Food and Agriculture Organization of the United Nations

SDG Indicator 2.4.1

PROPORTION OF AGRICULTURAL AREA UNDER PRODUCTIVE AND SUSTAINABLE AGRICULTURE

METHODOLOGICAL NOTE

~~Third~~ Fourth revision

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Contents

1. Introduction: 54

Background on SDG indicators 54

Target 2.4: Sustainable agriculture 54

2. Process for developing SDG indicator 2.4.1 54

3. Methodology for constructing the indicator 75

Steps involved in constructing the indicator 76

Characteristics of Indicator 2.4.1 86

Measurement scope: the focus is on agricultural production 87

Spatial scope: the denominator 108

Farm typology and scope 118

Data collection instrument 119

Defining themes and sub-indicators 119

Assessing productivity and sustainability performance through each sub-indicator 1411

Periodicity 1412

Sampling design 1512

Reporting the indicator 1512

Use of alternative data sources to construct the indicator 1814

4. References 2017

Annex: Themes, sub-indicators and metadata sheets 2218

1. Farm output value per hectare 2319

2. Net Farm Income 2521

3. Risk mitigation mechanisms 2824

4. Prevalence of soil degradation 2925

5. Variation in water availability 3127

6. Management of fertilizers 3329

7. Management of pesticides 3531

8. Use of agro-biodiversity-supportive practices 3933

9. Wage rate in agriculture 4336

10. Food Insecurity Experience Scale (FIES) 4437

11. Secure tenure rights to land 4639

1. Introduction: 4
Background on SDG indicators 4
Target 2.4: Sustainable agriculture 4
2. Process for developing SDG indicator 2.4.1 4
3. Methodology for constructing the indicator 5
Steps involved in constructing the indicator 5
Characteristics of Indicator 2.4.1 6
Data collection instrument 9
Defining themes and sub-indicators 9
Assessing sustainability performance for each sub-indicator 12
Periodicity 12
Sampling design 12
Reporting the indicator 13
Use of alternative data sources to construct the indicator 15
4. References 16
Annex: Themes, sub-indicators and metadata sheets 18
1. Farm output value per hectare 19
2. Net Farm Income 21
3. Risk mitigation mechanisms 23
4. Prevalence of soil degradation 24
5. Variation in water availability 26
6. Management of fertilizers 28
7. Management of pesticides 30
8. Use of biodiversity friendly practices 32
9. Wage rate in agriculture 34
10. Food Insecurity Experience Scale (FIES) 35
11. Secure tenure rights to land 37

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1. Introduction:

Background on SDG indicators

In September 2015, the United Nations General Assembly adopted the 2030 Development Agenda and an associated 17 Sustainable Development Goals (SDGs). The resultant SDGs are accompanied by 169 targets under the various goals and a set of 232 indicators to monitor progress toward the SDGs. Responsibility for the development of indicators is given to the United Nations Statistical Commission (UNSC), which established an Inter-Agency and Expert Group ~~for~~on SDG indicators (IAEG-SDG) comprising 28 member countries.

While the international system of official statistics is embodied in the UNSC and member countries, in practice the measurement and international reporting of the comprehensive set of SDG topics is coordinated through a range of international agencies. These agencies, including the OECD, WHO, FAO, IMF, World Bank, ILO, have developed statistical and measurement expertise in the particular areas that fall within their broader roles. Under the auspices of the IAEG-SDG, various agencies were given "custodianship" for the finalization of the appropriate indicators for the different SDG targets and for the co-ordination of data collection following endorsement of the indicators, including leading the co-ordination with other international agencies. FAO was given custodianship of 21 indicators across six SDGs.

Among the large number of SDG indicators, some ~~of the indicators~~ are based on currently established methods and data (Tier I); others have methods but data collection is more limited (Tier II); and finally there are indicators for which agreed definitions and methods need to be developed (Tier III). The indicator for sustainable agriculture currently falls into the Tier II~~I~~ category. ~~The development of the methods described in this document support the consideration of this indicator as a Tier II indicator.~~

Target 2.4: Sustainable agriculture

This document focuses on the indicator for Target 2.4, one of eight targets under SDG 2: "End hunger; achieve food security and improved nutrition and promote sustainable agriculture". Specifically, Target 2.4 is to "By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality."

2. Process for developing SDG indicator 2.4.1

Led by FAO and in collaboration with the Global Strategy to improve Agricultural and Rural Statistics (GSARS), work progressed through 2015~~-~~-18 to establish a methodology to measure progress towards achieving Target 2.4. A two-page methodology note ~~was~~, endorsed by the IAEG-SDG in March 2016~~. The methodological note~~, described, in broad terms~~,~~ an approach to the measurement of this indicator of which the most challenging aspect is the definition of productive and sustainable agriculture.

Through 2016 research focused on a broad ranging literature review on "Frameworks and Methods for Measuring and Monitoring Sustainable Agriculture" (Hayati, 2017) conducted by the GSARS. A key aspect of all approaches to measuring sustainable agriculture is the recognition that sustainability is a multi-dimensional concept, ~~and that these multiple dimensions~~which therefore need to be reflected in the construction of the indicator.

A technical meeting was convened in December 2016 involving a number of experts in sustainable agriculture to establish priority areas for measurement for indicator 2.4.1. The results ~~of that meeting~~ were drawn together to complete a first draft of the methodological paper. That draft was presented to the February 2017 meeting of the Scientific Advisory Committee (SAC) of the GSARS.

Utilizing their feedback, an updated draft was completed to support discussion at an Expert Group Meeting (EGM) ~~on indicator 2.4.1~~ held in Rome from 3-5 April, 2017. The EGM gathered ~~agriculture~~

agricultural statisticians from eight countries ~~across~~ in all regions, civil society and private sector representatives, as well as thematic experts from academia and from FAO Technical Departments. The purpose of the EGM was to review the methodology developed and to provide guidance on the approach, the dimensions, themes and sub-indicators offered for discussion, as well as the modalities to construct Indicator 2.4.1.

A key aspect in the development of the method was the selection of relevant themes, sub-indicators and the sustainability criteria for each sub-indicator. Following the EGM, detailed descriptions of methods for sub-indicators across all three dimensions of sustainability – economic, environmental and social – were developed and the methodological document was further refined. On the basis of research and discussion, in particular involving engagement with thematic experts, a set of documents was developed to support desk testing of the indicator in selected countries.

In October 2017, the methodological documents were submitted to an online global consultation, inviting all National Offices in charge of agricultural statistics to provide their comments.

In November 2017, the methodology was submitted to the IAEG-SDG at its 6th Meeting in Bahrain. The recommendations of the IAEG-SDG were to wait for the results of the country pilots and re-submit the methodology after having taken their results into account. In addition, the IAEG-SDG provided a series of comments on the approach and methodology.

Pilot desk studies were carried out in Bangladesh, Ecuador, ~~the~~ Kyrgyz Republic and Rwanda during the last quarter of 2017, and in Belgium in early 2018. The goal was to test the proposed approach and review the metadata sheets for the respective indicators to: 1) assess its clarity and completeness; 2) take stock of what data are available at a country level; and 3) verify whether the indicator can be constructed using the information already available at the country level. Results are presented in separate reports. In April 2018, participants from the five pilot countries gathered in a technical meeting at FAO to present the results of their desk studies and work out modifications to the methodological document with the team in charge of SDG 2.4.1 development. In 2018-19, cognitive tests of the standalone survey questionnaire developed for SDG 2.4.1 were carried out in Kenya, Mexico and Bangladesh. In collaboration with the Bangladesh Bureau of Statistics, a full scale pilot test to collect data on the survey questionnaire was completed in 2019.

Results from the global consultation, ~~from~~ the IAEG-SDG, and ~~from~~ the country pilots were reviewed and analyzed, and the approach was modified in order to address the issues identified through these processes, resulting in a first revision of the methodology document, dated 22 May 2018. This version was shared with the members of the IAEG-SDG, and two subsequent webinars were organized to present the methodology and discuss IAEG-SDG questions and comments. Member countries were then invited to provide their comments in writing.

All country contributions were then analyzed and used in the preparation of a ~~second~~ ~~revised~~ ~~revision~~final draft, which~~that~~ ~~-~~was submitted to the IAEG-SDG in October 2018 for its approval and endorsement. The decision to upgrade the indicator from Tier III to Tier II was taken in the 8th meeting of the IAEG-SDG in November 2018. Additional comments were received from~~by~~ c~~C~~ountries during the period Jan-Apr 2019, aimed at further refining SDG 2.4.1 m~~M~~ethodology in view of the open revision process under the IAEG-SDG. This ~~May~~ October ~~27~~11 2019 d~~D~~raft represents minor modifications that were implemented by FAO in response to those comments.~~This means that the methodology proposed by FAO to measure progress towards SDG Target 2.4 is~~has ~~now formally endorsed.~~

~~Now that the indicator is Tier II (i.e. the methodology is approved and endorsed), t~~The next phase ~~is to collect and report data on the indicator and gradually upgrade it as Tier I over time. The ability of countries to collect, analyze and report statistics on this indicator is seen as a game changer for the entire sustainability agenda, and will require substantial investment and creative solutions in order to make it function at regime. To this end,~~ FAO will be working with countries in the ~~the efforts of FAO~~

~~to support its member countries measure and monitor indicator 2.4.1. is a pioneering effort, as it strives to measure progress towards sustainable agriculture across 11 sub-indicators of economic, social and environmental sustainability of farms around the world. The current phase of FAO work is to collect~~ collection and reporting data on ~~the indicator~~SDG 2.4.1, in order ~~and gradually ensure most countries are able~~ to support countries in ~~to~~ produce ~~it~~ing it and use~~ing~~ it for national policy analysis as well as for SDG reporting. ~~The methodology presented in this document is the result of the above process.~~

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3. Methodology for constructing the indicator

Note: The following terminology has been used in this document:

- **Indicator**: Overall measure of sustainable agriculture.
- **Dimension**: The dimensions of sustainability: economic, environmental, social.
- **Themes**: Specific areas within a dimension (e.g. land productivity, biodiversity, decent employment, etc.)
- **Sub-indicator**: Variable used to measure performance of the farm in relation with a given theme.
- **Sustainability criteria**: Critical/thresholds values against which the performance of each sub-indicator is assessed to classify the farm in terms of the sustainability level.

Steps involved in constructing the indicator

The following steps were used to ~~D~~derive~~ing an~~ the indicator for sustainable agriculture ~~involves several steps~~. Although these steps are presented in a linear fashion, in practice, a degree of iteration was required through ~~processes of~~ extensive discussion and ~~investigation~~research. This is especially the case for steps 3, 5 and 6 below in which the description of the relevant approach for assessing sustainability performance depends on the sub-indicator, but at the same time, the choice of sub-indicator ~~will likely be~~is closely informed by the data collection instrument:

1. Determining the **scope** of the indicator: The scope of Indicator 2.4.1 is the agricultural farm holding, and more precisely the agricultural land area of the farm holding, i.e., land used primarily to grow crops and raise livestock. ~~The focus of choice made for indicator 2.4.1 is to focus on crops and livestock production.~~ ~~t~~~~T~~~~hus~~~~The scope~~ ~~is includes~~ ~~excluding~~~~include~~ ~~f~~Forestry, fisheries and aquaculture activities may be included to the extent that they are secondary activities conducted on ~~but to the extent it take place in~~ the agricultural area of the farm holding, for example rice-fish farming and similar systems.~~.~~
2. Determining the **dimensions** to be covered: ~~The choice made for i~~Indicator 2.4.1 ~~is to~~ includes environmental, economic and social dimensions in the sustainability assessment.
3. Choosing the **scale** for the sustainability assessment: ~~The choice made for i~~Indicator 2.4.1 is farm level with aggregation to higher levels.
4. Selecting the data collection **instrument(s).** It is recommended that indicator 2.4.1 be collected through a farm survey.
5. Selecting the **themes** within each dimension, and choosing a **sub-indicator** for each theme. The sub-indicators should satisfy a number of criteria (described ~~below~~in annex 1 for each sub-indicator, respectively).
6. Assessing **sustainability performance at farm level for each sub-indicator**: Specific sustainability **criteria** are applied in order to assess the sustainability level of the farm for each theme according to the respective sub-indicators.
7. Deciding the **periodicity of monitoring the indicator**. It is recommended to be collected at least every three years.

8. **Modality of reporting the indicator.** The set of sub-indicators are presented in the form of a **dashboard**. The dashboard ~~described above~~ approach offers a response in terms of measuring sustainability at farm level and aggregating it at national level.

Characteristics of Indicator 2.4.1

~~The methodology note endorsed by the IAEG-SDG defines the~~ Indicator 2.4.1 is defined as "Proportion of agricultural area under productive and sustainable agriculture", which is expressed by the following formula:

$$SDG2.4.1 = \frac{Area\ under\ productive\ and\ sustainable\ agriculture}{Agricultural\ land\ area^{3}\cancel{,4}}$$

This implies the need to measure both the extent of land under productive and sustainable agriculture (the numerator), as well as the extent of agricultural land area ~~under agriculture~~ (the denominator). The ~~nominator~~ numerator is the subject of this note, and its computation is described in the sections "Assessing sustainability performance for each sub-indicator" and "Reporting the indicator at national level". The denominator, in turn, ~~is a function of the scope of the indicator, which is discussed in the following section. It is the agricultural land area managed by agricultural holdings, defined as~~is the sum of the agricultural land area (as defined by FAO) utilized by agricultural holdings that are owned (excluding rented-out), rented-in, leased, sharecropped or borrowed[2].~~.~~

The methodological note further indicates that the construction of the indicator must respect the following conditions:

- The indicator must reflect the priorities as they are expressed in the SDG target 2.4. and therefore to consider issues related to resilience, productivity, ecosystem maintenance, adaptation to climate change and extreme events, and soils.
- The preferred data source is the farm survey.
- The need to define productive and sustainable agriculture implies the use of criteria to distinguish between sustainable and unsustainable areas.

Measurement scope: the focus is on agricultural production

The scope of Indicator 2.4.1 is the agricultural farm holding, and more precisely ~~focuses on~~ the agricultural land area of the farm holding, ~~and therefore~~i.e., ~~primarily on~~ land ~~that is~~ used primarily to grow crops and raise livestock. This choice of scope is fully consistent with the intended use of a country's agricultural land area as the denominator of the aggregate indicator.

More precisely~~, the following paragraphs indicate what is included and excluded from the scope of the indicator in terms of activities and areas~~:

Included within ~~the~~ scope~~:~~

- I~~Both i~~ntensive and extensive crop and livestock production systems ~~(including intensive livestock production).~~
- Subsistence agriculture~~.~~
- State and common land when used exclusively and managed by the farm holding~~.~~
- Food and non-food crops and livestock products (~~example~~ e.g., ~~crops such as~~ tobacco, cotton, ~~and livestock raised for non-food products like~~ sheep ~~for~~ wool)~~.~~
- Crops grown for fodder or for energy purposes~~.~~

~~[3] State and common land not used exclusively by the agriculture holding areis not included in the scope are excluded from the scope.~~
~~[4] State or communal land used by farm holdings is not included, see discussion in section "Spatial scope: the denominator"~~

- Agro-forestry (trees on the agricultural land area of the farm).
- Aquaculture, to the extent that it takes place within the agricultural land area. For example, rice-fish farming and similar systems.

Excluded from the scope:

- State and common land not used exclusively by the agriculture farm holding (see next section).
- Nomadic pastoralism.
- Production from gardens and backyards. Production from hobby farms[3].
- Holdings focusing exclusively on aquaculture.
- Holdings focusing exclusively on forestry Forest and other wooded lands, when not part of an agricultural holding.
- Food harvested from the wild.

Beyond defining the measurement boundary for agricultural production, the following considerations are also to be noted:

First, from an environmental perspective, the scope of the indicator focuses on the environmental impacts of farming within the farm gate, i.e. the direct impacts that farming practices, farmer choices and farming methods have on the environment. This implies that all possible impacts that are beyond this scope are not considered. One case considered outside the scope of the indicator, fFor example, Note however that, in this specific case, the decline in soil health or water pollution within the farm holding due to nutrient imbalance is within scope, of indicator 2.4.1, but

, is land- use change, specifically the conversion from natural vegetation to agricultural land, is not in scope, in particular the transformation from natural vegetation to agricultural land.

From a social perspective, the approach also focuses on farming as a source of livelihood. Thus, the social impact of farming activities in terms of household livelihood and food security is included. Access to productive resources, including land, is considered, as it impacts directly the performances of agriculture, but access to basic services, for instance (food? water, education, health care) for farm households[4] is considered outside of the scope of the assessment.

In terms of food agricultural value chains, the scope of the assessment stops at the farm gate. Itthe scope being within the farm gate, the indicator does not extend to the sustainability of the transportation, storage, processing, distribution and marketing of agricultural products. Rather, – the agricultural value chain – although it is accepted that the efficiency and effectiveness of the delivery of these services may be significant in assuring the provision of food. Of particular relevance here is the issue of food waste, which, for varying reasons depending on the country, is likely to be a significant issue in the assessment of sustainable provision of food. SDG 12 addresses the issue of sustainable consumption and production of food, and specific indicators exist to capture sustainability in the value chain.

Likewise, the proposed approach does not take into consideration the sustainability of supply chains that provide inputs to agricultural production. For example, the availability and cost of fertilizers will not be captured except to the extent that they affect farm profitability or soil health. Note however

[3] A task team has been created by FAO on request by countries to define hobby farms consistently. The proposal on definition once developed will be discussed in the next meeting of the UNSC. In the meanwhile it has been agreed that countries will The countries will define hobby farms as per their national criteria and remove these farms from the population of interest for 2.4.1. SDG indicators until an international definition is available.

[4] The definition of farm household is based on the standard set by the World Census of Agriculture 2020 (See chapter 26: http://www.fao.org/3/a-i4913e.pdf) . See chapter 26: http://www.fao.org/3/a-i4913e.pdf

~~that, in this specific case, the decline in soil health or water pollution due to nutrient imbalance is within scope of indicator 2.4.1.~~

Finally, the impacts of ~~agricultural production~~food systems on the health of end-consumers and their dietary outcomes (except for the farm household itself) is outside the scope of the indicator.

Spatial scope: the denominator

An important aspect is to determine the total agricultural land area of a country to be used as denominator ~~and the conceptual scope for the sustainability assessment~~for SDG 2.4.1. Agricultural land ~~area~~ is defined by FAO as the sum of ~~arable land plus and the land dedicated to permanent crops~~cropland (arable land plus permanent crops) and~~,~~ ~~plus~~ permanent meadows and pastures (FAOSTAT Land Use, Irrigation and Agricultural Practices Questionnaire, 2018; SEEA AFF, 2018)~~[5]~~. National level statistics are collected by FAO from member countries and disseminated in FAOSTAT. Two practical points need to be considered:

- determining the extent to which the coverage and design of the farm survey encompasses the entire agricultural land area;
- determining the extent to which the total ~~area of~~ land area under the management of farmers (the agricultural farm holding) is different from the associated agricultural land areas. The agricultural holding may be larger than the agricultural land area because it can also include for example, areas left for conservation, farm buildings, etc.

For the purpose of calculating the indicator, the statistical unit is ~~necessarily~~ the ~~agricultural~~ farm holding to which an agricultural land area is associated. Sustainability for each sub-indicator is likewise assessed at the level ~~of the agricultural holding (i.e. farm level) and then associated with~~of the agricultural land area of the farm~~at~~ holding.

Particular consideration must be given to common land that cannot be clearly associated with a particular ~~agricultural~~ farm holding. In some regions, these lands may represent a large percentage of agricultural land areas. This is relevant in many countries ~~in which~~where a significant number of farmers, with or without land, rely on livestock farming using common lands (pastoralists, agro-pastoralists).

In line with the World Census of Agriculture, as well as consistently with the farm survey instruments selected to measure indicator 2.4.1 (next section), c~~C~~ommon land is included ~~in the~~from scope insofar as it can be associated with and is under the exclusive control of a particular ~~agricultural~~ farm holding. ~~What is outside the scope of the indicator are large a~~Areas of land that are not managed but used by different ~~agricultural~~ farm holdings without any management arrangement are out of scope of indicator 2.4.1.

~~The FAO definition of total agricultural land area includes these common lands that are a part of *permanent meadows and pastures*. However, the scope of indicator 2.4.1 is to capture to what extent producers make use of the land under their direct control in a sustainable way, and several of the proposed sub-indicators imply a certain level of control on the land. Furthermore, the global area of common land represents a large share of agricultural land area. Including common lands in the calculation of agricultural sustainability would therefore substantially bias substantially the results at country, regional and global levels. Pilot studies have recommended to exclude common land from the survey and focus on agricultural holdings only. This is also in line with the instrument selected to measure indicator 2.4.1 (the next section). In conclusion the denominator for indicator 2.4.1 has been modified as agricultural land area minus common land the agricultural land area in the denominator of SDG 2.4.1 refers to the FAO definition of total agricultural land area applied to an agricultural holding (minus state or common land). This decision needs to be considered in the broader framework~~

~~[5] The national level statistics are collected by FAO from member countries and disseminated in FAOSTAT.~~

~~of the full set of SDG indicators, considering in particular the indicator associated with SDG Target 15.3.~~

Farm typology and scope

In some developed countries, ~~agricultural~~ farm surveys limit their coverage to farms with a value of operations above a certain monetary threshold in order to exclude hobby farmers. In developing countries, applying this threshold would tend to exclude smaller and subsistence farms whose contribution to total agricultural area and overall sustainability may be substantial. This methodology requires that all types of agricultural holdings be taken into consideration, with the exception of hobby farms, and considering the scope as described above.

Data collection instrument

~~An earlier version of the methodology suggested a combination of different data collection instruments to monitor the various sub-indicators. In the consultations undertaken, however, several countries did highlight the difficulties in combining data from different sources and requested that this be avoided to the extent possible.~~ This ~~revised~~ methodology is based on the farm survey as main data collection instrument for all sub-indicators, but it also discusses the possibility of using a combination of different data sources as an alternative option for those countries wishing to do so.

By focusing on the ~~agricultural~~ farm holding and its~~the~~ agricultural land area ~~associated with it~~, the farm survey offers an opportunity for collecting data through a single instrument for Indicator 2.4.1. This decision is in line with countries' efforts, supported by FAO, to develop farm surveys as the most appropriate tool for generating agricultural statistics. ~~It also benefits from the FAO work in developing the Agricultural Integrated Survey (AGRIS) programme, which has been recently finalized.~~

The decision to focus on a farm survey has implications for~~on~~ the type of information that ~~it~~ is possible to capture in order to cover the different dimensions of sustainability. While farm surveys are well suited to measure the economic dimension of sustainability, they may not be the ideal tool for measuring environmental and social sustainability in terms of impact/outcomes.

Typically, environmental impacts of agriculture are measured through monitoring systems like remote sensing, soil and water sampling, or other tools associated with a specific area, rather than within a single agricultural holding. For several environmental themes, it is unlikely that farmers would be able to assess the environmental impact of their farming practices on issues like fertilizer pollution or pesticide ~~impact~~use. Using ~~a~~ farm survey ~~instrument,~~ instead of environmental monitoring systems~~,~~ therefore implies moving from measuring outcome/impact to assessing farmers' behavior. Whenever possible, however, the revised methodology continues to focus on measuring outcomes.

The information in ~~the sub-themes under the that are part of~~ the social dimension sub-themes is~~are usually best~~ generally captured through household surveys. While in the majority of cases agricultural farm holdings are closely associated with a given household, this is not always the case, and therefore ~~capturing the social dimension of sustainability through a farm survey poses certain challenges~~care must be given to capturing this information through dedicated survey design.

Defining themes and sub-indicators

Selecting themes

The literature review (Hayati, 2017) identified a large number of potential sustainability themes across the three dimensions of sustainability and, for each theme, usually a large number of possible sub-indicators. The key considerations in the selection of themes are relevance and measurability. In terms of relevance, the relationship between the associated sub-indicator and sustainable agriculture outcomes at farm level should be strong. Following this approach, only sub-indicators that are responsive to farm level policies aimed at ~~improving~~ productive and sustainable agriculture are

considered. In terms of measurability, only a "core" set of themes and sub-indicators, for which measurement and reporting is expected in the majority of countries, are selected.

Two points deserve to be mentioned. First, there are many relevant subthemes and sub-indicators but, from an operational point of view, it is ~~impossible~~ unfeasible to consider all of them in order to measure progress towards productive and sustainable agriculture. The subject is too complex, and the factors influencing sustainable agriculture ~~are~~ too diverse across countries, for reaching a consensus on an indicator that covered~~s~~ all sustainability issues while remaining manageable and universally valid. ~~. FAO therefore proposes to m~~Measurement of indicator 2.4.1 is therefore operationalized through a core set of 11 themes for global reporting purposes. Countries may consider including **additional themes** to ensure that their national indicator for productive and sustainable agriculture is relevant for national policy-making, ~~but for the sake of SDG reporting, and~~yet to ensure international coherence, they are requested to report globally on Indicator 2.4.1 by using the core set of 11 sub-indicators associated with the 11 themes.

Second, the selection of themes for this indicator must be seen in the context of other SDG indicators that cover the full range of economic, environmental and social themes associated with sustainable development. This is especially important when recalling that, for Indicator 2.4.1, the intention is to focus on a farm level assessment of sustainable agriculture, rather than provide information to support a more generalized discussion on the contribution of agricultural activity to various economic, environmental and social outcomes.

Criteria for selecting sub-indicators

Selecting the most appropriate sub-indicator for each theme is a distinct step in the process. For any given theme, ~~indeed,~~ there may be multiple sub-indicators that are relevant and/or measurable. Consequently, in selecting the sub-indicators for indicator 2.4.1, the following six key criteria have been considered:

- ***Policy relevance***: the indicator must be easily understood (reasons why it is selected) and the results easily interpreted by policy makers (is agricultural productivity and sustainability ~~decreased~~ increased and why? Which policies needs to be implemented to address the issue?).
- ***Universality***: the indicator must be relevant for all countries in the world, both developing and developed.
- ***International comparability***: the way indicators are computed must ensure comparability across countries in order to ensure global reporting. Comparability, however, does not necessarily mean the use of absolute standards. For instance, agricultural wages may be compared with the national minimum wage rate, even if these wage rates vary from one country to another. Similarly, compliance with national environmental standards or nationally recognized certification systems can be considered in computing environmental sub-indicators, even if national criteria vary from one country to another.
- ***Measurability***: many themes are important productivity and sustainability issues but their measurement is difficult, complex or would involve costs that cannot be sustained in the framework of a regular monitoring exercise. To the extent possible, alternative measures have been proposed to maintain indicators that are considered relevant while offering feasible measurement solutions.
- ***Cost effectiveness***: cost effectiveness is related to measurability. The cost associated with indicator measurement have systematically been considered in relation with the accuracy and reliability of the results obtained through different measurement options.
- ***Minimum cross-correlation between sub-indicators***: ~~In selecting a limited~~The set of eleven themes and sub-indicators~~, efforts were made to reduce~~ are meant to have low cross-correlation between ~~different sub-indicators~~them. High cross-correlation ~~between sub-indicators~~ would imply that two or more sub-indicators capture the same sustainability issue.

In this case, the inclusion of one single sub-indicator, instead of several, would be sufficient to adequately measure agricultural sustainability performances.

Sub-indicators may be of five broad types~~. They may be~~:

- **Impact/outcome** indicators that record what the state or change in state of environmental, economic and social factors and associated flows of benefits or costs.
- **Awareness** indicators record the level of awareness and knowledge of interviewed persons in relation with a given sustainability issue. Awareness is considered a prerequisite step towards addressing sustainability issues.
- **Behavior** indicators that capture peoples' attitudes in relation to a given sustainability issue. While behavior is influenced by awareness, the two can also be disconnected.
- **Practice** indicators that measure specific and codified agricultural methods applied on a farm.
- **Perception** indicators that record peoples' views about a specific issue.

For the purposes of SDG reporting and consistent application across countries, it is considered that impact/outcome indicators should be the preferred focus of measurement: if an outcome can be measured, it is the most objective way to measure performance~~s~~ in relation ~~with~~ to a given sustainability theme. In the absence of the possibility to measure outcomes, capturing farm behavior through carefully crafted questions~~,~~ can be considered ~~acceptable~~ sufficient proxies to assess sustainability performances.

In general however, measuring sustainability performance~~s~~ through farm practices presents several challenges. The impact of a given practice often varies from one place to another, and from one farm type to another, and what can be considered sustainable in one setting may not be suitable in another. Care should be taken, therefore, when proposing indicators on practices to ensure that they are universally relevant in relation with the sustainability issue they are meant to address.

Perception indicators should be used carefully and are not considered to be amenable to the measurement of many sustainability themes as they offer a level of subjectivity hardly acceptable in the computation of an indicator like indicator 2.4.1.

List of sub-indicators

~~The proposed list of themes and sub-indicators was obtained through a series of multistakeholder consultations, and on the basis of the above criteria.~~ The list of selected themes and sub-indicators is provided in Table 1. In total 11 themes are included. The methodology for the compilation of the sub-indicators and for defining the associated sustainability criteria is described in detail in Annex 1. Annex 1 also lists the minimum set of data items needed to produce the relevant information for the sub-indicator. Moreover, questionnaire modules that contain the minimum set of questions needed to measure each sub-indicator at farm level have also been designed. These questions can be integrated into existing farm surveys for ensuring a comprehensive assessment of indicator 2.4.1.

Table 1: Revised list of themes and sub-indicators (see definitions in Annex and supporting documents)

No.	Theme	Sub-indicators
1	Land productivity	Farm output value per hectare
2	Profitability	Net farm income
3	Resilience	Risk mitigation mechanisms
4	Soil health	Prevalence of soil degradation
5	Water use	Variation in water availability
6	Fertilizer pollution risk	Management of fertilizers
7	Pesticide risk	Management of pesticides
8	Biodiversity	Use of agro-biodiversity ~~friendly~~supportive practices

9	Decent employment	Wage rate in agriculture
10	Food security	Food insecurity experience scale (FIES)
11	Land tenure	Secure tenure rights to land

Whenever the farm survey focuses on understanding levels of awareness, farmers' behavior or, in some cases, practices or perception, the questions are crafted in a way ~~in order~~ to maintain~~that they keep~~ their universal relevance, to the extent possible.

Assessing productivity and sustainability performance ~~for~~ through each sub-indicator

For each sub-indicator, criteria to assess sustainability levels are developed. The concept of sustainability implies an idea of continuous progress and improvement towards ~~better~~ improved performance~~s~~ across all themes, ~~and such performances~~ which can therefore be individually more or less sustainable. In order to capture the concept of continuous progress towards sustainability, a 'traffic light' approach is proposed, in which three sustainability levels are considered for each sub-indicator:

- Green: desirable
- Yellow: acceptable
- Red: unsustainable.

While a certain level of subjectivity is unavoidable, this approach allows identification, for each theme, of conditions of critical unsustainability (red), conditions that can be considered 'ideal' (green) and, in between, intermediate conditions that are considered 'acceptable' but would need to be scrutinized in terms of possible improvements (yellow). This approach also acknowledges the trade-offs ~~existing~~ that exist between sustainability dimensions and themes, and the need to find an acceptable balance between them.

Each sub-indicator is assessed at the level of the agricultural farm holding. The sustainability level is then associated with the agricultural land area of the agricultural holding. All sub-indicators for a given agricultural farm holding ~~therefore~~ refer to the same underlying agriculturale land area.

Progress towards productive and sustainable agriculture: managing trade-offs across sustainability objectives

Achieving productive and sustainable agriculture is a progressive process of identifying and striking a balance between agriculture's social, economic and environmental objectives. This process reflects the evolution of society's knowledge, ~~-~~which has an impact on how sustainability goals and priorities are set in practices. Assessment of agricultural sustainability must therefore be seen as a dynamic process subject to periodic revisions. the traffic light approach helps defining the 'hard boundaries' of unsustainability for each theme, as well as desirable conditions, helping to assess trade-offs across the different sustainability themes. The criteria proposed in this methodology reflect current level of knowledge and broad consensus on sustainability conditions and practices for each sub-indicator. They should be revised periodically to reflect progressive changes in knowledge.

Periodicity

SDG Indicator 2.4.1 measures progress towards more productive and sustainable ~~and productive~~ agriculture. For many sub-indicators, it is likely that changes will be ~~relatively limited~~small from ~~a~~ one year to another. ~~Furthermore, the 3-year periodicity will enable countries to have three data points on the indicator before 2030.~~ It is therefore recommended that the survey be conducted every three

years. Furthermore, the 3-year periodicity will enable countries to have three data points on the indicator before 2030, assuming that they begin reporting in the early 2020s.

Sampling design

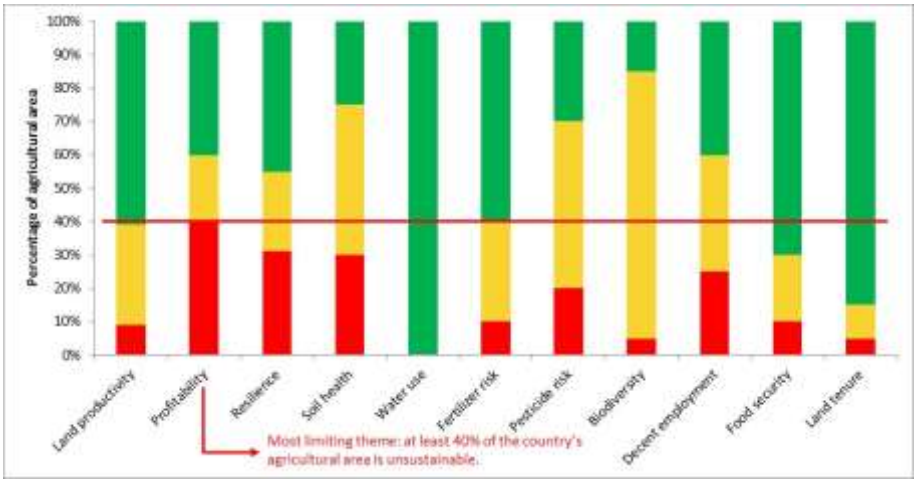
The farm survey's sampling design must respond to the need to capture the structure and the different typologies of agricultural farm holdings. In particular, it is important to develop a specific design for the holdings of the non-household sector (i.e. commercial farms, corporations~~…).~~ , etc.). A probabilistic sampling is required to allow the assessment of estimations errors and the extrapolation of the statistics using appropriate~~the~~ sampling weights. Stratification is recommended to improve the precision of the estimations and to produce disaggregated statistics. Possible stratification variables include agricultural farm holding types (household and non-household), agricultural production systems (e.g., crop, livestock, mixed) and other key elements to be considered (e.g.,~~;~~ irrigated/non irrigated cropland)~~; organic/non organic;~~ and taking into account sub-national specificities. This will allow reporting the indicator at national and sub-national levels and ~~estimate~~ estimating corresponding precisions.

Reporting the indicator

The final step in the sustainability assessment process is to report the results at sub-national and national level~~s~~. In order to ~~report results~~do so at a subnational level, ~~that~~ the level of possible geographical disaggregation should be that of the ~~a planned~~ sampling domains of the farm survey, to which the farm data can be extrapolated.

Reporting through a dashboard

The 2.4.1 ~~revised~~ methodology proposes ~~to focus~~ reporting of indicator 2.4.1 ~~on~~ through a national-level dashboard, ~~which presenting~~ presenting~~s~~ the different sub-indicators together but ~~separately~~independently~~. The dashboard is chosen for reporting the indicator, as sustainability is about finding an acceptable balance between its three dimensions. It~~. The dashboard approach offers several advantages, including the possibility of combining data from different sources and ~~clarity~~ identification ~~about~~ of ~~the main~~critical ~~un~~sustainability issues, facilitating ~~. The dashboard is chosen for reporting the indicator, as sustainability is about finding~~the search for ~~an acceptable~~a balance between the~~its~~ three sustainability dimensions. It~~; c~~. As a result, countries can easily visualize their performance in terms of the different sustainability dimensions and themes, and understand where policy efforts can be focused for future improvements ~~(see below)~~.



Example of dashboard for SDG Indicator 2.4.1

Computation of results and construction of the dashboard ~~is~~ are performed for each sub-indicator separately using the 'traffic light' approach already defined for each sub-indicator: ~~for each sub-indicator,~~ aggregation at national level is ~~done~~ performed for each sub-indicator independently, by summing the agricultural land area of ~~all~~ each agricultural holdings~~s~~ by sustainability category (red, yellow or green), and reporting the resulting national total~~ed~~ as percentage of the total national agricultural land area ~~of~~ of all agricultural farm holdings in the country ~~(minus the common land, as discussed earlier)~~.

In practice, the reported value of Indicator 2.4.1 is determined by the results of most-limiting sub-indicator in terms of sustainability performance (see example above).

Ideally, to obtain the proportion of agriculture area that is productive and sustainable, the assessment of sustainability should be made across all sub-indicators for each farm that is part of the sample. The farm would then be assigned a sustainability level that is the most constraining across all sub-indicators, and the results would then be aggregated at national level. In order to do this, geospatial information on the portion of each farm area associated to a certain sub-indicator should be known. This is not the case however for most of the farm-based survey approaches that may be used to implement this methodology. In fact, in the methodology of 2.4.1, the assessment of each sub-indicator at farm level is associated to the entire agricultural land area of the farm holding itself (see next sections).

It should therefore be noted that, while the national-level dashboard proposed offers a much easier tool for reporting the indicator 2.4.1, implementable across a variety of data collection methods, it will systematically over-estimate the proportion of agricultural area under productive and sustainable agriculture, compared to a farm-level dashboard approach. The reason is that different holdings will likely be categorized as unsustainable across different sub-indicators, however this information is lost by aggregating individually at national level. The total area considered 'unsustainable' will therefore likely be higher in reality than by performing nationally-aggregated limiting factors.

Computing Indicator 2.4.1 from the dashboard

~~The methodological note endorsed by the IAEG-SDG indicates that the sub-indicators are to be aggregated so as to be able~~in order to report progress towards sustainable agricultural at country level through a single measure.

~~Ideally, to obtain the proportion of agriculture area that is sustainable, the assessment of sustainability should be made across all sub-indicators for each farm that is part of the sample. The farm would then be assigned a sustainability level that is the most constraining across all sub-indicators, and the results would then be aggregated at the national level. However, this implies that a single data collection instrument (the farm survey) is used to collect information on all sub-indicators for a given agricultural area representative of the country's agricultural area. If different sources are used to collect information on the different sub-indicators (see next section), it is impossible to assess sustainability at the level of the farm holding.~~

~~In order to allow for the possibility to use alternative data sources, Indicator 2.4.1 is derived from the dashboard at country level, and is associated with the result of the sub-indicator that is most limiting sustainability performances. This is to check amongst all sub-indicators one that has~~ been categorized ~~as achieved the the least 'desirable + acceptable' sustainability level (or the highest level of unsustainability) at the country level (see example above).~~

T~~Respecting the 'traffic light' approach, t~~he ~~following~~ values for reporting indicator 2.4.1 can ~~then~~ be calculated as follows:

$$SDG241_d = \min_{n:1-11} (SI_{d\,n})$$

where:

$SDG241_d$ = proportion of agricultural land area that have achieved the 'desirable' level. ~~(estimated by excess, see note below)~~

$SI_{d\,n}$ = proportion of sub-indicator n that is classified as 'desirable'

min refers to the minimum level of $SI_{d\,n}$ at national level across all 11 sub-indicators

$SDG241_d$ is the proportion of agricultural area for which all sub-indicators are green.

$$SDG241_{a+d} = \min_{n:1-11} (SI_d + SI_a)_n$$

where:

$SDG241_{a+d}$ = proportion of agricultural land area that have achieved at least the 'acceptable' level (estimated by excess, see note below)

$SI_{d\,n}$ = proportion of sub-indicator n that is classified as 'desirable'

$SI_{a\,n}$ = proportion of sub-indicator n that is classified as 'acceptable'

min refers to the minimum level of ($SI_{d\,n}$ + $SI_{a\,n}$) at national level across all 11 sub-indicators

$SDG241_{a+d}$ is the proportion of agricultural area for which all indicators are either green or yellow, an acceptable situation, but that could be improved.

$$SDG241_u = 1 - SDG241_{a+d} = \max_{n:1-11} (SI_{u\,n})$$

where:

$SDG241_u$ = proportion estimated by default of agricultural area that is 'unsustainable' (see note below)

$SI_{u\,n}$ = proportion of sub-indicator n that is classified as 'unsustainable'

max refers to the highest value of $SI_{u\,n}$ across all 11 sub-indicators at national level

$SDG241_u$ = is the proportion of agricultural area for which at least one sub-indicator is unsustainable, and is therefore classified as unsustainable.

The performances of countries over time can be measured by the change in the value of $SDG241_d$ and $SDG241_{a+d}$. An increase over time indicates improvement, while decrease indicates degradation.

~~Note: It should be noted that the choice of using the results of the dashboard at national level to compute Indicator 2.4.1. rather than compiling results at farm level and aggregating them further at national level will systematically over-estimate the proportion of agricultural area under sustainable and productive agriculture. The reason is that it is more likely the probability is high that different holdings will perform badly (red)be categorized as unsustainable across sub-indicators. in terms of different sub-indicators. The total area considered 'unsustainable' will therefore likely be higher in reality than by looking at the limiting factor aggregated at national level through the dashboard. This shortcoming is compensated by the higher level of flexibility offered by the method described above.~~

Use of alternative data sources to construct the indicator

Several countries have suggested using existing data sources or alternative data sources, such ~~like~~ as remote sensing and GIS, on the grounds that these instruments can be more cost-effective and sometimes provide more reliable results than farm surveys. The table below indicates possible instruments/sources of information for each sub-indicator.

Table 2: Possible data collection instruments for each sub-indicator

No.	Sub-indicators	Possible data collection instruments
1	Farm output value per hectare	Agricultural surveys, household surveys linked with administrative records and market surveys, remote sensing, agricultural and livestock census
2	Net farm income	Agricultural surveys, household surveys linked with administrative records and market surveys, agricultural and livestock census
3	Risk mitigation mechanisms	Household surveys with agricultural information, community surveys, administrative records
4	Prevalence of soil degradation	Environmental monitoring systems, soil sampling, remote sensing calibrated with ground observations, GIS data/maps/models calibrated with ground observations and samplings
5	Variation in water availability	River flows records, water level records, abstraction records, remote sensing, GIS information/maps/hydrogeological models, administrative sources, household surveys
6	Management of fertilizers	Environmental monitoring systems (soil, water quality), agricultural surveys, GIS data/maps and models based on sale data, agricultural surveys and administrative sources
7	Management of pesticides	Environmental monitoring systems (soil, water quality), agricultural surveys, models based on active substance sale data, agricultural surveys and administrative sources
8	Use of agro-biodiversity-~~friendly~~supportive practices	Environmental monitoring systems including remote sensing (land use/land cover), GIS data/maps
9	Wage rate in agriculture	Labor force survey, Household survey with agricultural module, administrative data
10	Food insecurity experience scale (FIES)	Household surveys, health data

11	Secure tenure rights to land	Household surveys with agricultural module, administrative/legal sources

The use of such instruments can be considered, but several aspects need to be carefully taken into account prior to using alternative data sources. First of all, it should be demonstrated that the alternative source gives results of at least same quality as the surveys and ensure international comparability. In order to produce consistent and reliable data as per recommended periodicity, it is advised that the use of alternative data sources may be considered when the available datasets fulfill the following criteria:

- Can be reflected in or attributed to agricultural land area in the country, considering different farm typologies and agricultural regions;
- Can be associated with the country's agricultural productions systems, particularly crops, livestock and the combinations in between;
- Capture the same aspect/phenomenon as the proposed farm survey (as described in the sub-indicator metadata sheets) with at least a documented same quality, considering scientific standards;
- Are representative of the situation at the national level (with respect to agricultural land area) taking into account main agricultural region types;
- Are compliant with international/national standards and classifications systems in order to ensure the indicator to be internationally comparable;
- Data are available at the same level of territorial disaggregation as the farm survey.
- The ways and means to adjust for under-coverage and non-coverage (when needed) should be clearly devised and described;
- Data collection year and periodicity are homogenous across the sub-indicators.

Finally, using different data sources implies that mechanisms should ~~be put~~ in place at the country level to coordinate regularly the flow of required information generated by various institutions.

Alternative data sources may also be used to complement and/or validate farm survey data. This combined approach has the potential to improve the validity and soundness of results, in particular in countries that have well-established monitoring systems and that are able to produce quality information consistently over time. The information from other sources may be used and leveraged in different ways depending on quality and regularity of its collation. For example:

- Replace farm survey questions, when alternative sources of information are available and respond to the criteria listed above.
- Complement farm survey questions, by providing additional contextual information helpful to interpret the results.
- Crosscheck the farm survey results to identify any inconsistencies and ensure the robustness of the indicator. This validation exercise can be done ex-post or during the data collection by providing the external data to the enumerators before going to the field. In this way, the enumerators can probe whether the responses to the farm survey are consistent with the a priori external knowledge.

~~In any case, i~~Therefore it is recommended that countries complement the farm survey with a monitoring system that can measure the impact of agriculture on the environment (soil, water, fertilizer and pesticide pollution, biodiversity) and on health (pesticides residues in food and human bodies). This will provide additional information and help crosschecking the robustness of indicator 2.4.1 with regard to the environmental dimension of sustainability.

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Annex: Themes, sub-indicators and metadata sheets

List of themes and related sub-indicators

No.	Theme	Sub-indicator
1	Land productivity	Farm output value per hectare
2	Profitability	Net farm income
3	Resilience	Risk mitigation mechanisms
4	Soil health	Prevalence of soil degradation
5	Water use	Variation in water availability
6	Fertilizer pollution risk	Management of fertilizers
7	Pesticide risk	Management of pesticides
8	Biodiversity	Use of agro-biodiversity-supportive~~friendly~~ practices
9	Decent employment	Wage rate in agriculture
10	Food security	Food ~~I~~insecurity ~~e~~Experience ~~s~~Scale (FIES)
11	Land tenure	Secure tenure rights to land

1. Farm output value per hectare

Dimension: Economic

Theme: Land Productivity

Land productivity is a measure of agricultural value of outputs obtained on a given area of land. Maintaining or improving the output over time relative to the area of land used is an important aspect in sustainability for a range of reasons. At farm level, ~~the~~ land productivity reflects technology and production processes for given agro-ecological conditions. In a broader sense, an increase in the level of land productivity enables higher production while reducing pressure on increasingly scarce land resources, commonly linked to deforestation and associated losses of ecosystem services and biodiversity.

Coverage: All farm types ~~(except those that purchase more than 50% of the feed for their livestock)~~

Commented [KA(2]: Removed as per agreement with informal group of countries

Description:

The sub-indicator is described as farm output value per hectare (crop~~s~~ and livestock).

Information on farm outputs and agricultural area should be standard information available from farm surveys thus providing a good basis for assessment at farm level.

- Farm output value: The volume of agricultural output at farm level generally takes into account production of multiple outputs, e.g. crop types and crop and livestock combinations, etc. Since the volume of agricultural outputs is not measured in commensurate units (e.g. not all outputs are measured in tonnes, and tonnes of different output represent different products), it is necessary to establish an appropriate means of aggregation, in this case using a monetary unit. A simple way to enable aggregation is to reflect the multiple outputs produced by a single farm in terms of values (i.e. quantity multiplied by prices).
- Farm agricultural land area: defined as the area of land used for agriculture within the farm[6].

Sustainability criteria:

Distance from the 90th percentile of the national distribution[7]:

- Green (desirable): Sub-indicator value is ≥ 2/3 of the corresponding 90th percentile
- Yellow (acceptable): Sub-indicator value is ≥ 1/3 and < 2/3 of the corresponding 90th percentile
- Red (unsustainable): Sub-indicator value is < 1/3 of the corresponding 90th percentile

Data items

Reference period: last calendar year

1.1. Quantities and farm gate prices of the 5 main crops and/or livestock and livestock products and by-products produced by the farm

[6] According to the SEEA-AFF classification and the classification of the World Agricultural Census 2020

[7] The percentile is calculated by major production system (crops, livestock, or mix of crops and ~~/~~livestock) and by major agricultural areas of the country and farm productivity is compared with similar farms in same agricultural area.

1.2. Quantities and farm gate prices (or value of production) of other agricultural products ~~(agro-forestry and/or aquaculture products)~~ produced by the farm (e.g. agro-forestry, aquaculture products and others)

1.3. Agricultural land area of the holding

~~1.4. Distribution of sources of animal feed used on the agricultural holding (same as 8.2)~~

- ~~1 percentage produced on the agricultural holding~~
- ~~2 percentage purchased from outside the holding~~

2. Net Farm Income

Dimension: Economic

Theme: Profitability

An important part of sustainability in agriculture is the economic viability of the farm, driven to a large extent by its profitability. Profitability is measured using the net income that the farmer is able to gain from farming operations. Availability and use of information on farm economic performance, measured using profitability, will support better decision making both at micro and macro-economic level. Since performance measures drive behaviour, better information on performance can alter behaviour and decision-making by government and producers both in large-scale commercial farming and medium and small-scale subsistence agriculture.

Coverage: All farms types

Description:

The sub-indicator measures if the farm is consistently profitable over a 3-year period. The focus of this sub-indicator is on income from farming operations as distinct from the total income of the farming household, which may include other sources of income such as, for example, employment in local businesses by other family members, tourism activity, etc.

Formula[8]:

$$NFI = CR + Y_k - OE - Dep + VIC\cancel{\Delta In}$$

where:

- NFI = Total Net Farm Income
- CR = Total farm cash receipts including direct program payments
- Y_k = Income in kind
- OE = Total operating expenses after rebates (including costs of labour)
- Dep = Depreciation
- ~~Δ Inv~~VIC = Value of inventory change~~ (VIC).~~

Definitions:

- Net farm income refers to the return (both monetary and non-monetary) to farm operators for their labor, management and capital, after all production expenses have been paid (that is, gross farm income minus production expenses). It includes net income from farm production, the value of commodities consumed on the farm, depreciation, and inventory changes.
- Gross farm income refers to the monetary and non-monetary income received by farm. Its main components include cash receipts from the sale of farm products, direct program payments to producers, other farm income (such as income from custom work), value of food and fuel produced and consumed on the same farm, and change in value of year-end inventories of crops and livestock[9].
- Farm cash receipts include revenues from the sale of agricultural commodities in local currency units that include sales of crops, livestock and its by-products.
- Direct program payments to producers included in farm cash receipts represent the amounts paid under various government and private programs to individuals involved in agricultural production. The payments related to current agricultural production include subsidies to encourage production or to compensate producers for low market returns, payments to stabilize incomes

Commented [KA(3]: Added to have more clarity (adopted from Statistics Canada)

[8] The formula, terms and definitions have been adopted from ~~See S~~Statistics Canada ~~at~~: see http://www.statcan.gc.ca/pub/21-010-x/21-010-x2014001-eng.pdf

9 Rental value of farm dwellings is not considered as part of farm income.

and payments to compensate producers for crop or livestock losses caused by extreme climatic conditions, disease or other reasons and insurance payments.

- Income-in-kind measures the value of the agricultural goods produced on farms and consumed by farm operator families. It is included to measure total farm production.
- Operating expenses represent business costs incurred by farm businesses for goods and services used in the production process. Expenses include both purchase and self-produced items that are: property taxes, custom work, seeds, rent, fertiliser and lime, chemicals, machinery and building repairs, irrigation, fuel for heating and machines, wages, interest and business share of insurance premiums.
- Depreciation charges account for the economic depreciation or for the loss in fair market value of the capital assets of the farm business. Calculated on farm buildings, farm machinery, and the farm business share of autos, trucks and the farm home, depreciation is generally considered to be the result of aging, wear and tear, and obsolescence. It represents a decrease in the potential economic benefits that can be generated by the capital asset.
- Value of inventory change (VIC) measures the currency value of the physical change in producer-owned inventories. This concept is used to value total agricultural economic production. To calculate VIC, the change in producer-owned inventories (between the end and the beginning of a calendar year) is first derived and then multiplied by the average annual crop prices or value per animal. This calculation is different from the financial or accounting book value approach, which values the beginning and ending stocks, and then derives the change.
- The VIC over all the major commodities can vary widely (depending on the size of the change of inventories and prices). The VIC can be either positive (when inventories are larger at the end of the year compared to the beginning levels) or negative (when year- end inventories are smaller than the levels at the beginning of the year). If the inventory levels are the same at the beginning and end of the year, VIC will be zero despite price changes.

Estimating profitability at a farm level will generally require compilation of basic farm financial records, i.e. daily, weekly, monthly or seasonal transactions in an organized way. In general, large commercial farms maintain detailed financial records however, in case of medium farms and small subsistence agriculture, record keeping is seldom practiced and in most of the countries it doesn't exist at all.

In case when detailed data are not available at farm level, then estimates will be calculated based on farmer declaration of both outputs and inputs quantities~~y~~ and ~~value~~ prices. In these cases, depreciation, variation of stocks and taxes may be neglected. This is described below as simplified option (1).

A ~~second~~ simplified option (2) ~~(short questionnaire)~~ is also offered, based on farmer's declaration of the agricultural holding's profitability over the last three calendar years. It is recommended to use this simplified option only when other two options are not feasible.

Sustainability criteria:

For a farm to be profitable the net farm income should be above zero.

- Green (desirable): above zero for past 3 consecutive years
- Yellow (acceptable): above zero for at least 1 of the past 3 consecutive years
- Red (unsustainable): below zero for all of the past 3 consecutive years

Data items

Reference period: last three calendar years

~~Detailed~~ Recommended option

Data from farm financial records, i.e. daily, weekly, monthly or seasonal transactions in an organized way (in general, large commercial farms maintain detailed financial records on the basis of which the NFI can be calculated as per above equation).

Simplified option (1)

To be used when the detailed data are not available at farm level (better adapted to smallholders and household sector). ~~Variables to be calculated are Farm Cash Receipts; Income in kind; Direct program payments; and Operating Expenses.~~

1.1 ~~Output~~ Quantity produced (i.e. crops and livestock and its products and by-products produced both for market~~ed~~ and/or self-consumption~~ed~~)
1.2 Farm gate prices of above ~~outputs~~quantities produced
1.3 Operating expenses including ~~i~~inputs quantities~~y~~ and its market prices
1.4 ~~Income from other on-farm Activities~~ Quantity/output of other on-farm activities carried out and/or commodities produced on the holding e.g. aquaculture, agroforestry and others.
1.5 Farm gate prices of the other on-farm activities/commodities
~~1.4~~1.6 Input quantities and prices that are used to produce other on-farm outputs
~~1.5 Operating expenses~~

Simplified option (2)

1.1 Respondent's declaration on agricultural holding's profitability over the last 3 calendar years

3. Risk mitigation mechanisms

Dimension: Economic

Theme: Resilience

Resilience encompass absorptive, anticipatory and adaptive capacities and refers to the properties of a system that allows farms to deal with shocks and stresses, to persist and to continue to be well-functioning (in the sense of providing stability, predictable rules, security and other benefits to its members).

Coverage: All farms types

Description:

This sub-indicator measures the incidence of the following mitigation mechanisms:

- Access to or availed credit[10].
- Access to or availed insurance.
- On farm diversification (share of a single agricultural commodity not greater than 66% in the total value of production of the holding).

Access to credit and/or insurance is defined here as when a given service is available and the holder has enough means to obtain the service (required documents, collateral, positive credit history, etc.). Broadly, access to one or more the above 3 factors will allow the farm to prevent, resist, adapt and recover from external shocks such as, floods, droughts, market failure (e.g. price shock), climate shock and pest/animal diseases.

Sustainability criteria:

A farm holding is considered resilient if it has availed or has the means to access the risk mitigation mechanisms as follows:

- Green (desirable): Access to or availed at least two of the above-listed mitigation mechanisms.
- Yellow (acceptable): Access to or availed at least one of the above-listed mitigation mechanisms.
- Red (unsustainable): No access to the listed mitigation mechanisms.

****

Data items

Reference period: last calendar year

3.1. Agricultural holding access to or availed of credit, insurance or other financial instruments:

- Credit (formal, informal)
- Insurance

3.2 List of other on-farm activities apart from crops and livestock

3.3 Value of ~~production~~ output for the listed on-farm ~~commodities~~activities/commodities

[10] Include cash loans and in-kind loans (e.g.~~,~~ seeds provided by another farmer and repaid with a share of the harvest, seeds, etc.) only for agriculture related investments.

4. Prevalence of soil degradation

Dimension: Environmental

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Theme: Soil health

Many of the processes affecting soil health are driven by agricultural practices. FAO and the Intergovernmental Technical Panel on Soils (ITPS) have identified 10 main threats to soil functions: soil erosion; soil organic carbon losses; nutrient imbalance; acidification; contamination; waterlogging; compaction; soil sealing; salinization and loss of soil biodiversity.

Coverage: All farms types

Description:

The sub-indicator measures the extent to which agriculture activities affects soil health and therefore represents a sustainability issue. A review of the 10 threats to soil shows that all except one (soil sealing, which is the loss of natural soil to construction/urbanisation) are potentially and primarily affected by inappropriate agricultural practices. Ideally, therefore, all soils under agricultural land area in a country should be the subject of periodic monitoring in order to assess the impact of agriculture on soils. This requires detailed surveys and sampling campaigns, associated with laboratory testing. In order to propose a manageable solution while capturing the main trends in the country in terms of soil health, the farm survey focuses on the four threats that combine the characteristics more widespread (for national monitoring, countries may choose to add any of the other areas indicated above, depending on relevance), and easier to assess through farm surveys:

1. Soil erosion
2. Reduction in soil fertility
3. Salinization of irrigated land
4. Waterlogging
5. Other - specify

The farm survey captures farmer's knowledge about the situation of the agricultural holding in terms of soil degradation. Experience has shown that farmers are very much aware of the state of their soils, health and degradation level. Farmers may also be offered the opportunity to mention other threats than the above four.
Other data sources on soil health may either complement the information collected through the farm survey and offer opportunities for cross-checking farmers' responses; or be used as alternative sources of data. Prior to the farm survey, a desk study could collect all available information on soil health, including using national official statistics or statistics available from international agencies such as FAO. This typically includes maps, models, results from soil sampling, laboratory analysis and field surveys, and all existing report on soil and land degradation at national level. On the basis of this information, maps or tables (by administrative boundaries or other divisions of the country) can be established, showing the threats to soils according to the above 4 categories of threats.

Sustainability criteria:
Proportion of agricultural area of the farm affected by soil degradation.

- Green (desirable): The combined area affected by any of the four selected threats to soil health is negligible (less than 10% of the total agriculture area of the farm).
- Yellow (acceptable): The combined area affected by any of the four selected threats to soil health is between 10% and 50% of the total agriculture area of the farm.
- Red (unsustainable): The combined area affected by any of the four selected threats to soil health is above 50% of the total agriculture area of the farm.

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Data items

Reference period: last three calendar years

4.1 List of soil degradation threats experienced on the holding

- Soil erosion (loss of topsoil through wind or water erosion)
- Reduction in soil fertility[11]
- Salinization of irrigated land
- Waterlogging
- Other – specify
- None of the above

4.2 Total area of the holding affected by threats related to soil degradation

[11] Reduction in soil fertility will be experienced by farmers as progressive reduction in yield and will be the result of a negative nutrient balance by which the amount of nutrient application (including through mineral and organic fertilizers, legumes, or green manure) is lower than the amount that is lost and exported by crops.

5. Variation in water availability

Dimension: Environmental

Theme: Water use

Agriculture, more specifically irrigated agriculture, is by far the main economic sector using freshwater resources. In many places, water withdrawal from rivers and groundwater aquifers is beyond what can be considered environmentally sustainable. This affects both rivers and underground aquifers. Sustainable agriculture therefore requires that that level of use of freshwater for irrigation remains within acceptable boundaries. While there is no internationally agreed standards of water use sustainability, signals associated with unsustainable use of water typically include progressive reduction in the level of groundwater, drying out of springs and rivers, increased conflicts among water users.

Coverage: All farm types

Description:

The sub-indicator captures the extent to which agriculture contributes to unsustainable patterns of water use. Ideally, the level of sustainability in water use is measured at the scale of the river basin or groundwater aquifer, as it is the combined effect of all users sharing the same resource that impact water sustainability. The farm survey captures farmers' awareness and behaviour in relation with water scarcity, and associates them with three levels of sustainability. These awareness and behaviour are expressed in terms of:

- whether the farmer uses water to irrigate crops on at least 10% of the agriculture area of the farm and why, if the answer is negative (does not need, cannot afford);
- whether the farmer is aware about issues of water availability in the area of the farm and notices a reduction in water availability over time;
- whether there are organizations (water users organisations, others) in charge of allocating water among users and the extent to which these organisations are working effectively.

Other data sources may either complement the farm survey on water use and offer opportunities for cross-checking farmers' responses; or be used as alternative sources of data. Prior to the farm survey, a desk study should collect all available information on water balance, including national official statistics or statistics available from international agencies such as FAO. Information on water resources and use is usually collected by the entities in charge of water management or monitoring and are organised by hydrological entity (river basin or groundwater aquifer). They typically include hydrological records (river flow, groundwater levels), models and maps showing the extent of water use by hydrological entity.

Sustainability criteria:

Farm sustainability in relation with water use will be assessed as follows:

- Green (desirable): Water availability remains stable over the years, for farms irrigating crops on more than 10% of the agriculture area of the farm. ~~It is automatically green~~ ~~Considered sustainable~~Default result for farms irrigating less than 10% of their agricultural area ~~does not use water for irrigating crops on more than 10% of the agriculture area of the farm, or water availability remains stable over the years~~
- Yellow (acceptable): uses water to irrigate crops on at least 10% of the agriculture area of the farm, does not know whether water availability remains stable over the years, or

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experiences reduction on water availability over the years, but there is an organisation that effectively allocates water among users.

- Red (unsustainable): in all other cases.

Data items

Reference period: last three calendar years

5.1 Irrigated agricultural area of the holding

5.2 Reduction in water availability experienced on the holding

5.3 Existence of organizations dealing with water allocation

6. Management of fertilizers

Dimension: Environmental

Theme: Fertilizer pollution risk

Agriculture can affect the quality of the environment through excessive use or inadequate management of fertilizers. Sustainable agriculture implies that the level of chemicals in soil and water bodies remains within acceptable thresholds. Integrated plant nutrient management considers all sources of nutrients (mineral and organic) and their management in order to obtain best nutrient balance. Measuring soil and water quality captures the extent and causes of pollution, but establishing monitoring systems of soil and water is costly and not always feasible in countries.

Note: the management of plant nutrients addresses two sustainability issues: avoiding pollution, and maintaining a good level of soil fertility. This sub-indicator addresses the first issue, while the second one is addressed under sub-indicator 4 'Soil health'.

Coverage: All farm types

Description:

The proposed approach is based on questions to farmers about their use of fertilizer, in particular mineral or synthetic fertilizers and animal manure, their awareness about the environmental risks associated with fertilizer and manure applications, and their behaviour in terms of plant nutrient management[12]. Management measures considered to help reducing risk is as follows:

1. Follow protocols as per extension service or retail outlet ~~recommendations~~ directions or local regulations, not exceeding recommended doses
2. Use organic source of nutrients (including manure or composting residues) alone, or in combination with synthetic or mineral fertilizers
3. Use legumes as a cover crop, or component of a multi/crop or pasture system to reduce fertilizer inputs
4. Distribute synthetic or mineral fertilizer application over the growing period
5. Consider soil type and climate[13] in deciding fertilizer application doses and frequencies
6. Use soil sampling at least every 5 years to perform nutrient budget calculations
7. Perform site-specific nutrient management or precision farming[14]
8. Use buffer strips along water courses.

Sustainability criteria:

Farm sustainability in relation with fertilizer pollution risk will be assessed as follows:

- Green (desirable): ~~The farm does not use fertilizers[15] or uses fertilizers and takes specific measures to mitigate environmental risks (at least four from the list above)~~ The farm ~~does~~ takes specific measures to mitigate environmental risks (at least four from the list above). ~~If the farm does~~ Default result for farms not usinge fertilizers~~,~~[16] ~~it is considered sustainable automatically green~~

[12] In order to keep the questionnaire manageable, the module does not consider different types of crops or practices. The method therefore assumes that if a farmer reports best practices, these practices are applied over the entire farm. It may therefore over-estimate the area under good practices.
[13] Soil type, combined with climate, and in particular the frequency and intensity of rainfall events, are important elements to consider in deciding fertilizer application doses and frequencies.
[14] Precision farming is a farming management concept based on observing, measuring and responding to inter and intra-field variability in crops.
~~[15] Fertilizers to be considered include mineral and synthetic fertilizers as well as animal manure.~~
[16] Fertilizers to be considered include mineral and synthetic fertilizers as well as animal manure.

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- Yellow (acceptable): the farm uses fertilizers and takes at least two measures from the above list to mitigate environmental risks
- Red (unsustainable): farmer uses fertilizer and does not take any of the above specific measures to mitigate environmental risks associated with their use.

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Data items

Reference period: last calendar year

6.1 Use of synthetic or mineral fertilizer or animal manure/slurry by the agricultural holding (Y/N)

6.2 Specific measures taken to mitigate the environmental risks associated with the excessive use or misuse use of fertilizers as per list below:

◯ 1 Follow protocols as per extension service or retail outlet ~~recommendations~~ directions or local regulations, not exceeding recommended doses

◯ 2 Use organic source of nutrients (including manure or composting residues) alone, or in combination with synthetic or mineral fertilizers

◯ 3 Use legumes as a cover crop, or component of a multi/crop or pasture system to reduce fertilizer inputs

◯ 4 Distribute synthetic or mineral fertilizer application over the growing period

◯ 5 Consider soil type and climate in deciding fertilizer application doses and frequencies

◯ 6 Use soil sampling at least every 5 years to perform nutrient budget calculations

◯ 7 Perform site-specific nutrient management or precision farming

◯ 8 Use buffer strips along water courses.

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7. Management of pesticides

Dimension: Environmental

Theme: Pesticide risk

Pesticides are important inputs in modern agriculture (crop and livestock), but if not well managed they can cause harm to people's health or to the environment. Practices associated with integrated pest management (IPM[17]) exist that contribute to minimise risks associated with the use of pesticides and limit their impact on human health and on the environment. The International Code of Conduct on Pesticide Management defines best practice in pesticide management.

Coverage: All farm types

Description:

The proposed sub-indicator is based on information on the use of pesticides on the farms, the type of pesticide used and the type of measure(s) taken to mitigate the associated risks[18]. It considers the possibility that the holding adopts specific measures to help reducing risks associated with pesticide use. List of possible measures:

Health

1. Adherence to label ~~recommendations~~ directions for pesticide use (including use of protection equipment while applying pesticides)
2. Maintenance and cleansing of protection equipment after use
3. Safe disposal of waste (cartons, bottles and bags)

Environment

1. Adherence to label ~~recommendations~~ directions for pesticide application
2. Adopt any of the above good agricultural practices (GAPs): adjust planting time, apply crop spacing, crop rotation, mixed cropping or inter-cropping
3. Perform biological pest control or use biopesticides
4. Adopt pasture rotation to suppress livestock pest population
5. ~~Use of pest resistant/tolerant cultivars, disease resistant/tolerant livestock breed and standard/certified seed and planting material~~
6. ~~6.~~5. Systematic removal of plant parts attacked by pests
7. ~~7.~~6. Maintenance and cleansing of spray equipment after use
8. ~~8.~~7. Use one pesticide no more than two times or in mixture in a season to avoid pesticide resistance.

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[17] Integrated Pest Management (IPM) is an ecosystem approach to crop production and protection that combines different management strategies and practices to grow healthy crops and minimize the use of pesticides (FAO).

[18] In order to keep the questionnaire manageable, the module does not consider different types of crop or livestock. Thus, the best practices could concern only one crop or livestock, while practices may be different for other ones. The method therefore assumes that if a farmer reports best practices, these practices are applied over the entire farm. It may therefore over-estimate the area under good practices.

Sustainability criteria:

Farm sustainability in relation with pesticides will be assessed as follows:

- Green (desirable): The farm ~~does not use pesticides or~~ uses only moderately or slightly hazardous[19] pesticides (WHO Class II or III). In this case, it adheres to all three health-related measures and at least four of the environment-related measures. Default result for~~If the~~ farms ~~does~~ not usinge pesticides. ~~it is automatically green~~
- Yellow (acceptable): ~~farmer~~ The farm uses only moderately or slightly hazardous pesticides (WHO Class II or III) and takes some measures to mitigate environmental and health risks (at least two from each of the lists above)
- Red (unsustainable): ~~farmer~~ The farm uses highly or extremely hazardous pesticides (WHO Class Ia or Ib), illegal pesticides[20], or uses moderately or slightly hazardous pesticides without taking specific measures to mitigate environmental or health risks associated with their use (fewer than two from any of the two lists above).

Data items

Reference period: last calendar year

7.1 Use of pesticides for crop or livestock by the agricultural holding (Y/N)

7.2 Use of highly or extremely hazardous or illegal pesticides by the agricultural holding (Y/N)

7.3 Measures taken to protect people from health-related risks associated with pesticides:

1. Adherence to label ~~recommendations~~ directions for pesticide use, including use of personal protection equipment (Y/N)
2. Maintenance and cleansing of protection equipment after use (Y/N)
3. Safe disposal of waste (cartons, bottles and bags) (Y/N)

7.4 Measures taken to avoid environment-related risks associated with pesticides:

4. Adherence to label ~~recommendations~~ directions for pesticide application (Y/N)
5. Adjustment of planting time (Y/N)
6. Application of crop spacing (Y/N)
7. Application of crop rotation (Y/N)
8. Application of mixed cropping (Y/N)
9. Application of inter-cropping (Y/N)
10. Perform biological pest control (Y/N)
11. Use of biopesticides (Y/N)
12. Adopting pasture rotation to suppress livestock pest population (Y/N)

~~13. Use of pest resistant/tolerant cultivars (Y/N)~~
~~14. Use of disease resistant/tolerant livestock breed (Y/N)~~
~~15. Use of standard/certified seed and planting material (Y/N)~~
~~16.~~13. Systematic removal of plant parts attacked by pests (Y/N)
~~17.~~14. Maintenance and cleansing of spray equipment after use (Y/N)
~~18.~~15. Use one pesticide no more than two times or in mixture in a season to avoid pesticide resistance (Y/N).

[19] WHO Class II or III pesticides as defined by WHO classification (http://www.who.int/ipcs/publications/pesticides_hazard_2009.pdf), or equivalent national classification.
[20] In principle, illegal pesticides refer to any products which do not comply with national regulations on pesticide management, such as un-registered, mislabeled, illegally imported etc. It does not cover "off-label uses," which could be considered as an illegal use action.

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8. Use of agro-biodiversity ~~friendly~~ supportive practices

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Dimension: Environmental

Theme: Biodiversity

The Convention on Biological Diversity (CBD) stresses the close relationship between agriculture activities and biodiversity, considering three levels of biodiversity: genetic level diversity; agrobiodiversity at production system level; and ecosystem level (wild) biodiversity. The way agriculture is practiced influences all three levels. Attempts to develop indicators of biodiversity for agriculture systematically consider a large number of sub-indicators, with no universally agreed sustainability criteria. Considering these constraints, and the importance of addressing biodiversity in the construction of Indicator 2.4.1, it is proposed to develop a sub-indicator that captures the efforts towards more ~~biodiversity-friendly agriculture~~ sustainable agriculture that better contributes to biodiversity, by identifying a limited list of practices that are conducive to biodiversity conservation.

Coverage: All farm types

Description:

~~This sub-indicator measures the level of adoption of biodiversity-friendly practices by the farm at ecosystem, species and genetic levels.~~ This sub-indicator measures the level of adoption of more sustainable agricultural practices that better contribute to biodiversity by the farm at ecosystem, species and genetic levels. This indicator addresses both crops and livestock ~~and uses the entire area of the holding to assess sustainability status to agricultural area of the holding, in order to allow for monitoring of special non-agricultural management (i.e. buffer zones, nature conservation areas, etc.) that enhance biodiversity and ecosystem services.~~ Specifically in case of this sub-indicator the scope is the entire area of the farm holding as opposed to the agricultural area that is used for rest of the 10 sub-indicators.

In particular, two separate scoring systems depending on the applicability of the organic farming criterion have been proposed.

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Depending on whether organic certification system exists, countries will select one of the below two proposed set of criteria and thus will be evaluated/scored differently in terms of their sustainability status. According to this formulation, to secure green status, farms in countries with organic certification in place, will have to check 3 out of 6 criteria. On the contrary, farms operating in countries with no organic certification in place, will have to check 2 out of 5 criteria for obtaining the green status.

The detailed formulation of the criteria for the 2 scoring systems is described below:

A. Criteria for group of countries with organic certification systems/schemes:

1. Leaves at least 10% of the holding area for natural or diverse vegetation. This can include natural pasture/grassland, maintaining wildflower strips, stone and wood heaps, trees or hedgerows, natural ponds or wetlands.
2. Farm produces agricultural products that are organically certified, or its products are undergoing the certification process.
3. Farm does not use medically important antimicrobials as growth promoters.
4. At least two of the following contribute to farm production: 1) temporary crops, 2) pasture, 3) permanent crops, 4) trees on farm, 5) livestock or animal products, and 6) aquaculture.
5. Practices crop or crop/pasture rotation involving at least 2 crops or crops and pastures on at least 80% of the farm agricultural area (excluding permanent crops and permanent

pastures) over a period of 3 years. In case of a 2-crop rotation, the 2 crops have to be from different plant genus, e.g. a grass plus a legume, or a grass plus a tuber etc.

6. Livestock includes locally adapted breeds.

Sustainability status:

- Green (desirable): The agricultural holding meets at least three of the above criteria
- Yellow (acceptable): The agricultural holding meets one or two of the above criteria
- Red (unsustainable): The agricultural holding meets none of the above criteria

B. Criteria for group of countries with no organic certification systems/schemes:

1. Leaves at least 10% of the holding area for natural or diverse vegetation. This can include natural pasture/grassland, maintaining wildflower strips, stone and wood heaps, trees or hedgerows, natural ponds or wetlands.
2. Farm does not use medically important antimicrobials as growth promoters.
3. At least two of the following contribute to farm production: 1) temporary crops, 2) pasture, 3) permanent crops, 4) trees on farm, 5) livestock or animal products, and 6) aquaculture
4. Practices crop or crop/pasture rotation involving at least 2 crops or crops and pastures on at least 80% of the farm agricultural area (excluding permanent crops and permanent pastures) over a period of 3 years. In case of a 2-crop rotation, the 2 crops have to be from different plant genus, e.g. a grass plus a legume, or a grass plus a tuber etc.
5. Livestock includes locally adapted breeds.

Sustainability status:

- Green (desirable): The agricultural holding meets at least two of the above criteria
- Yellow (acceptable): The agricultural holding meets one of the above criteria
- Red (unsustainable): The agricultural holding meets none of the above criteria

~~The practices are broken down as follows:~~

~~Leaves at least 10% of the holding area for natural or diverse vegetation. This can include natural pasture/grassland[21], maintaining wildflower strips, stone and wood heaps, trees or hedgerows, natural ponds or wetlands.~~

~~Does not use synthetic pesticides, does not purchase more than 50% of the feed for livestock and does not use antimicrobials as growth promoters.~~

~~At least two of the following contribute to the farm production, each of them representing at least 10% of the value of the holding's production: 1) crop/pasture[22]; 2) trees or tree products (including permanent crops like orchards or vineyards); 3) livestock or animal products; 4) fish.~~

~~Practices crop or crop/pasture rotation involving at least 3 crops or crops and pastures on at least 80% of the farm area (excluding permanent pastures) over a period of 3 years.~~

~~The area under a single continuous commodity is not larger than 2 hectares (excluding pasture), and areas larger than 2 hectares under a single commodity use at least two different varieties.~~

~~[21] Natural pastures or grassland implies no use of mineral or chemical fertilizer and no pesticides~~

~~[22] A value needs to be applied for pasture even if it is used for animal production on the farm~~

~~At least 50% of each animal species' population consists of locally adapted breeds[23] or breeds at risk of extinction[24].~~

~~**Sustainability criteria:**~~

~~Level of adoption of biodiversity-friendly practices:~~

~~Green (desirable): The agricultural holding meets at least four of the above criteria~~

~~Yellow (acceptable): The agricultural holding meets two or three of the above criteria~~

~~Red (unsustainable): The agricultural holding meets less than two of the above criteria~~

Data items

Reference period: last calendar year

8.1 Percentage of the holding area covered by natural or diverse vegetation (not cultivated), including natural pasture or grasslands; wildflower strips; stone or wood heaps; trees or hedgerows; natural ponds or wetlands

8.2 Farm produced products (crops and/or livestock) that are organically certified (Y/N)

8.3 Farm produced products (crops and/or livestock) that are undergoing organic certification (Y/N)

8.4 Report the holding organic certification number

8.5 Report the name of organic certifying body

8.6 Area on which certified organic [CROP/LIVESTOCK] was produced

~~8.2a Use of pesticides by the agricultural holding (Y/N) (covered by sub-indicator 7)~~

~~8.2b Distribution of sources of animal feed used on the agricultural holding~~

~~◯ 1 percentage produced on the agricultural holding~~

~~◯ 2 percentage purchased from outside the holding~~

8.7~~2c~~ Use of medically important antimicrobials as growth promoter for livestock (Y/N)

8.8~~3~~ Value of ~~P~~production of~~n~~ the holding (covered by sub-indicator 1)

◯ 1 ~~Crops or pasture~~Temporary crops

◯ 2 Pastures

◯ 3 Permanent crops

◯ 4~~2~~ Trees ~~and tree products~~on farm

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[23] ~~Locally adapted breeds: "which have been in the country for a sufficient time to be genetically adapted to one or more of traditional production systems or environments in the country." 15 FAO. 2000. Guidelines for the development of country reports (available at http://www.fao.org/docrep/meeting/021/am228e.pdf).~~

[24] ~~The enumerator will be provided with a national list of breeds at risk of extinction based on DAD-IS (http://www.fao.org/dad-is/en/).~~

◯ 5~~3~~ Livestock and animal products

◯ 6~~4~~ ~~Fish~~Aquaculture

8.9~~4~~ Percentage of the ~~agricultural~~ cultivated area on which crop rotation or crop/pasture rotation involving at least ~~three~~ two crops (excluding permanent crops and permanent pastures) from different plant genus is practiced over a 3 year period

8.10~~5~~ Area of the agricultural holding covered by the (up to 5) main crops listed for sub-indicator 1 (excluding pasture)

~~8.6 Number of varieties used for each of the (up to 5) main crops cultivated on the holding~~

8.11~~7~~ List of different breeds and cross-breed and percentage of animals they represent for each animal species

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9. Wage rate in agriculture

Dimension: Social

Theme: Decent employment

The theme provide information on the remuneration of employees working for the farm and belonging to the elementary occupation group, as defined by the International Standard Classification of Occupation (ISCO-08 - code 92). It informs about economic risks faced by unskilled workers (those performing simple and routine tasks) in terms of remuneration received, the later benchmarked against the minimum wage set at national level in the agricultural sector. This sub-indicator allows distinguishing between holdings that pay a fair remuneration ~~to all~~ to its employees under the elementary occupation group, and agricultural holdings paying a remuneration to their employees belonging to the elementary occupation group that is below the minimum wage standard. In the latter case, agricultural holdings are deemed to be non-sustainable since the remuneration paid is not sufficient to ensure a decent living standard.

Coverage: Not applicable to farms that employ only family labour.

Description:

The sub-indicator measures the farm unskilled labour daily wage rate in Local Currency Units (LCU).

$$Daily\ wage\ rate\ of\ unskilled\ hired\ labor = \frac{Total\ annual\ compensation}{Total\ annual\ hours\ worked} * 8\ hour$$

Where: compensation is ~~= Both~~both monetary and in kind payments expressed in Local Currency Units (LCU)

Sustainability criteria:

Unskilled labour wage rate in relation to national or agriculture sector minimum wage rate. In case there is no national or agriculture sector minimum wage rate, the national poverty line is used instead:

- Green (desirable): ~~if the farm doesn't hire any labour or if the holding has fair labour certification,[25] or~~ if the wage rate paid to unskilled labour is above the minimum national wage rate or minimum agricultural sector wage rate (if available). Default result for farms not hiring labour.
- Yellow (acceptable): if the wage rate paid to unskilled labour is equals to the minimum national wage rate or minimum agricultural sector wage rate (if available).
- Red (unsustainable): if the wage rate paid to unskilled labour is below the minimum national wage rate or minimum agricultural sector wage rate (if available).

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Data items

Reference period: last calendar year

9.1 Unskilled workers hired on the agricultural holding (Y/N)

9.2 Average pay in-cash and/or in-kind ~~for a~~paid to the hired unskilled worker per day (of 8 hours)

9.3 Minimum agricultural sector wage rate (if available) or minimum national wage rate

[25] ~~Recognized nationally~~

10. Food Insecurity Experience Scale (FIES)

Dimension: Social

Theme: Food security

FIES is a metric of severity of food insecurity at the household level that relies on people's direct yes/no responses to eight simple questions regarding their access to adequate food. It is a statistical measurement scale similar to other widely-accepted statistical scales designed to measure unobservable traits such as aptitude/intelligence, personality, and a broad range of social, psychological and health-related conditions.

Coverage: Only household farms

Description:

The Food Insecurity Experience Scale (FIES) produces a measure of the severity of food insecurity experienced by individuals or households, based on direct interviews.

The FIES questions refer to the experiences of the individual respondent or of the respondent's household as a whole. The questions focus on self-reported food-related behaviours and experiences associated with increasing difficulties in accessing food due to resource constraints.

The FIES is derived from two widely-used experience-based food security scales: the U.S. Household Food Security Survey Module and the Latin American and Caribbean Food Security Scale (Spanish acronym ELCSA). It consists of a set of eight short yes/no questions asked directly to people. The questions focus on self-reported, food-related behaviours and experiences associated with increasing difficulties in accessing food due to resource constraints. The FIES is based on a well-grounded construct of the experience of food insecurity composed of three domains: uncertainty/anxiety, changes in food quality, and changes in food quantity.

This sub-indicator is SDG indicator 2.1.2~~,~~ contextualised for a farm survey.

Sustainability criteria: Level on FIES scale

- Green (desirable): Mild food insecurity[26]
- Yellow (acceptable)[27]: Moderate food insecurity
- Red (unsustainable): Severe food insecurity

Data items

Reference period: last ~~calendar year~~12 months

10.1 The respondent's recollection that he/she (or any other adult in the household) would be worried about not having enough food to eat due to lack of money or other resources

10.2 The respondent's recollection that he/she (or any adult in the household) was unable to eat healthy and nutritious food because of lack of money or other resources

10.3 The respondent's recollection that he/she (or any adult in the household) only ate a few kinds of food due to lack of money or other resources

[26] Computation of food insecurity level is described in details in e-learning course on SDG 2.1.2: http://www.fao.org/elearning/#/elc/en/course/SDG212

[27] The terminology "Acceptable" must be read within the context of SDG 2.4.1; it should be interpreted as a situation that nevertheless merits attention and actions aimed at improvement.

10.4 The respondent's recollection that he/she (or any adult in the household) had to skip a meal because there was no enough money or other resources for food

10.5 The respondent's recollection that he/she (or any adult in the household) ate less than he/she thought he should due to lack of money or other resources

10.6 The respondent's recollection that he/she (or any adult in the household) ran out of food because of a lack of money or other resources

10.7 The respondent's recollection that he/she (or any adult in the household) was hungry but not eating due to lack of money or other resources for food

10.8 The respondent's recollection that he/she (or any adult in the household) did not eat for a whole day because of a lack of money or other resources

11. Secure tenure rights to land

Dimension: Social

Theme: Land tenure

The sub-indicator allows assessing sustainability in terms of rights over use of agricultural land areas. Since agricultural land is a key input for agricultural production, having secure rights over land ensures that the agricultural holding controls such a key asset and does not risk losing the land used by the holding for farming.

Evidence shows that farmers tend to be less productive if they have limited access to and control of economic resources and services, particularly land. Long-lasting inequalities of economic and financial resources have positioned certain farmers at a disadvantage relative to others in their ability to participate in, contribute to and benefit from broader processes of development.

As such, adequate distribution of economic resources, particularly land, help ensure equitable economic growth, contributes to economic efficiency and has a positive impact on key development outcomes, including poverty reduction, food security and the welfare of households.

This sub-indicator is SDG indicator 5.a.1~~.~~, ~~contextualised~~ customised for SDG indicator 2.4.1 ~~a farm survey~~.

Coverage: All farms types

Description:

The sub-indicator measures the ownership or secure rights over use of agricultural land areas using the following criteria:

- Formal document issued by the Land Registry/Cadastral Agency
- Name of the holder listed as owner/use right holder on legally recognized documents
- Rights to sell any of the parcel of the holding
- Rights to bequeath any of the parcel of the holding

Sustainability criteria:

Level of security of access to land.

- Green (desirable): has a formal document with the name of the holder/holding on it, or has the right to sell any of the parcel of the holding, or has the right to bequeath any of the parcel of the holding
- Yellow (acceptable): has a formal document even if the name of the holder/holding is not on it
- Red (unsustainable): no positive responses to any of the 4 questions above

Data items

Reference period: last calendar year

11.1 Type of formal document for any of the agricultural land of the holder/holding that it holds (alternatively 'possess, use, occupy) issued by the Land Registry/Cadastral Agency

◯ 1 Title deed
◯ 2 Certificate of customary tenure
◯ 3 Certificate of occupancy
◯ 4 Registered will or registered certificate of hereditary acquisitions
◯ 5 Registered certificate of perpetual / long term lease
◯ 6 Registered rental contract
◯ 7 Other

11.2 Name of any member of the holding listed as an owner or use right holder on any of the legally recognized documents

11.3 The right of the holder/holding to sell any of the parcel of the holding

11.4 The right of the holder/holding to bequeath any of the parcel of the holding