Food and Agriculture Organization
of the United Nations

FAO Statistics Working Paper Series / 18-14

METHODOLOGY FOR COMPUTING AND MONITORING THE SUSTAINABLE DEVELOPMENT GOAL INDICATORS 2.3.1 AND 2.3.2

WorkingPaper Series
ESS / 18-14

METHODOLOGY FOR COMPUTING AND MONITORING THE SUSTAINABLE DEVELOPMENT GOAL INDICATORS 2.3.1 AND 2.3.2

Food and Agriculture Organization of the United Nations
Rome, 2019

FAO STATISTICS DIVISION
Working Paper Series
ESS/18-14

Contents

Abstract

Target 2.3 of the 2030 Sustainable Development Agenda aims to double, by 2030, "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." The progress in achieving this target will be monitored by indicators 2.3.1 and 2.3.2, which are the "volume of production per labour unit by classes of farming/pastoral/forestry enterprise size", and the "average income of small-scale food producers, by sex and indigenous status", respectively. This paper informs on the statistical methodology for measuring progress in SDG indicators 2.3.1 and 2.3.2 approved by the Inter-Agency and Expert Group on the Sustainable Development Goals (IAEG-SDG) in September 2018. The methodology entails three steps. First, the target population must be identified and selected, that is, the "small-scale food producers". Second, the "volume of production per labour unit by classes of farming/pastoral/forestry enterprise size" must be computed. Finally, the "average income of small-scale food producers, by sex and indigenous status" must be calculated. The second and the third of these steps are relatively straightforward, while the first step is complex, as it requires the adoption of an international definition of "small-scale food producer". The IAEG-SDG has agreed, as proposed by FAO, to define small-scale food producers using a combination of two criteria, namely the physical size of the food producer, as expressed by the amount of operated land and number of livestock heads in production, and the economic size of the food producer, as expressed by its revenues. The definition sets thresholds using a relative approach, in which producers that fall in the bottom 40% of the cumulative distribution are considered to be 'small-scale'. This definition and the associated method to identify "small-scale food producers" was submitted to member countries through a mechanism put in place by UNSD and endorsed by the Chairs of the IAEG-SDG. The paper also provides examples of the calculation for a hypothetical country, as well as results for a pool of countries in which micro data from convenient surveys was available.

Acknowledgements

The paper was drafted by Ipek Ergin, Piero Conforti and Clara Aida Khalil of the FAO Statistics Division, with substantive inputs from Yonca Gurbuzer, Svetlana Mladenovic and Josè Rosero Moncayo. Valuable support and inputs were received from the Office of the Chief Statistician, particularly Dorian Navarro and Pietro Gennari. Several comments were received from colleagues of the Core team of the FAO Strategic Program 3 on “Reducing rural poverty”.

1. Introduction

Following the adoption of 2030 Agenda for Sustainable Development, the UN Statistical Commission agreed on a list of 232 unique global indicators to track the progress of the 169 targets and 17 Sustainable Development Goals (SDGs). As the custodian agency of 21 SDG indicators, FAO is responsible for collecting, validating and harmonizing data to monitor the progress at sub-regional, regional and global levels, in order to inform the annual progress reports of SDGs, follow-up and review processes of the High-Level Political Forum.

Each Goal is composed of several targets. Goal 2 includes 5 outcome targets and 3 targets on "means of implementation". Target 2.3, one of the outcome targets of SDG 2, aims to double, by 2030, "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." The progress in achieving this target will be monitored by indicators 2.3.1 and 2.3.2, which are the "volume of production per labour unit by classes of farming/pastoral/forestry enterprise size", and the "average income of small-scale food producers, by sex and indigenous status", respectively.

The purpose of this note is to inform on the statistical methodology for computing and monitoring target 2.3 and measure progress in SDG indicators 2.3.1 and 2.3.2 approved by the Inter-Agency and Expert Group on the Sustainable Development Goals (IAEG-SDG) in September 2018. When the UN Statistical Commission agreed on the SDG monitoring framework, these indicators were classified as Tier III, as there was no harmonized methodology available to measure them. An international methodology for measuring them was proposed by FAO in the spring of 2017. Member countries were consulted on the methodology proposed by FAO in the fall of 2017. The methodology was further tested in the subsequent months, and adjusted by FAO on the basis of comments and suggestions received from member countries, util the present version was agreed in the IAEG-SDG in September 2018.

The methodology entails three steps. First, the target population must be identified and selected, that is, the "small-scale food producers". Second, the "volume of production per labour unit by classes of farming/pastoral/forestry enterprise size" must be computed. Finally, the "average income of small-scale food producers, by sex and indigenous status" must be calculated.

From a conceptual standpoint, the second and the third of these steps are relatively straightforward, as they are based on a standardized approach. The first step, instead, is more complex, as it requires the adoption of an international definition of "small-scale food

producer". This is potentially controversial, as there is a wide variety of definitions proposed and adopted over time in several countries. [1]

Next section addresses the first of the three steps outlined above, by describing the definition of small-scale food producers adopted. Sections 3 and 4 describe the methods for computing SDG indicators 2.3.1 and 2.3.2, respectively. Section 5 discusses the possible data sources for computing and monitoring the two indicators. Finally, Sections 6 reports the results of calculation undertaken with available micro-data for a selected set of countries.

2. Defining and identifying "small-scale food producers"

The IAEG-SDG has agreed, as proposed by FAO, to define small-scale food producers using a combination of two criteria, namely the physical size of the food producer, as expressed by the amount of operated land and number of livestock heads in production, and the economic size of the food producer, as expressed by its revenues. These criteria are applied in relative terms.

In practice, small-scale food producers are producers who:

1. *Physical size*

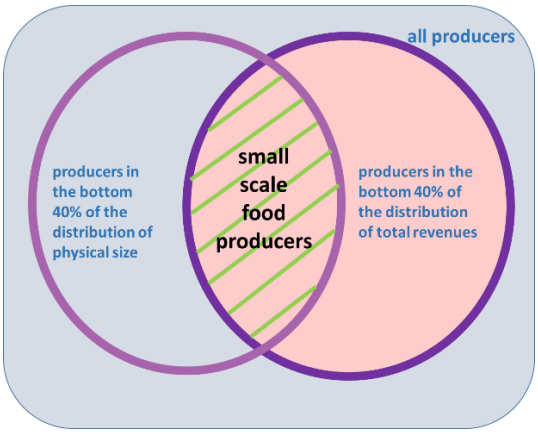
- operate an amount of land falling in the first two quintiles (the bottom 40 percent) of the cumulative distribution of land size at national level (measured in hectares); and
- operate a number of livestock falling in the first two quintiles (the bottom 40 percent) of the cumulative distribution of the number of livestock per production unit at national level (measured in Tropical Livestock Units – TLUs); and

2. *Economic size*

- obtain an annual economic revenue from agricultural activities falling in the first two quintiles (the bottom 40 percent) of the cumulative distribution of economic revenues from agricultural activities per production unit at national level (measured in Purchasing Power Parity Dollars).

A visual demonstration of the definition is provided below.

[1] This note relies on the FAO Statistics Division Working Paper on "Defining small-scale food producers to monitor target 2.3. of the 2030 agenda for sustainable development" available at http://www.fao.org/3/a-i6858e.pdf The Working Paper presents a review of the literature and a set of experiments with different types of thresholds.



Within the resulting set of producer identified by these criteria, an additional absolute cap is applied, to exclude producers earning a revenue higher than 34 387 Purchasing Power Parity Dollars per year[2].

It is important to highlight that the definition of small-scale food producers" described here is only meant to serve the purpose of computing and monitoring SDG indicators 2.3.1 and 2.3.2, and it is not intended to replace country-specific definitions. National definitions reflect national policy priorities, while the proposed international definition ensures global reporting of the SDG indicators. Therefore countries are called upon planning their data collection in a way that allows monitoring both this international definition, along with other relevant national definitions.

Definitions of "small-scale food producers" that are found in the scientific literature and in policy documents are mostly based on four criteria: size of operated land, amount of labour input employed for agricultural production (especially of family members), market orientation and economic size[3] of the holding. *Land size* is the most commonly used criterion, as the vast majority of "small-scale food producers" definitions are based on the physical size of the farm and the number of livestock heads. The second main criterion is the *labour* input of the farm. The third criterion is the extent of *market orientation or access of the producers*, which refers to the destination of the output of the farm, either for own-final consumption or for sale and/or barter in markets. A fourth criterion is the *economic size* of the holding, expressed through the gross monetary value of agricultural production.

[2] This cap was introduced as a follow-up of extensive testing of the other two criteria – the relative physical size and the relative economic size of the production units. Tests are described and reported in the document "Task Force Report on *The FAO for SDG indicators 2.3.1 & 2.3.2_Small Scale Food Producers in Developed Countries* (forthcoming)"jointly prepared by Statistics Denmark, Eurostat, Statistics Canada, France's Ministère de l'agriculture, de l'agroalimentaire et de la forêt, Swedish Board of Agriculture, Statistics Norway and Statistics Bundesamt (Germany). The Task Force Report shows that a cap at (EUR 25 000 or) $PPP 34 387 improves the reliability of the two criteria proposed by FAO when applied to European and North American countries.

[3] See the FAO Statistics Division Working Paper on "Defining small-scale food producers to monitor target 2.3. of the 2030 agenda for sustainable development" available at http://www.fao.org/3/a-i6858e.pdf quoted in footnote 1.

The Monitoring Framework of the SDGs, as mentioned, refers to the concept of small-scale "food producers". Agricultural producers represent the main target of SDG-2 and for this reason, indicators 2.3.1 and 2.3.2 must be operationalized first and foremost with reference to small-scale agricultural producers.

Why using a combination of two criteria

The choice of relying on land size and the size of herds reflects the aim of capturing structural constraints in production. The assumption is that producers with small endowments of key resources are likely to be disadvantaged *vis-à-vis* those operating on a larger scale. However, the physical size fails to consider the quality of the land and the livestock, the type of crops grown, the farming systems, and the many and wide disparities that exist across countries and regions in terms of socio-economic and agro-ecological characteristics and distribution of resources. As an obvious example, one hectare of specialized horticultural production in high-tech greenhouses in a rich peri-urban area well connected to markets is not comparable to one hectare of cassava in a remote small village.

To overcome these limitations, the definition combines the physical size of the food producer with its economic size, expressed by the revenues from farming activities (revenues from other type of activities, instead, are not be considered). This additional criterion provides a more accurate view and a more precise identification of small-scale food producers compared to land and herds' size only. Consistent with the spirit of target 2.3 of SDG-2, the combination of physical constraints and economic results allows capturing and identifying as small-scale food producers those producers that have limited access to land, resources, input and technology, and obtain poor economic results. The use of revenue as an additional criterion, in other words, reduces the risk of classifying as small-scale food producers who manage to achieve substantive economic results, even from a small resource base. The revenue cap at $PPP 34 387 further increases the reliability of the method, and its applicability in a widely diverse range of contexts.

Information on land size and the number of livestock heads is available in most countries. For this reason, the physical size of farms and herds has frequently been used as a criterion to identify small-scale producers, especially where data for a more accurate measurement is not available. The economic size criterion has been used in countries with a more comprehensive agricultural statistics programme[4]. Monitoring SGD indicators 2.3.1 and 2.3.2, however, will necessarily require detailed economic data, given the need to compute the income of food producers and the amount of production per labour input. It is therefore justified to include the economic size criterion for developing an accurate definition of small-scale food producers.

[4]See the FAO Statistics Division Working Paper on "Defining small-scale food producers to monitor target 2.3. of the 2030 agenda for sustainable development" available at http://www.fao.org/3/a-i6858e.pdf quoted in footnote 1.

One limitation of the revenue as a measure of economic size is that it does not take into account differences in production costs among farms, which can be significant. However, this variable is preferable to any proxy of income or the gross margin, as indicator 2.3.2 is aimed at measuring income itself. Moreover, data on costs of production are more difficult to obtain and less frequently collected than data on revenues. Similarly, another limitation that is worth noting is the fact that all the variables chosen to identify smallholders – land, livestock heads and revenues – exhibit some degree of correlation with income and productivity. This is the case for virtually any variable that can be used to describe the scale of production.

It is also important to underline that the definition of small-scale producers adopted by the IAEG-SDG can be applied to fisheries, aquaculture and forestry producers, only to the extent that these activities are conducted in combination with farming. The specificities of production in fisheries, aquaculture and forestry allow using only the economic revenues, while the other two criteria proposed are not applicable to these particular cases. For what concerns forestry, production happens to a large extent on land which is not owned, nor exclusively accessed by individual households. Thus, measuring the size of land operated by a single farm for forestry-related activities is not straightforward. Similar considerations apply to the fisheries and aquaculture sectors, where variables other than land size and TLUs may be necessary to define the physical size of the holding, such as the number or size of boats in the case of fisheries.

Why a relative approach to define thresholds

Once a set of criterion variables is adopted to define "small-scale food producers", the issue remains of choosing a convenient threshold that separates small-scale producers from other producers. Thresholds can be based on an absolute or a relative definition.

An absolute definition assigns, for each criterion variable, the same exact threshold in all countries – say, for instance, 5 hectares, 5 livestock heads and $1000 of revenue -- regardless of agro-ecological and socio-economic conditions.

A relative definition, instead, assigns for each criterion variable a threshold at the same relative level in each country; that is, thresholds are set with a homogeneous criterion but within a reference system defined at the national level. In the case of the scale of production, a relative threshold can be set at the same point of *the cumulative distribution* of the three variables; examples are any percentile of the distribution of land, herds and revenues in each country.

With the relative approach, thresholds are still established with a unique criterion, whose application yields different thresholds in each country, depending on the shape of the distribution of the criterion variables. Depending on the distribution of land, livestock heads and revenues in a given country, therefore, thresholds that identify small-scale food producers can be, for example, 5 hectares in one country and 10 hectares in another; or 3

livestock heads in one country and 6.5 livestock heads in a another; or $1 500 in one country and $ 2 800 in another.

The absolute approach has the advantage of enhancing comparability across countries. The definition of an absolute threshold could be linked to measures of extreme poverty, thus establishing a close relationship between SDG 1 and SDG 2. However, this approach makes it difficult and somewhat arbitrary the identification of unique thresholds and disregards differences among national contexts. For instance, a 5-hectare land size may capture virtually all producers in a country where natural conditions and the organization of production determine a small average farm size. However, the same threshold may be capturing a negligible share of producers in countries where the average farm size is much larger.

The relative approach, instead, identifies producers in each country who are *relatively disadvantaged* in terms of access to land, availability of livestock and economic revenues with a homogeneous criterion. This approach reflects more effectively the differences in agro-ecological, demographic, economic and technological characteristics that shape the distribution of land, herds and revenues in each country[5].

Moreover, for the purpose of monitoring SDG indicators 2.3.1 and 2.3.2, the relative approach shows another key advantage over the absolute approach. If defined by an absolute threshold, the composition of the small-scale producers group will inevitably change over time, and more likely decrease in size. The best performing producers will "graduate" to a non-small-scale condition, while the worst performing producers will not; and some bad performers may enter the small-scale's group. An absolute threshold, in other words, would generate an adverse selection bias, which would lead to monitor the worst performers. This may yield paradoxical results. For instance, a country in which the number of small-scale food producers would be drastically reduced may report no progress on indicators 2.3.1 and 2.3.2, if those few remaining below the "small-scale food producers" thresholds were to show no progress in income and labour productivity. With a relative threshold, instead, that same country would report progress, as the improvements of producers' access to land, herds and revenues would affect the distribution of these variables, and thus signal the changed conditions of producers located in the designated part of the distribution.

Given these consideration, **the definition sets thresholds using a relative approach**. The three criterion variables – land size, herd size and economic revenue – are used to identify as 'small-scale' those producers that fall in the bottom 40% of the cumulative distribution. The introduction of an absolute cap on revenues, which applies only after the relative criteria are enforced on the all three variables, does not alter the fundamental relative

[7] See the FAO Statistics Division Working Paper on "Defining small-scale food producers to monitor target 2.3. of the 2030 agenda for sustainable development" available at http://www.fao.org/3/a-i6858e.pdf quoted in footnote 1.

nature of the threshold proposed. It rather represents a compromise that increases the comparability of the measurement, which prevents the inclusion of absolutely wealthy economic agents among in the set of small-scale producers. In other words, the cap represents and additional constraint, which triggers only in countries where the subset of producers identified by the union of the bottom 40 percent of the cumulative distribution of land, livestock and revenues still contains producers with a revenue higher than $PPP 34 387; and ensures that these producers are excluded from the population of small-scale producers.

This definition has the advantage of maintaining comparability among countries, in the spirit of the 2030 Sustainable Development Agenda, as all thresholds are computed on the basis of the same statistical criteria. At the same time, the proposal acknowledges the wide diversity of national contexts in which small-scale food producers operate, which results in country-specific thresholds.

The choice of the bottom 40% of the cumulative distribution, as many relative and absolute thresholds, is somewhat arbitrary[6]. However, the bottom 40% -- or two quintiles of the distribution – is consistent with experts' recommendations[7], and with common practices. For example, it is used by the World Bank in its measurement of Shared Prosperity.

It is worth underlying again that this definition aims to facilitate the monitoring of SDGs indicators 2.3.1 and 2.3.2. As such, it is expected to coexist with any other national definitions of small-scale food producers – or other policy-relevant groups such as family farms -- that reflect national priorities.

A practical example on how to identify smallholders and compute the two proposed indicators is provided in Annex 2, referring to a hypothetical country named Smallscalestan.

The consultation of member countries

Before the approval of the IAEG-SDG, in August 2017, this definition and the associated method to identify "small-scale food producers" was submitted to member countries through a mechanism put in place by UNSD and endorsed by the Chairs of the IAEG-SDG. Feedback was received from 58 national and regional institutions. Most member countries accepted the methodology as a valid international standard. A number of them provided comments and useful suggestions that led to improvements in the method, without affecting the basic thrust of what was originally proposed by FAO. After the consultation, several countries tested the methodology on their own national micro-data -- generating more evidence on its application at national level – thus adding to the tests that FAO could conduct, which were inevitably limited to countries for which micro-data is publicly

[6] This is also the case, for instance, of the 2-hectare threshold, which is the most popular criterion for identifying smallholders worldwide – see the paper quoted in footnote 1.

[7] See the FAO Statistics Division Working Paper on "Defining small-scale food producers to monitor target 2.3. of the 2030 agenda for sustainable development" available at http://www.fao.org/3/a-i6858e.pdf quoted in footnote 1.

available. Further testing and discussion with member countries ensued the proposal of adding to absolute revenue cap the three relative criteria, as a mean to widen the applicability of the methodology, particularly in high-income countries[8].

Altogether, the consultation and the subsequent exchange with member countries helped improving the methodology originally proposed by FAO; while at the same time confirming that such methodology is effective for the purpose of monitoring SDG indicators 2.3.1 and 2.3.2.

Implementing the Proposed Definition

Computing the physical size

The amount of land available to an agricultural producer must be considered in terms of the "*operated"* land. This is defined as the amount of land effectively used; it includes the land that is cultivated with temporary and permanent crops, the land rented in, and fallow land (that is, the areas left uncropped at the time of data collection, and not dedicated to grazing). Excluded from the operated is the land rented out, the forest land and the land abandoned prior to the reference period. Where information on land use is incomplete, for instance data on fallow land is often unavailable, data on "*cultivated"* land should be used instead.

Computation of the threshold of the bottom 40% of operated land size distribution is done by first creating a variable that is the cumulative distribution of the operated land size. From this variable, the point that corresponds to the 40% of the cumulated distribution is identified. This point is chosen as the threshold that separates the bottom 40% from the top 60%. Producers included in the bottom set constitute those who fulfill the first criterion.

The second criterion of the physical size is the size of livestock holdings of the food producers. The number of livestock available to a producer must be considered in terms of Tropical Livestock Units (TLUs). This is a conversion scale developed by FAO for global comparisons, which standardizes different livestock types in a single measure through conversion factors valid for specific livestock varieties in each region of the world. The mean of comparison is the basal metabolic rate, which is the energy expenditure per unit of body weight per unit time[9].

Finding the bottom 40% of the TLU distribution requires the same methodology applied above for the operated land. The cumulative distribution of the TLUs of the country is considered, to find the point that corresponds to the 40% of the cumulated distribution.

[8] Extensive tests and discussions on upper and lower bounds to the definition of the population of small-scape producers are presented in the Task Force Report on *The FAO for SDG indicators 2.3.1 & 2.3.2_Small Scale Food Producers in Developed Countries* (forthcoming)

[9] Information on the TLU is available at https://www.fao.org/3/x5443E/x5443e04.htm

This is identified as the bottom 40% threshold. Producers included in the bottom set constitute those who fulfil the second criterion.

In addition to these criteria, each national statistical system, depending on the specific conditions, may consider establishing a *minimum size* of land and/or livestock that separates hobby farming, gardening and other non-professional activities from small-scale food production.

Computing the economic size

Revenues from agricultural activities include those generated by crop, livestock fisheries, aquaculture and forestry. Given *i* agricultural activities, including crops, livestock, fisheries and forestry activities, for each producer *k*, revenues can be written as

$$R_k^t = \sum_k V_k^t p_{ik}^t$$

where:

- $V_{ik}^t$is the physical volume of agricultural product *i* sold by producer *k* during year t;
- $p_{ik}^t$is the constant selling price received by the small-scale food producer *k* for the agricultural product *i* during the same year t.
  In details, physical volumes $V_{ik}^t$are derived, for each *k* producer, from the following items.

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

  Significant difficulties are likely to arise in the identification of p_{ik}, that is, of a vector of constant prices to be attributed to each of the items listed. First, detailed data on selling prices at the farm level are not always collected. When they are not, convenient proxies need to be identified for the closest available territorial entity, such as median prices

referred to the same district, province or even at the national level. Second, for all the items which are not sold in the market -- such as own-consumed products or products used for in-kind payment and barters -- market prices do not apply. A correct evaluation would require an assessment of the shadow prices for each such item, indicating their opportunity cost, which are heavily dependent upon context-specific conditions. In fact, it looks unlikely that the computation of revenues of a large sample of producers, such as the one required in this case, can rely on credible and detailed shadow prices. Thus, it is likely for market prices to be used as proxies in this context, despite their limitations.

To implement the methodology described, all values in local currency units need to be converted in Purchasing Power Parity Dollars (PPP $)[10].

As mentioned, fisheries, aquaculture and forestry producers can only be considered in this context in terms of the second criterion, that is, the economic size. In addition to the complexity of the statistical operationalization of physical constraints in forestry, fisheries and aquaculture, additional constraints in these sub-sectors originate from the lack of consistent accessible data.

The computation of the threshold for the economic size criterion is the same as that of the physical size. A variable is generated that takes the cumulative distribution of revenues in the countries. The point that is at the 40 per cent of the cumulative distribution is identified, and this number is applied as the threshold for economic size – the producers which have revenues that are less than this number creates the third set of producers that fulfil the final criterion of the definition. Both the physical and the economic criteria must be satisfied if data is available.

The overall absolute cap at $PPP 34 387 must be applied after all other criteria have been applied. In practice, this means that within the sub-set of producers included in the bottom 40 percent of the cumulative distribution of land endowment, and the bottom 40 percent of the cumulative distribution of livestock endowment, and the bottom 40 percent of the cumulative distribution of revenues, producers with a revenue higher than $PPP 34 387 (if any) must be excluded.

[10] Information on PPP dollars is available from the World Bank World Development Indicators, at http://data.worldbank.org/indicator/PA.NUS.PPP It must be noticed that this conversion is necessary to enforce the revenue cap – as well as for measuring progress in the SDG indicators 2.3.1 and 2.3.2 -- but it is not necessary for identifying food producers that fall with the bottom 40 percent of the cumulative distribution of revenues, as the distribution is not affected by the conversion. The subset of farmers falling in the bottom 40 percent of the cumulative distribution of revenues, in other words, will not change with the conversion of the currency to PPP Dollars or any other measurement unit.

3. Computing SDG Indicator 2.3.1: Production per Labour Unit of Small-Scale Food Producers

The Manual for Measuring Productivity, published by the OECD in 2001, provides a standard definition of productivity, which is as follows: *"Productivity is commonly defined as a ratio of a volume measure of outputs to a volume measure of input use."* Productivity measures the amount of output produced by an economic unit (country, industry, sector, farm or other economic operators) given a set of resources and inputs. Productivity can be measured for a single economic entity, such as the farm or commodity, a group of farms, at any geographical scale depending on the purpose of the inquiry. [11]

In the context of SDG indicator 2.3.1, which specifically focuses on labour productivity, the numerator is *the volume of agricultural/livestock/fisheries/forestry production* and the denominator is represented by the labour input. Given *i* agricultural activities, including crops, livestock, fisheries and forestry production, and *j [1,…,n]* small-scale food producers defined as in the previous section as a subset of all *N [1,…,k]* food producers, the SDG indicator 2.3.1 must be computed using the following formula:

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

where:

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

A practical example on how to identify smallholders and compute the two proposed indicators is provided in Annex 2, referring to a hypothetical country named Smallscalestan.

In detail, physical volumes V_{ij} are derived as indicated above, in the section on the implementation of the economic size criterion for identifying small-scale producers.

As made clear by the expression above, this indicator is a measure of the average productivity of labour, to be computed on the target population of "small-scale food producers" identified by the criteria described in the previous section.

As the considered indicator is referred to a set of production units – those of a small-scale — the numerator needs to summarize information on the entire production undertaken in

[11] More information on possible definitions of productivity and the summary of the relevant literature can be found in the Technical Report Series of FAO, "Productivity and Efficiency Measurement in Agriculture: Literature Review and Gaps Analysis".

each unit. This requires that volumes of production are reported in a common numeraire, given that it is impossible to sum up physical units[12]. The most convenient numeraire for aggregating products in the numerator is a vector of constant prices. When measured at different points in time, as required by the monitoring of the SDG indicators, changes in constant values represent aggregated volume changes, which is the change required by the description of SDG indicator 2.3.1. To ensure comparability of values across countries, constant values must be computed in Purchasing Power Parity Dollars (PPP $)[13] and with reference to the same year.

The denominator of the indicator must capture the entire volume of labour input employed by small-scale food producers in a given period, including all forms of paid and unpaid labour such as family labour and exchange labour, together with hired labour. Labour input can be referred to different time units. Recent contributions in the literature indicate that the most accurate measure of labour volumes, which ensures an appropriate comparability of productivity across different farms' size and economic activities, is obtained in terms of the number of hours worked[14]. In fact, hours worked in agriculture differs significantly by type of worker. However, accurate and detailed information on hours worked is seldom available in agricultural surveys, to date. Collecting this information requires close monitoring of the working time devoted to the many activities which are usually undertaken in agriculture. For this reason, it is proposed here to refer to the number of working days devoted to agriculture in a year, for which information can be more easily approximated. Another conceptual difficulty of computing labour input is the lack of consideration of elements such as the quality of labour input when aggregating the number of labour units employed in the holding. Indeed, one day of work of a specialized professional supplying veterinary or agronomic services should not be treated as one hour of unspecialized basic services, such as those employed in massive operation like, for instance, manual harvesting. One way to overcome this difficulty would be considering labour inputs in value terms, assuming that wages capture quality differences. However, this would not be consistent with the formulation of the indicator – which talks about labour input, and not labour costs – and pose significant problems in terms of identifying convenient proxies for the value of unpaid labour and family contributions. These are particularly widespread in small-scale food production units.

[12] The typical example of "apples and pears" applies here: the sum of their physical volumes would not make sense, as they are not homogeneous. Even more difficult would be summing physical volumes of crops and livestock products.

[13] As mentioned, information on PPP dollars is available from the World Bank at: http://data.worldbank.org/indicator/PA.NUS.PPP

[14] See, among others, McCullough, E.B. "Labor productivity and employment gaps in Sub-Saharan Africa", World Bank Policy Research working paper no. WPS 7234, 2015

4. Computing SDG Indicator 2.3.2: Average Income of Small-Scale Food Producers

SDG indicator 2.3.2 specifically focuses on income from on-farm production activities, which is related to the production of agricultural and food products. Household income from on-farm activities includes income from crop production, livestock production, fisheries and aquaculture production, and from forestry production.

In this context, these income components refer in fact to *gross* income. Gross income is defined as revenues minus operating costs – also referred to as the operating surplus -- without taking into account the depreciation of assets. Moreover, due to difficulties in measuring taxes in rural contexts, direct taxes or employment-related obligations are also not deducted from the calculation of income.

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

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

where:

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

A practical example on how to compute the indicator is provided in Annex 2, referring to a hypothetical country named Smallscalestan.

In detail, physical volumes V^t_{ij} must be derived as indicated above, in the section on the implementation of the economic size criterion for identifying small-scale producers.

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

In details, costs C^t_{ij} generally include the following items:

- Costs of crop activities: inputs paid in cash, land rent, technical assistance/extension costs, crop saved for seed, crop used for paying labour, crop used for paying rent, crop used for paying inputs, crop given out in sharecropping agreement (sharecrop out), crop wasted,

crop used for producing by-products, total value of input purchased, including those reimbursed in kind

- Costs of livestock activities: livestock bought, livestock additional expenditures, crop used as feed, technical assistance/extension costs for livestock,
- Costs of forestry activities: input costs (seedlings, fertilisers, hired labour, etc.), machine rental costs, land rental costs, other related costs.
- Costs of fisheries and aquaculture activities: fishing gear expenditures, hired labour expenditures, trading activities, fresh fish purchases, processed fish purchases, other related costs

To obtain comparable results across countries in the case of income, values must be expressed in International Dollars at Purchasing Power Parity (PPP $)[15].

Gross income from livestock activities must take into account the balance between the sales and the purchases of livestock heads during the year, together with the value of the additional cash expenditures incurred for obtaining livestock production, including hired labour, fodder, medicine, vaccinations, utensils, the monetary value of crops used as feed, and the costs of technical assistance. The revenues include the value of the sales of both products and by-products, plus own consumption of products and by-products used to pay for reimbursements for land, labour (or any other services received and for reimbursements for inputs borrowed or acquired on credit), minus the total value of production expenditures, including land, labour, services received, payments for credit, additional input and transport.

In principle, income from livestock should also take the overall animal stock variation into account, computed as the difference between the closing stocks (value of herds at the end of the year) and the initial stocks (value of herds at the beginning of the year). This calculation requires information on the type and number of animals and in the final and initial reference periods, together with the corresponding unit prices.

Income from fish catching and processing activities equals the monetary value of all fresh and processed fish for market and final consumption utilisation, minus the operating costs. Income from fish trading includes the proceedings of sales in wholesale or retail fresh or processed fish bought from others, together with net from purchase expenditures and other operating costs. The criteria to be used for aquaculture are largely similar to those that apply to livestock production. The methodology for income from forestry follows the general principles presented in the other sections taking into account cash and in-kind revenues minus operating costs.

[15]As mentioned, information on PPP dollars is available from the World Bank at: http://data.worldbank.org/indicator/PA.NUS.PPP

5. Data Sources

Given that indicators 2.3.1 and 2.3.2 are measured on a target population of producers – those considered as small-scale -- the ideal data source for measuring them is a single survey that collects all the information required with reference to individual production units. It would be difficult, in other words, to use data on labour input from one survey and on production volumes from another, as this would make it difficult to refer the calculation to the target population, that is, to the small-scale food producers, as identified with the method described in Section 2.

The most appropriate data source for collecting information on the total volume of agricultural production and on labour input adopted on the agricultural holding are agricultural surveys. However, in many countries agricultural survey are seldom conducted on a systematic and complete basis, especially at the level of the holdings.

To fill this key data gap, the FAO has recently promoted a new approach to agricultural surveys, with the Agricultural Integrated Surveys (AGRISurvey) project. AGRISurvey proposes a set of integrated farm-level surveys, bridging the 10-year gap that normally exists between Agricultural Censuses. AGRISurvey collects data every year for a core module – which includes current agricultural production and its value – while other modules are administered less frequently, to collect structural information on the key technical characteristics of small-scale producers. One such module is entirely dedicated to collect information on the economic accounts of the holding, while another is dedicated to collect information on labour. In the AGRISurvey approach, all modules are based on a consistent sampling frame. For the purposes of monitoring indicator 2.3.1 and 2.3.2, the surveys that AGRISurvey is promoting will play a key role in improving quality and consistency of data collected at the national level.

At present, reliable and useful reference for the type of measurement required for SDG indicators 2.3.1 and 2.3.2 are the surveys undertaken by the Living Standards Measurement Study (LSMS) of the World Bank. In certain countries, the LSMS surveys include an Integrated Surveys of Agriculture, known as LSMS-ISA. These surveys use the households, and not the agricultural holding, as a reference; however, the approximation of these two entities can be acceptable in several contexts, especially where the majority of agricultural production units, and especially the smaller ones, are run by households. LSMS-ISA surveys provide a wealth of granular information on farm size, disaggregated by geographic areas, type of activities, and type of households. They collect information on both values of output, production costs (at least explicit costs), and the number of hours devoted to specific activities, from which it is possible to compute working days. For what concerns labour input, LSMS-ISA surveys allow obtaining data on labour units, particularly those engaged in cropping activities. However, even these surveys collect very little information on labour inputs in livestock, forestry, fisheries and aquaculture activities. Furthermore, given the level widespread seasonality and pluri-activity that characterizes labour in agriculture at the same time, it is difficult to obtain credible information on the effective

amount of total labour input on an annual basis. This implies using very long recall periods in surveys, which may affect the precision of the information collected.

A recent joint initiative of FAO, the World Bank and IFAD is compiling harmonized indicators of rural livelihoods from national household surveys and from the LSMS project. This platform is called RuLIS – Rural Livelihoods Information System. RuLIS computes harmonized indicators disaggregated by gender, rural and urban areas, income quintiles, degree of engagement in agriculture and farm size. RuLIS contains information so far available on SDG indicator 2.3.1 and 2.3.2 for countries that disseminate micro-data from convenient household surveys.

Agricultural censuses also report some information on agricultural production, economic variables and labour input. These surveys are undertaken in a large number of countries, albeit in scattered time periods. However, censuses usually do not collect detailed information on labour input – that is, the effective involvement of each labour unit in the production process – and they report information at low frequency, as they are usually conducted every 10 years.

Administrative data sources can also be leveraged to monitor the indicators, notably farmers' registries. These tools can be useful to the extent to which they ensure sufficient coverage of the targeted population, and they report details allowing to compute statistically representative values for the variables described, notably revenues, costs and labour input.

Finally, it is worth underlining that, when computing indicator 2.3.1, it is important to maintain consistency between the information included in the numerator and the denominator; and when computing indicator 2.3.2 it is crucial to maintain consistency between information on revenues and costs. If information on labour input is only available for crop activities, the numerator of indicator 2.3.1 should also report only revenues from crops, and exclude those from livestock, fisheries and forestry. The same criterion should obviously apply to the comparison of revenues and costs in indicator 2.3.2. Should this not be the case, the resulting average productivity and income estimates would be biased.

6. Results of the computation of SDG indicators 2.3.1 and 2.3.2 in selected countries

The methodology for identifying small-scale food producers and the computation of the SDG indicators 2.3.1 and 2.3.2 described in the previous sections were tested on a sample of countries, using micro data collected in 41 household surveys and processed in the framework of the RuLIS project[16].

The table below shows the thresholds corresponding to the bottom 40 per cent of land size, herd size and revenue from farming activities. For some countries – Armenia, Ecuador,

[16] See RuLIS webpage at http://www.fao.org/in-action/rural-livelihoods-dataset-rulis

Ethiopia, Georgia, Guatemala, India, Iraq, Niger, Peru, Tanzania and Uganda – data availability allowed to compute the threshold for more than one similar survey in different years. In these cases, it was possible to check on how the thresholds for identifying small-scale food producers, and how the associated percentages of small-scale food producers changed in different time periods. The cap of $PPP 34 387 does not apply in any of the countries included in these calculation.

The survey micro-data available – listed in Annex 1 – only allowed to apply the entire methodology in a limited set of countries. Where one of the criterion variables was not available from a survey, the identification of the target population of the indicators was based only on those available. Therefore, for instance, for Burkina Faso the methodology could only take into account as small-scale producers those falling within the bottom 40 percent of the cumulative distribution of land and revenues, as no accurate information could be retrieved on livestock from the available survey. This same limitation applies to the computation of the percentage of small-scale producers in total producers, and the values of the indicators. Values of the revenues are all reported to year 2011.

Thresholds, based on the definition described in Section 2

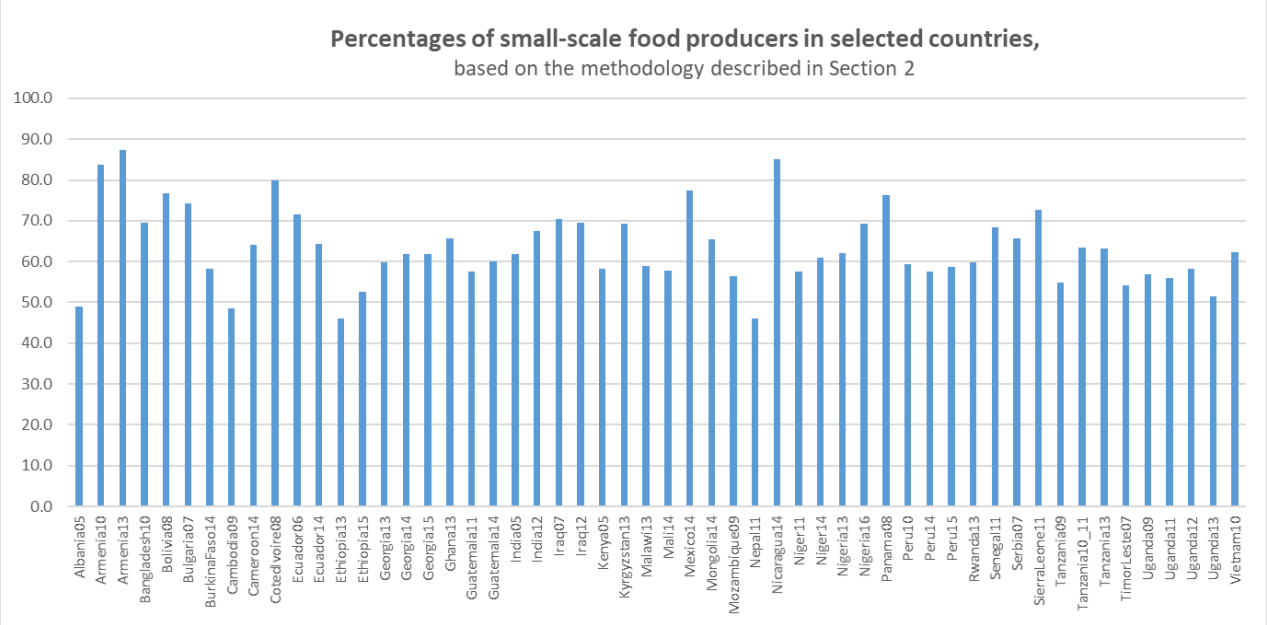
	land size (ha)	Tropical Livestock Units (number)	Revenues (PPP $)
Albania 2005	0.9	2.8	5 023
Armenia 2010	1.5	9.5	5 834
Armenia 2013	2.0	9.8	7 986
Bangladesh 2010	1.0	1.6	2 632
Bolivia 2008	3.0	11.5	4 372
Bulgaria 2007	1.8		5 469
Burkina Faso 2014	4.0		1 236
Cambodia 2009	1.5		2 314
Cameroon 2014	3.0	4.8	3 560
Cote d'Ivoire 2008	11.0	3.7	-
Ecuador 2006	6.4	9.2	2 671
Ecuador 2014	5.0	8.4	2 406
Ethiopia 2013	1.4	3.0	1 400
Ethiopia 2015	1.6	3.5	1 804
Georgia 2013	0.9	3.1	4 715
Georgia 2014	1.0		5 625
Georgia 2015	1.0	4.5	5 160
Ghana 2013	3.0	2.8	4 771
Guatemala 2011	1.2	1.6	1 687
Guatemala 2014	1.4	1.0	1 457
India 2005	1.4	1.4	5 148
India 2012	1.6	1.0	7 796
Iraq 2007	4.5		11 075
Iraq 2012	5.0		11 158
Kenya 2005	1.0	2.8	3 558
Kyrgyzstan 2013	2.1	3.6	6 182
Malawi 2013	0.8	1.1	1 059
Mali 2014	7.9	7.0	2 937
Mexico 2014			1 722
Mongolia 2014		35.1	8 407
Mozambique 2009	1.8	1.6	428
Nepal 2011	2.7	6.8	2 502
Nicaragua 2014	10.6		3 580
Niger 2011	5.3	18.3	680
Niger 2014	6.4	17.8	703
Nigeria 2013	1.2	9.9	2 587
Nigeria 2016	1.5	6.5	3 766
Panama 2008		15.0	905

Peru 2010	3.2	10.9	1 956
Peru 2014	3.0	10.3	2 806
Peru 2015	2.9	10.1	2 758
Rwanda 2013	0.7	0.9	663
Senegal 2011		9.3	2 179
Serbia 2007	3.0	2.7	4 921
Sierra Leone 2011		0.9	1 885
Tanzania 2009	1.6	5.3	764
Tanzania 2011	3.0	5.2	945
Tanzania 2013	2.7	7.8	1 263
Timor Leste 2007	0.9	3.2	2 552
Uganda 2009	2.9	3.1	1 734
Uganda 2011	2.5	2.8	1 622
Uganda 2012	2.4	3.0	1 537
Uganda 2013	2.0	2.0	1 160
Viet Nam 2010	0.7	1.4	7 293

Source: RuLIS, provisional data. Own calculation on data from surveys listed in Annex 1

Thresholds show significant variability across countries. A small-scale food producer in Cote d'Ivoire or Nicaragua operates more than 10 hectares; while in several countries, such as Rwanda, Viet Nam, Georgia and Timor Leste, a small-scale producer operates less than 1 hectare.

Revenue thresholds show an even wider variability, in Malawi the threshold for being considered a small producer corresponds to less than 1 000 PPP$ in Mozambique or Tanzania, while it is beyond 10 000 PPP$ in Iraq.



Source: Source: RuLIS, provisional data. Own calculation on data from surveys listed in Annex 1

The percentages of small-scale food producer resulting in each country are reported in the chart above. In the selected surveys, the incidence of small-scale food producers in total food producers varies from 43 per cent in Nepal up to 85 percent or more in countries such as Armenia or Nicaragua. In most countries, however, this percentage seems to identify some 50 to 70 percent of total agricultural producers. Based on the test conducted in the Task Force Report[17], the percentages of small-scale producers are below 10 percent in countries of the European Union, and as low as 2 percent in Germany, Denmark, France and Netherlands. These shares are considered appropriate for the mentioned countries, and they are affected by the cap that excludes farmers whose revenue exceeds $PPP 34 387.

It is worth highlighting that the multiple criterion proposed results, in general, in a wide variability of the percentages of small-scale producers across countries. The main reason for this variability is the reliance on three different variables – revenues, land and livestock

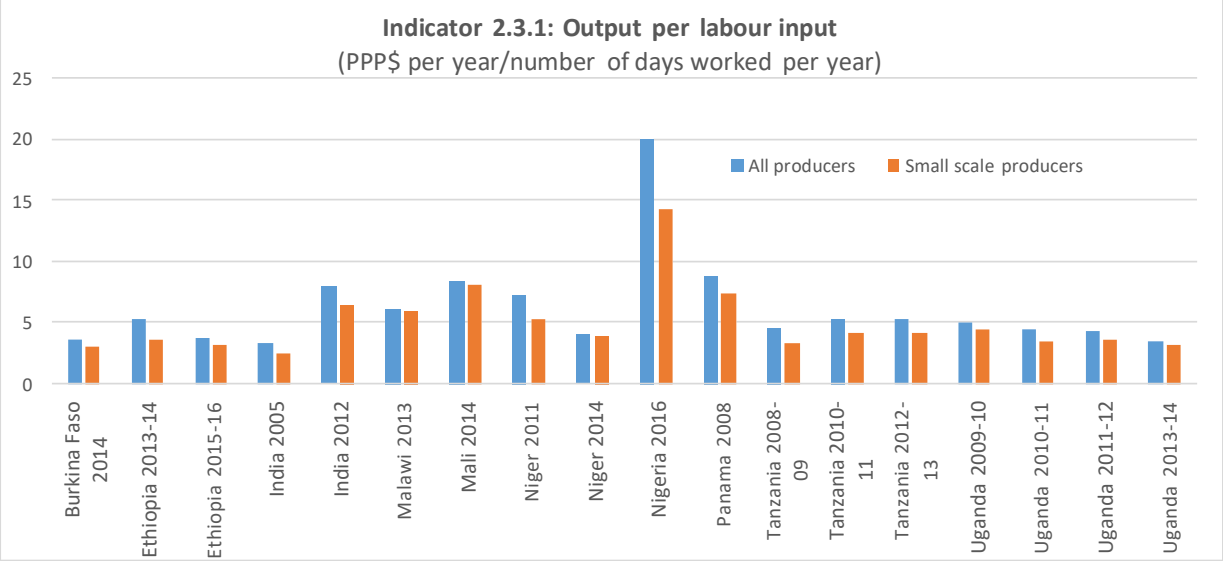
[17] Task Force Report on *The FAO for SDG indicators 2.3.1 & 2.3.2_Small Scale Food Producers in Developed Countries* (forthcoming)

units -- whose distributions can take very different shapes. Hence the intersection of the sets of producers identified in each of the three distributions is hard to predict. In this respect, single-variable criteria may yield more stable results in terms of percentages across countries. However, the advantage of the multiple criterion is expected to be a higher accuracy in identifying small-scale producers.

Moreover, experiments conducted with the same pool of data employed here showed that the implementation of different multiple criteria for identifying small-scale food producer – such as absolute thresholds on land and revenues – seems to result in an even higher variability in terms of percentage of small-scale food producers across countries.

Based on the proposed definition of small-scale producer, the same pool of surveys reported under Annex 1 was used to compute the two SDG indicators, following the methodologies reported in sections 3 and 4.

Concerning indicator 2.3.1, the sample of countries for which data is available is considerably more limited than the one on which smallholders were identified. The main limitation is the availability of consistent and comparable information on labour, allowing to reconstruct the number of days of work per year. Moreover, for this indicator, the computation had to be limited to crop production, as information on labour input was available only for this subsector. Results are reported in the chart below, for both smallholders and for all producers.

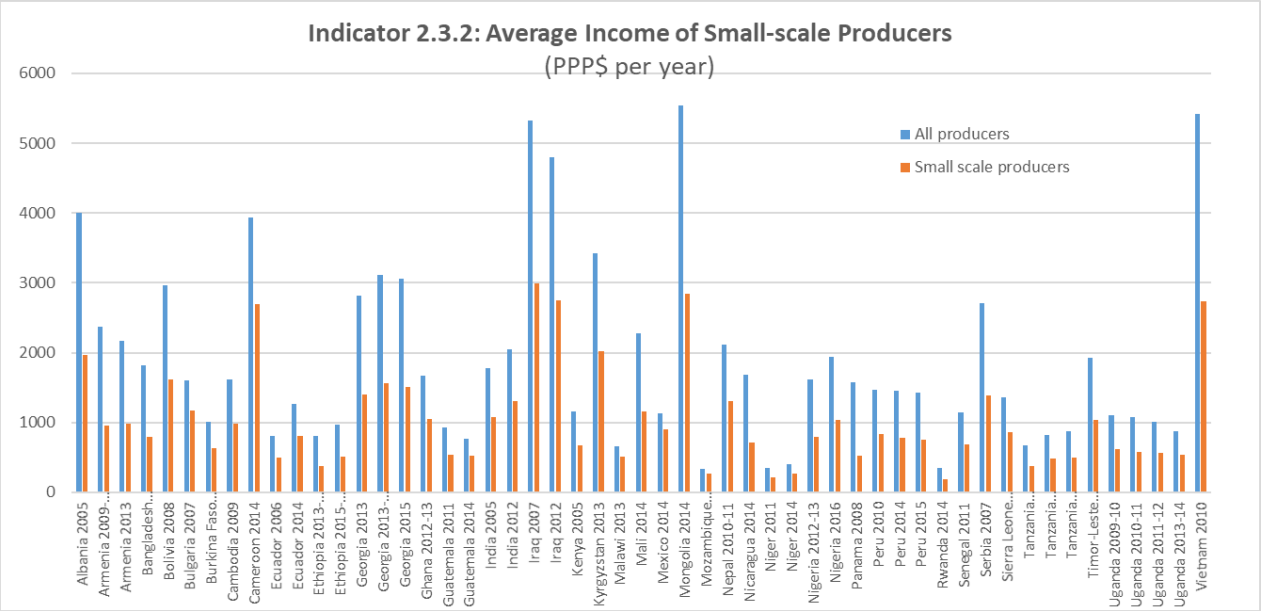


Source: RuLIS, provisional data. Own calculation on data from surveys listed in Annex 1

In these terms, the output per labour input in small-scale farms is systematically lower than in the average for all producers. The indicator presents a considerable variability across countries, which is largely arising from the crop production mix. Moreover, the absence of

livestock from both the numerator and the denominator of the indicator, certainly affects the level reported in different countries.

More information is available on indicator 2.3.2. Result are reported in the chart below, also in this case for all producers and for the small-scale, defined as proposed in Section 2. Significant discrepancies are observed between the annual income estimates for the small-scale producers and average for all producers, with the latter systematically higher than the former. The results are affected by the use of PPP Dollar as a standard measure. This conversion inevitably factors in the calculation the variability of exchange rates. Values are all referred to year 2011.



Source: RuLIS, provisional data. Own calculation on data from surveys listed in Annex 1

Annex 1: List of surveys used for the calculations reported in Section 6

Country	Survey	Year	Institution
Armenia	Integrated Living Conditions Survay	2010	National Statistical Service of the Republic of Armenia
Bangladesh	Household Income-Expenditure Survey	2010	Bangladesh Bureau of Statistics
Bolivia	Encuesta de los Hogares	2008	Instituto Nacional de Estadística - Ministerio de Planificación del Desarrollo - Bolivia
Burkina Faso	Enquete Multisectorielle Continue	2014/15	Institut National de la Statistique et de la Démographie - Ministère de l'Economie et des Finances
Cambodia	Cambodia Socio-Economic Survey	2009	National Institute of Statistics
Cote d'Ivoire	Enquete Niveau de Vie des Menages	2008	Institut National De La Statistique (INS) - Ministere d'Etat, Ministere du Plan et du Developpement
Ecuador	Encuesta sobre Condiciones de Vida	2006	Instituto de Estadística y Censos
Ecuador	Encuesta sobre Condiciones de Vida	2014	Instituto de Estadística y Censos
Ethiopia	Ethiopia Socioeconomic Survey	2013/14	Central Statistics Agency of Ethiopia (CSA) - Ministry of Finance and Economic Development
Ethiopia	Ethiopia Socioeconomic Survey	2014/15	Central Statistics Agency of Ethiopia (CSA) - Ministry of Finance and Economic Development
Georgia	Integrated Household Survey	2014	The State Department for Statistics of Georgia - GEOSTAT
Georgia	Integrated Household Survey	2015	The State Department for Statistics of Georgia - GEOSTAT

Ghana	Ghana Living Standards Survey	2012/13	Ghana Statistical Service (GSS)
Guatemala	Encuesta Nacional de Condiciones de Vida	2011	Instituto Nacional de Estadística - Gobierno de Guatemala
India	India Human Development Survey	2012	National Council of Applied Economic Research, New Delhi
Iraq	The Iraq household socio-economic survey	2007	Organization for Statistics and Information Technology (COSIT) - Ministry of Planning, Government of Iraq
Kenya	Integrated Household Budget Survey	2005/2006	Kenya National Bureau of Statistics
Kyrgyzstan	Integrated sample household budget and labor survey	2013	National Statistics Committee
Malawi	Third Integrated household Survey	2004	National Statistical Office (NSO) - Ministry of Economic Planning and Development (MoEPD)
Malawi	Third Integrated household Survey	2011	National Statistical Office (NSO) - Ministry of Economic Planning and Development (MoEPD)
Malawi	Fourth integrated Household Survey	2013	National Statistical Office - Government of Malawi
Mali	Enquête Agricole de conjoncture integree aux Conditions de Vie des Menages	2014/15	Cellule de Planification et de Statistiques - Ministère du Développement Rural Institut National de la Statistique - Gouvernement du Mali - Direction Nationale de l'Agriculture
Mali	Enquête Agricole de conjoncture integree aux Conditions de Vie des Menages	2014/15	Cellule de Planification et de Statistiques - Ministère du Développement Rural Institut National de la Statistique - Gouvernement du Mali
Mexico	Encuesta Nacional de Ingresos y Gastos de los hogares	2014	Instituto Nacional de Estadística y Geografía
Mozambique		2008	Direcção de Censos e Inquéritos - Instituto Nacional

	Inquérito sobre Orçamento Familiar		de Estatística (INE) - Ministry of Planning and Development
Nepal	Nepal Living Standards Survey	2011	Instituto Nacional de Estadística y Geografía
Niger	National Survey un Household Living Conditions and Agriculture	2011	Survey and Census Division - National Institute of Statistics
Niger	National Survey un Household Living Conditions and Agriculture	2014	Survey and Census Division - National Institute of Statistics
Nigeria	General Household Survey	2016	Federal Statistics Office
Pakistan	Pakistan Social and Living Standards Measurement Survey	2013-14	Federal Bureau of Statistics - Government of Pakistan
Perù	Encuesta Nacional de Hogares	2010	Instituto Nacional de Estadística e Informática - República del Perú
Perù	Encuesta Nacional de Hogares	2014	Instituto Nacional de Estadística e Informática - República del Perú
Perù	Encuesta Nacional de Hogares	2015	Instituto Nacional de Estadística e Informática - República del Perú
Rwanda	Integrated Household Living Conditions Survey	2013	National Institute of Statistics of Rwanda - Ministry of Finance and Economic Planning
Sierra Leone	Integrated Household Survey 2011	2011	Statistics Sierra Leone (SSL)
Tanzania	National Panel Survey	2008/09	National Bureau of Statistics
Tanzania	National Panel Survey	2012/13	National Bureau of Statistics
Timor Leste	Living Standard measurement	2007/08	National Bureau of Statistics
Uganda	The Uganda National Panel Survey	2009/10	Uganda Bureau of Statistics (UBOS)

Uganda	The Uganda National Panel Survey	2010/11	Uganda Bureau of Statistics (UBOS)
Uganda	The Uganda National Panel Survey	2013/14	Uganda Bureau of Statistics (UBOS)

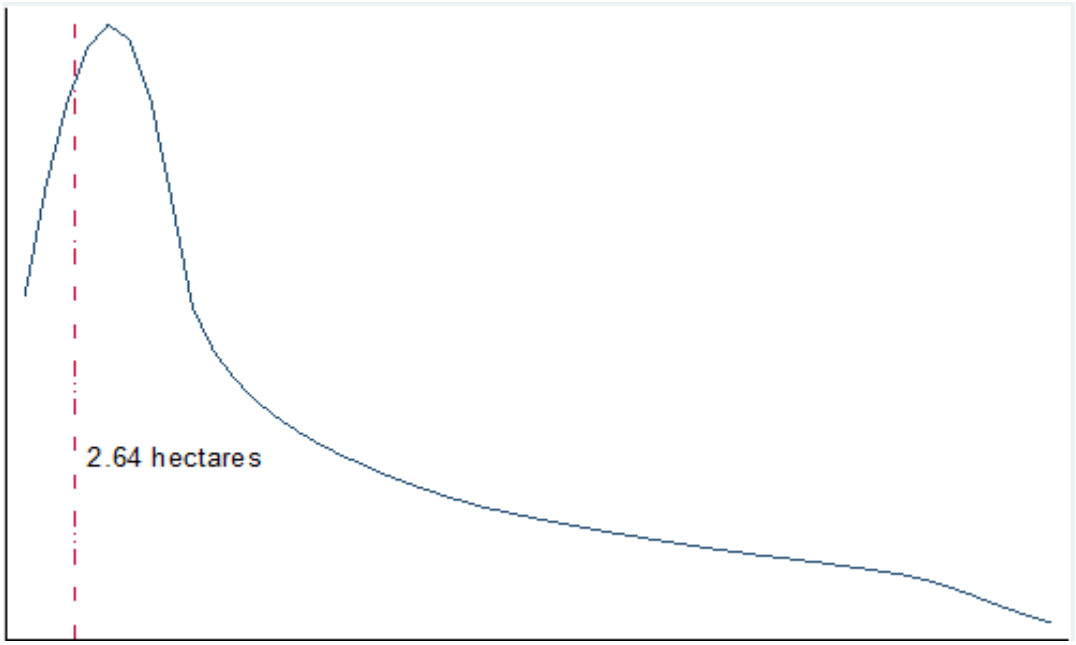
Annex 2: An Example of computation of SDG indicators 2.3.1 and 2.3.2 in Smallscalestan

This annex shows how the two indicators can be computed with an example from a hypothetical country, which will be called Smallscalestan. The first step in this process is the identification of small-scale producers.

Identifying small-scale producers

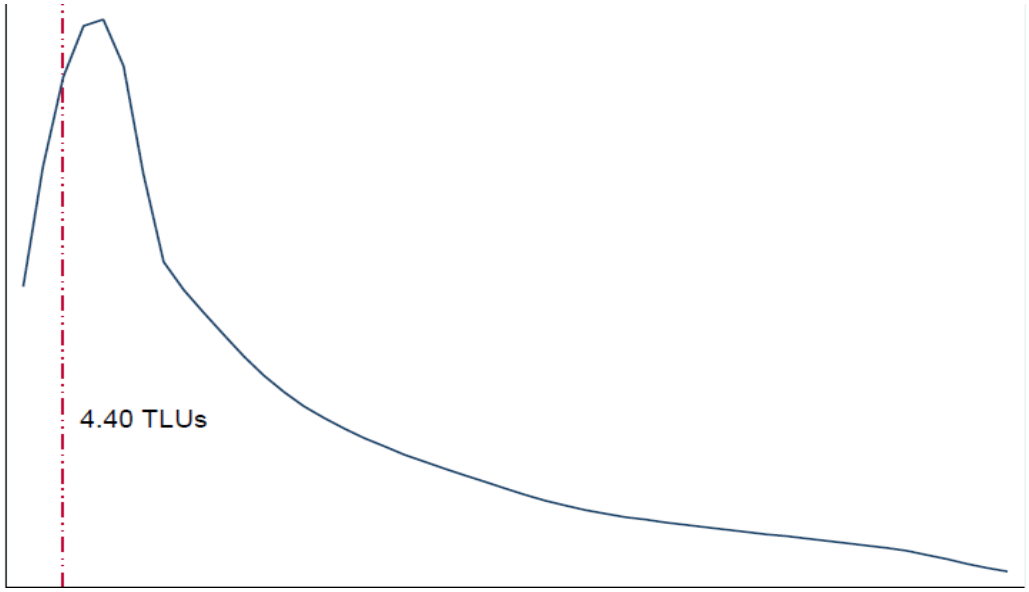
The three charts below present the distribution of the three relevant variables – land area, herd size and revenues – while the dashed line is the threshold at the point that corresponds to the bottom 40 per cent of each distribution. For this particular country, the threshold is 2.64 hectares of land size in Smallscalestan.

Distribution of land



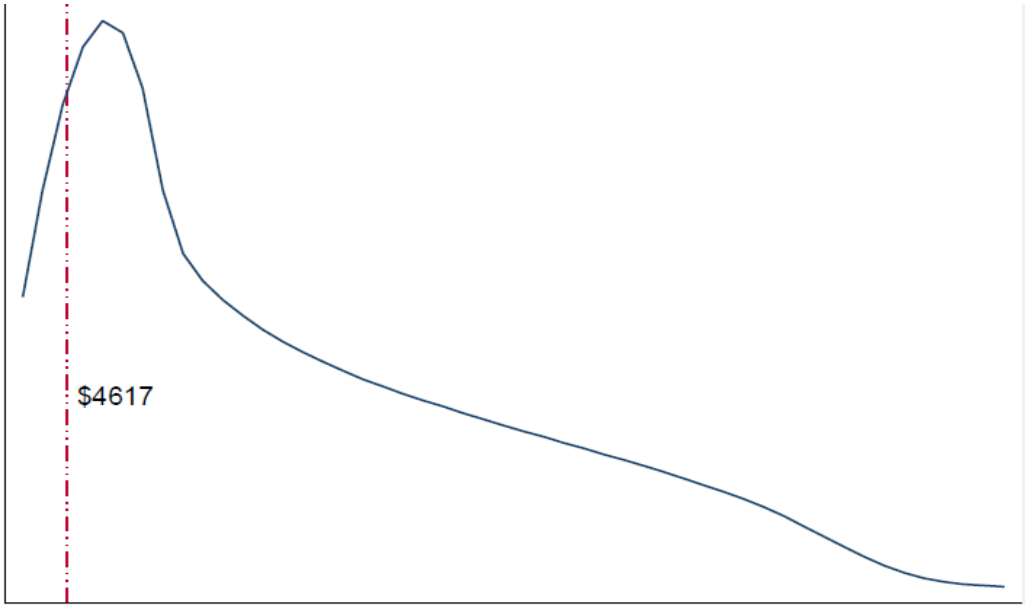
The distribution of the herd size in terms of TLUs, presented in the chart below, shows that the threshold identifying the bottom 40 per cent, is at 4.4 TLUs in Smallscalestan.

Distribution of livestock herds



Finally the chart below shows the distribution of the farm revenues in Smallscalestan. The threshold that separates the bottom 40 per cent in this case is PPP $4 617.

Distribution of revenues



The Table below offers a numerical example on how the three thresholds are used to identify small-scale food producers.

Table 2: A random selection of 50 production units from the hypothetical country "Smallscalestan"

Production unit Number	Operated Land Area (ha)	TLUs (number)	Revenues from crops ($ PPP constant prices)	Revenues from Livestock ($ PPP constant prices)	Revenues from fisheries ($ PPP constant prices)	Revenues from forestry ($ PPP constant prices)	Total Revenues ($ PPP constant prices)	small-scale
PU1	2.91	5.4	2 912	2 261	321	-	5 493	
PU2	1.12	1.6	746	442	-	-	1 188	
PU3	2.89	5.7	3 292	2 566	-	523	6 380	
PU4	4.07	4.4	3 885	2 257	-	-	6 141	
PU5	0.2	4.2	2 586	3 715	-	265	6 565	
PU6	1.73	5	813	1 279	-	-	2 091	
PU7	0.2	12	463	4 743	-	-	5 205	
PU8	0.51	1.5	195	342	-	-	536	
PU9	6.5	3.5	1 103	223	-	-	1 325	
PU10	3.56	4.6	4 599	3 453	-	-	8 052	
PU11	3.19	10.7	1 010	2 417	-	-	3 426	
PU12	2.44	2	1 268	243	-	187	1 697	
PU13	0.36	1.9	715	1 130	-	-	1 844	
PU14	0.08	1.3	587	1 004	-	-	1 591	
PU15	3.36	1.7	3 364	1 305	-	-	4 668	
PU16	6.97	5.1	5 213	1 524	1 064	-	7 800	
PU17	2.95	4.5	2 965	2 270	-	2 450	7 684	
PU18	1.88	1.5	1 600	651	-	-	2 251	
PU19	6.74	5.1	4 147	642	-	-	4 788	
PU20	2.46	1.2	1 451	377	-	450	2 277	
PU21	0.13	0.1	187	120	-	-	306	
PU22	1.53	0.5	661	-379	-	-	282	
PU23	4.92	5	4 120	2 034	-	-	6 153	
PU24	0.7	2.7	356	795	-	-	1 151	
PU25	4.02	2	3 884	1 408	-	-	5 292	
PU26	3.39	2.89	4 014	1 637	1 834	-	7 485	
PU27	6.73	1.7	5 033	278	-	-	5 310	
PU28	3.02	0.5	2 112	-120	-	-	1 992	
PU29	4.93	6.4	4 516	2 940	-	-	7 455	

PU30	0.2	1	515	725	-	-	1 239	
PU31	1.32	1.5	1 566	1 065	-	-	2 631	
PU32	4.73	5.3	2 942	2 011	-	892	5 844	
PU33	3.38	4.7	3 799	2 834	-	-	6 633	
PU34	0.46	1.7	342	603	-	-	944	
PU35	6.72	6.5	2 500	701	1 952	-	5 153	
PU36	2.9	4.9	3 001	2 494	-	-	5 495	
PU37	3.97	5.5	3 509	2 368	-	-	5 877	
PU38	2.97	5.1	3 145	2 656	-	-	5 800	
PU39	2.41	4.3	896	559	-	-	1 455	
PU40	0.41	1.5	639	866	128	-	1 633	
PU41	3.3	4.8	3 116	2 252	-	-	5 368	
PU42	5.65	8.9	4 219	2 992	-	-	7 210	
PU43	3.05	6.2	4 197	4 051	-	-	8 248	
PU44	0.83	6.5	1 481	3 222	-	-	4 702	
PU45	0.51	2.5	2 510	3 027	-	-	5 536	
PU46	2.79	8.5	3 380	4 293	-	-	7 673	
PU47	1.83	3.9	1 616	1 595	-	-	3 211	
PU48	0.2	7.3	1 088	3 629	-	-	4 716	
PU49	2.16	3.6	1 348	1 625	-	673	3 646	
PU50	4.86	6.2	3 191	1 597	-	-	4 787	

The cells highlighted in yellow show the production units that satisfy only one or two conditions. Those highlighted in green show the production units that are categorized as "small-scale food producers" according to the methodology described in Section 2, with the combination of the three criteria.

Computing SDG indicator 2.3.1

Having identified smallholders and computed their annual revenues, it is possible to compute the indicator 2.3.1 if information on their labour input in terms of number of labour days per year is also available.

Production unit Number	Total Annual Revenues ($ PPP constant prices)	Days of work per year (number)	Output per labour day (at constant prices)
PU2	1 188	127	9.354
PU8	536	84	6.381
PU12	1 697	203	8.360
PU13	1 844	134	13.761
PU14	1 591	145	10.972
PU18	2 251	207	10.874
PU20	2 277	186	12.242
PU21	306	28	10.929
PU22	282	35	8.057
PU24	1 151	116	9.922
PU30	1 239	174	7.121
PU31	2 631	286	9.199
PU34	944	106	8.906
PU39	1 455	154	9.448
PU40	1 633	198	8.247
PU47	3 211	347	9.254
PU49	3 646	406	8.980

Based on the table above, the value of SDG Indicator 2.3.1 for Smallscalestan is 9.53, corresponding to the average of the last column on the right-hand side. Assume now that this value, based on the above calculation is referred to a baseline year, such as 2018, and that the same exact set of calculations are repeated in year 2025, yielding a value of 15.25. This implies that Smallscalestan marks progress in SDG indicator 2.3.1 of 60.0 per cent. Given that target 2.3. aims to double the agricultural productivity of small-scale food producers by 2030, the value of indicator 2.3.1 for Smallscalestan should reach at least a level of 19.0 by that year. The percentage increase in the average aggregate value of production at constant price is, in fact, equivalent to a volume change in the output.

Computing SDG indicator 2.3.2

This indicator requires the computation of production costs, to be deducted from revenues. An example of the calculation of the income of small-scale producer is reported in the table below, as the difference between revenues and costs.

Production unit Number	Total Annual Revenues ($ PPP constant prices)	Total annual Costs ($ PPP constant prices)	Annual income ($ PPP constant prices)
PU2	1 188	335	853
PU8	536	174	362

PU12	1 697	540	1 157
PU13	1 844	653	1 191
PU14	1 591	358	1 233
PU18	2 251	642	1 609
PU20	2 277	683	1 594
PU21	306	99	207
PU22	282	93	189
PU24	1 151	294	857
PU30	1 239	342	897
PU31	2 631	742	1 889
PU34	944	306	638
PU39	1 455	463	992
PU40	1 633	578	1 055
PU47	3 211	722	2 489
PU49	3 646	1 039	2 607

Based on the above Table, the value of SDG Indicator 2.3.2 for Smallscalestan is $1 166 in constant PPP terms, corresponding to the average of the last column on the right-hand side. Assume now that this value, based on the above calculation is referred to a baseline year, such as 2018, and that the same exact set of calculations are repeated in year 2025, yielding a value of 1 575 PPP$ at constant prices. This implies that Smallscalestan marks progress in SDG indicator 2.3.2 of 35.1 percent and fulfills the goal. Given that Target 2.3. aims to double the income of small-scale food producers by 2030, the target value of indicator 2.3.2 for Smallscalestan is a level equal or greater than $2 332 in PPP terms at constant prices by that year. In this case, the percentage increase in income is computed at constant price as the target can reasonably be assumed to refer to doubling real incomes, net of inflation.

Contact:

Statistics Division (ESS)
The Food and Agriculture Organization of the United Nations
Viale delle Terme di Caracalla
00153 Rome, Italy

www.fao.org/economic/ess/workingpapers

FAO-statistics@fao.org