Output or process indicators, which measure the dynamic process of conversion of available inputs into policy outcomes, are the ideal candidate indicators for this conceptual level. With respect to the analysis of food security, this category includes a wide range of indicators such as performances in production (crops and livestock), market prices, socio-economic conditions, and many other factors that determine, but *are not*, food security outcomes *per se*. This theoretical distinction is particularly important, as in many lists process indicators (such as market prices) are included as direct outcomes of food security[9].
Finally, the third layer of analysis, the one related to *indicators for in-depth country assessments,* provides a broad set of indicators to contextualize and diagnose the country environment *latu sensu*, in order to allow for a detailed check-up of country's structural conditions in relation to food security (i.e. availability and of factors of production, market factors, cultural and socioeconomic conditions, climate, etc.). The specific country conditions will guide the selection of indicators in this specific layer. Figure 3 provides a graphical representation of the three different levels of analysis.

[9] For instance, as the FAO/FSAU (2009) noted: *"A 50 percent increase in the market price of milk (a process indicator) has a completely different outcome in a livelihood system that produces milk than in a livelihood system that is a net purchaser of milk, potentially being beneficial for the former and detrimental for the latter"* (p. 27).

Figure 3. Example of categorisation of food security indicators based on the proposed methodology for the dimensions of availability, access and utilisation.



5. Conclusions

This paper focuses on the selection of a core set of indicators for the monitoring of food security that conceptually backed the choice of the indicators first presented in the 2012 SOFI (FAO 2012) and analysed in greater detail in SOFI 2013. In doing so, it first carefully reviewed the concept of food security, then provided an operational definition as a basis for the evaluation and finally presented a taxonomy for the selection of indicators in multidimensional assessments. By grounding the evaluative assessment on a clear theoretical framework that links indicators selection with different possible objectives of the evaluation, the proposed methodology is able to avoid the typical problem of "laundry lists" of indicators that assemble tens of indicators. In particular, indicators are classified in three analytical categories that serve different purposes. The first level aims at providing a synthetic, yet comprehensive, snapshot of food insecurity at the country level through the selection of a suite of core indicators. By focusing on outcomes, the suite of core indicators is expressly designed to enhance the comparability over countries and over time in the various dimensions of food security. By contrast, the other two levels are more linked to policy analysis and action: on the one hand, the second level of indicators aims at providing a list of factors that are directly associated to variation in the core measures. Process indicators are particularly suitable for this aim. On the other hand, the third conceptual level aims at capturing the structural conditions of food insecurity of each country through the use of input indicators.

It is clear that, in practice, the selection of indicators also has to be confronted with data availability for international comparisons, which is particularly scarce with regards to the dimensions of utilisation and stability. As such, the list of indicators in the SOFI has been selected with the aim of striking the balance between theoretical relevance and issues of overall data quality, availability, and comparability over space and time. These measures cannot capture all the complexity of food security, but they are the best available for the purposes of international comparisons and undoubtedly are prone to further improvement.

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