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Food and Agriculture Organization of the United Nations

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Calculation Procedures

SGD indicator 2.4.1:

"proportion of Agricultural Area under Productive and Sustainable Agriculture"

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Background and introduction

SDG indicator 2.4.1. will capture the multidimensional aspects of sustainable agriculture and is defined as "percentage of agricultural area under productive and sustainable agriculture", where agricultural area is defined as arable land, permanent crops and permanent meadows and pastures.

The initial concept was endorsed in March 2016 by the Inter-Agency and Expert Group on SDG indicators (IAEG-SDG). The methodology has been further refined through several technical consultations and has been included in an expanded methodological note. The document presents a comparison of previous attempts to develop a similar indicator and practices to define sustainable agriculture; a proposed framework, with a selection of metrics by dimension and possible thresholds; the steps for calculating the indicator; and data collection strategies (see table 1 below).

Table 1. Framework for SDG indicator 2.4.1

Dimension	No.	Theme	Sub-indicator
Economic	1	Land productivity	Farm output value per hectare
	2	Profitability	Net farm income
	3	Resilience	Risk mitigation mechanisms
Environmental	4	Soil health	Prevalence of soil degradation
	5	Water use	Variation in water availability
	6	Fertiliser pollution risk	Management of fertilisers
	7	Pesticide risk	Management of pesticides
	8	Biodiversity	Use of biodiversity-supportive practices
Social	9	Decent employment	Wage rate in agriculture
	10	Food security	Food insecurity experience scale (FIES)

	11	Land tenure	Secure tenure rights to land

Briefly, the development of SDG indicator 2.4.1 involved eight key steps. These are:

1. Scope of the indicator: Focus on crops and livestock production excluding forestry, fisheries and aquaculture.
2. Dimensions covered: Environmental, economic and social.
3. Scale for the sustainability assessment: Farm level with aggregation to higher levels.
4. Data collection instrument(s). Farm Survey
5. Themes within each dimension, and sub-indicator for each theme.
6. Assessment of sustainability performance at farm level for each sub-indicator: Criteria to assess the sustainability level of the farm for each theme and respective sub-indicators.
7. Periodicity of monitoring the indicator. 3 years
8. Reporting the indicator. The sub-indicators are presented in a dashboard separately.

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Objective of the document:

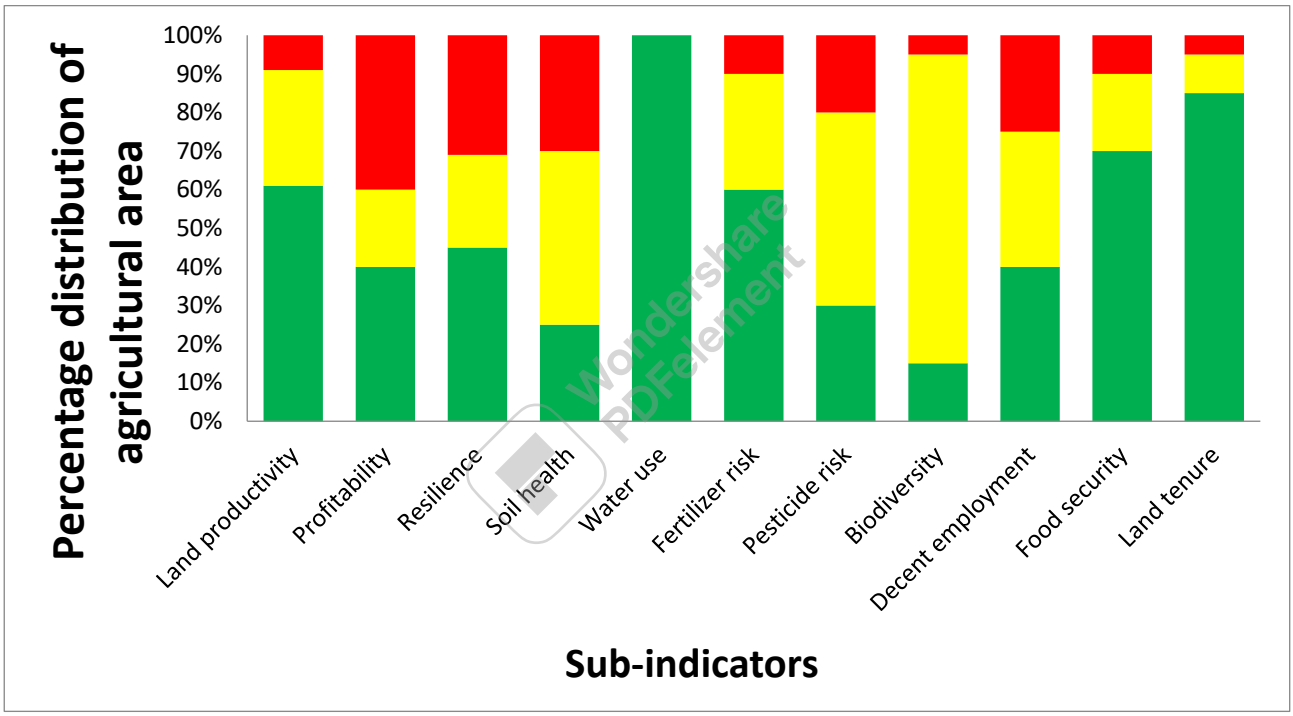
This document provides stepwise guidelines on how to calculate the 11 sub-indicators. That is how to analyse the statistical information collected through a survey module. **The document is divided into three chapters, with each focusing on the respective dimension of the indicator.**

Constructing the indicator

Each sub-indicator is assessed based on its sustainability criteria at the level of the agricultural holding. The sustainability level is then associated with the agricultural land area of the agricultural holding and reported as a percentage of total agricultural area in a dashboard using 'traffic light' approach (see figure 1).

1. Green: desirable
2. Yellow: acceptable
3. Red: unsustainable.

Figure 1: Dashboard



The dashboard offers several advantages, including the possibility to combine data from different sources and provide clarity about the main causes of unsustainability; countries can visualize their performance in terms of the different sustainability dimensions and themes, and therefore understand where policy efforts should be focused.

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Steps to calculate the sub-indicators

The calculation of the 11-sub indicators involves the following steps:

1. Classification of the farms and its agricultural area as desirable, acceptable or unstainable for each sub-indicator using the respective sustainability criteria.

2. For each sub-indicator at the national level, adding up the agricultural areas of the farms by sustainability status i.e. desirable, acceptable and unsustainable.

3. For each sub-indicator, calculate the agricultural area as a percentage of total agricultural area of the country.

The calculation procedure of each sub-indicator can be generalized according to the following formula:

$$Sub - indicator_i = \frac{Agricultural\ area\ of\ desirable\ farms}{Total\ agrciultural\ area}$$

$$Sub - indicator_i = \frac{Agricultural\ area\ of\ acceptable\ farms}{Total\ agrciultural\ area}$$

$$Sub - indicator_i = \frac{Agricultural\ area\ of\ unsustainable\ farms}{Total\ agrciultural\ area}$$

With i equals sub-indicator 1 to 11

The calculation procedure for each sub-indicator is presented as follows:

- Description
- Sustainability criteria
- Calculation steps
- Questions to collect data
- Variables to construct the sub-indicator

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Economic dimension

Sub-indicator 1. Farm output value per hectare (FOVH).

Description: The sub-indicator measures and classifies the agricultural area of the holding based on its productivity distance from the corresponding 90th percentile. Information on farm outputs and agricultural area is standard information available from farm surveys.

- Farm output: The volume of agricultural output at farm level generally takes into account production of multiple outputs, e.g. crop, livestock and its combinations. 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 terms in Local Currency Units (LCU). 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[1]. The agricultural land area of the holding comprises of land owned, rented and other type of land tenure. Nomadic pastoralism, common land and other agricultural activities not associated to land are out of scope.

Sustainability criteria.

- Green (desirable): Farm output value per hectare is ≥ 2/3 of the corresponding 90th percentile.
- Yellow (acceptable): Farm output value per hectare is ≥ 1/3 and <2/3 of the corresponding 90th percentile.
- Red (unsustainable): Farm output value per hectare is < than 1/3 of the corresponding 90th percentile.

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Calculation steps:

1) For each farm, calculate the farm output value per hectare as per below formula:

$$\textbf{Farm output value per hectare} = \frac{\textbf{Farm output value (LCU)}}{\textbf{Farm agricultural land area (hectare)}} \quad [1]$$

The farm output value is defined as the total volume of agricultural output i.e. quantity of produced commodities (i.e. crop and livestock and other on-farm activities) multiplied by the respective market/constant prices in LCU.

The calculation of farm output value is done as per the International Standard Industrial Classification (ISIC, rev. 4):

- **Crop activities: Section A** Agriculture, forestry and fishing; **Group: 011-012**
- **Livestock activities: Section A** Agriculture, forestry and fishing; **Group: 014**
- **On-farm activities: Section A** Agriculture, forestry and fishing **Group: 02**
- **On-farm activities: Section A** Agriculture, forestry and fishing **Group: 03**
- **On-farm activities: Section C** Manufacturing, forestry and fishing **Group: 10**
- **On-farm activities: Section C** Manufacturing, forestry and fishing **Group: 12**
- **On-farm activities: Section C** Manufacturing, forestry and fishing **Group: 16**

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

- On-farm activities: Section E Water supply; sewerage, waste management and remediation activities Group: 36
- On-farm activities: Section I Accommodation and food service activities Group: 55
- On-farm activities: Section I Accommodation and food service activities Group: 56
- On-farm activities: Section S Other service activities

The agricultural land area is defined as the area of land used for agriculture within the farm. It excludes common land areas unless they are managed exclusively by the farm and owned land rented out.

2) The second step is to classify farms according to their sustainability status:

- Farms are classified as green (desirable) if their farm output value per hectare is equal to or greater than 2/3 of the corresponding 90th percentile of the surveyed farms engaged in similar activities.
- Farms are classified as yellow (acceptable) if their farm output value per hectare is between 1/3 and 2/3 of the corresponding 90th percentile of the surveyed farms engaged in similar activities.
- Farms are classified as yellow red (unsustainable) if their farm output value per hectare is smaller than 1/3 of the corresponding 90th percentile of the surveyed farms engaged in similar activities.

3) The final step is to calculate the proportion of sustainable agricultural area by sustainability status for the country. This is done by adding up the total agricultural area associated with farms classified by the sustainability status (green, yellow or red) as a percentage of total agricultural area of the country.

Box 1 Example for the case of Tanzania.

Box 1. Calculation procedure for sub-indicator 1. Source: Tanzania farm survey (2010).

According to the calculation procedure, the first step implies calculating the farm output value per hectare, for each farm, as per formula [1] below.

$$\boldsymbol{Farm\ output\ value\ per\ hectare}_i = \frac{\boldsymbol{Farm\ output\ value\ (LCU)}_i}{\boldsymbol{Farm\ agricultural\ \ land\ area\ (hectare)}_i}$$

Where i is the $i-th$ farm in the survey, with i going from 1 to N; N is the total number of surveyed farms.

For each farm, the farm output value and the farm agricultural land area can be calculated by extracting information from question A.2, A.12-A.13 and A.15 respectively.

Once the farm output value per hectare has been calculated for each farm, the second step of the calculation procedure implies calculating the farm output value per hectare corresponding to the 90th percentile of the related distribution.

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Definition of the 90th percentile

Percentile is a measure used in statistics indicating the value (for instance the value of farm output value per hectare) below which a given percentage of observations in a group of observations fall. For example, the 90th percentile of the FOVH indicator is the value below which 90th of the observations are found. The 90th percentile can be calculated using the following formula:

$$\boldsymbol{90^{th} = 0.9 * total\ number\ of\ survyed\ farms}$$

Example: let's imagine that we have calculated the farm output value per hectare for a total of 14 farms which are part of a survey. The 90th percentile can be derived as follows:

$$\boldsymbol{90^{th} = 0.9 * 14 \cong 13}$$

The farm output value per hectare of each farm is then sorted from the lowest to the highest, as per table below. The value of farm output value corresponding to the 90th percentile is the one associated with the farm positioned 13th in the ranking, as derived from the formula above:

Farm number	Farm output value per hectare (in US $)	Value corresponding to the 90th percentile
1	7	
2	24	
3	25	
4	45	
5	66	
6	95	
7	133	
8	136	
9	140	
10	147	
11	159	
12	163	
13	184	90th percentile
14	186	

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Box 1(cont'd). Calculation procedure for sub-indicator 1. Source: Tanzania farm survey (2010).

The Tanzania dataset contains a total of 2692 observations -- farms -- for which the farm output value and farm agricultural area are available

The farm output value per hectare for the case of Tanzania is calculated as the ratio between the farm output value (as per ISIC code above) in total agricultural area of the farm (measured in hectares). The FOVH can be generated using a statistical software --such as STATA-- as per below commands:

generate Farm_output_value_per_hct= farm_output_value /farm_agricultural_area

label variable Farm_output_value_per_hct "farm output value per hectare in Local Currency Unit"

g Farm_output_value_per_hct_USD=Farm_output_value_per_hct/1409

lable variable Farm_output_value_per_hct_USD "farm output value per hectare in USD $"

Once the farm output value per hectare has been calculated for each farm in the survey, the farm output value per hectare corresponding to the 90th percentile can be easily calculated by using the following STATA commands

Summarize Farm_output_value_per_hct, details

Summarize Farm_output_value_per_hct_USD, details

The following table has been obtained through STATA and the value in red is the one corresponding to the 90th percentile

Percentile	Farm output value per hectare	Farm output value per hectare (in US $)
1	26,968.08	18.10
5	90,971.41	61.05
10	162,480.30	109.05
25	386,787.60	259.59
50	947,671.80	636.02
75	2,078,433.00	1,394.92
90	4,693,519.00	3,150.01
95	6,951,076.00	4,665.15
99	11,700,000.00	7,852.35

Finally, the 2/3 and 1/3 of the 90th percentile, which are the threshold used to classify farms as sustainable acceptable and non-sustainable, are derived by multiplying 4,693,519.00 by 0.66 (which is 2/3) and 0.33 (which is 1/3) respectively, as per formulas below

$$\frac{2}{3} of\ the\ 90^{th} = (0.66 * 4,693,519.00) = 3,097,722.54\ (local\ currency\ unit)$$

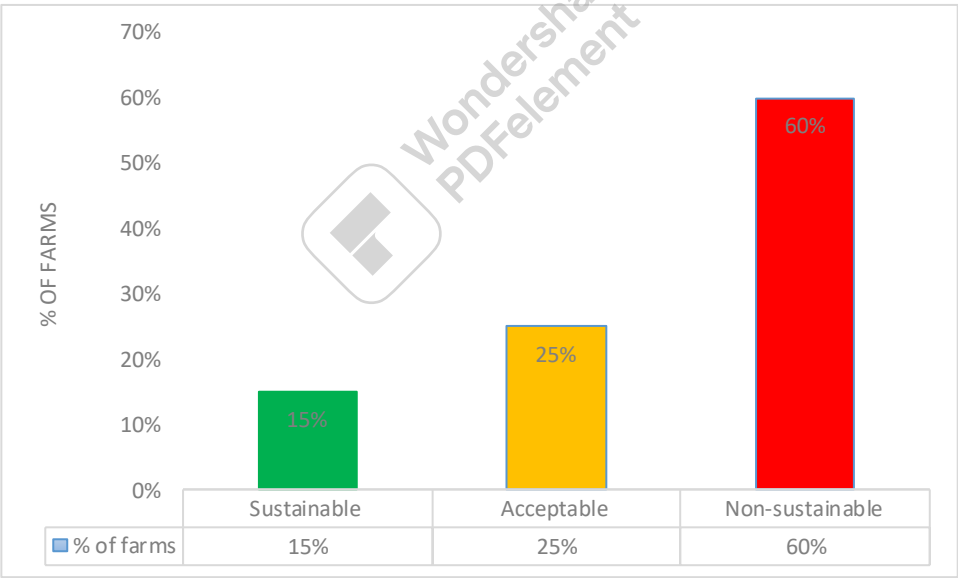
$$\frac{1}{3} of\ the\ 90^{th} = (0.33 * 4,693,519.00) = 1,548,861.27\ (local\ currency\ unit)$$

Box 1(cont'd). Calculation procedure for sub-indicator 1. Source: Tanzania farm survey (2010).

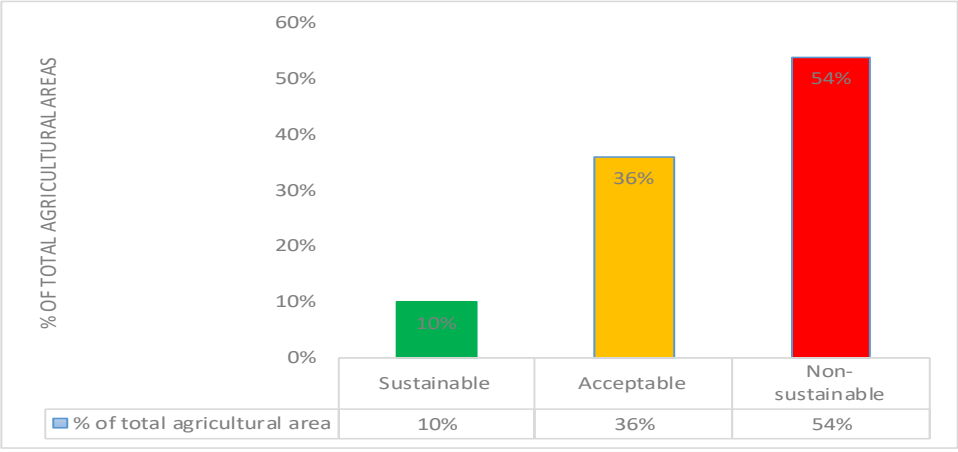
For each farm, the farm value output per hectare is benchmarked against the above calculated thresholds of sustainability, which $\mathbf{3,097,722.54}$ and $\mathbf{1,548,861.27}$

The following STATA command allows classifying farms by sustainability status, which is:

```
Generate Farm_sustainability_status= 1 if Farm_output_value_per_hct >= 3,097,722.54

Replace Farm_sustainability_status=2 if Farm_output_value_per_hct < 3,097,722.54 & Farm_output_value_per_hct >= 1,548,861.27

Replace Farm_sustainability_status= 3 if Farm_output_value_per_hct < 1,548,861.27

lable var Farm_sustainability_status "Farm classification by sustainability status "

    lab values Farm_sustainability_status Farm_sustainability_status

    lab def Farm_sustainability_status 1 "Sustainable, green"

    lab def Farm_sustainability_status 2 " Acceptable, yellow", add

    lab def Farm_sustainability_status 3 "Non-sustainable red", add
```



Finally, once farms have been classified by their sustainability status, the proportion of agricultural area by sustainability status can be calculated. For the case of Tanzania (2010), the following results have been calculated:



Question to collect data

A.2 Report area of the holding by land use.

Reference year: Last calendar year

(Fill in all that applies)

			Area of the holding	Unit of measure	
○	1a	Land under temporary crops			Add up values from code 1 to 9 to calculate the denominator of sub-indicator 1, After converting into hectares
○	1b	Greenhouses and land in family gardens (temporary crops)			
○	2	Land under temporary meadows and pastures (do not include common land areas)			
○	3	Land temporarily fallow			
○	4a	Land under permanent crops			
○	4b	Greenhouses and land in family gardens (permanent crops)			
○	5	Land under permanent meadow and pastures (do not include common land areas)			
○	6	Land under farm buildings and farmyards (exclude greenhouses and land in family gardens)			
○	7	Forest and other woodland			
○	8	Area used for aquaculture (including inland and coastal water if part of the holding)			
○	9	Other area not elsewhere classified			
		Total area of the holding			

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A.11 What was the total value of crops and its by-products produced by the holding?

Reference year: Last calendar year

(Fill in all that apply)

List up to 5 major crops and 5 major crop by-products produced

	Crop name	Area	Unit of measure	Number of varieties	Produced	Unit of measure	Price per unit	Value of Production	
○	1								Add up Values of crop production
○	2								
○	3								
○	4								
○	5								

	Crop by-product name	Quantity Produced	Unit of measure	Average or last Price per unit	Total Value of Production	
○	1					Add up

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2		. . . .	.		.	.	Values of by-product crop production
3		. . . .	.		.	.	
4		. . . .	.		.	.	
5		. . . .	.		.	.	

A.12 What was the total value of livestock and its by-products production of the holding?

Reference year: Last calendar year

(Fill in all that applies)
List up to 5 major livestock and 5 major livestock by-products produced

	Livestock animals name	Number of heads Live births	Number of heads Bought or received	Number of heads Died	Sold, paid to labor Rented, exchanged	Average or last Price per unit	Value of Production: Total
1						.	.
2						.	.
3						.	. Add up Values of animal production
4						.	.
5						.	.

	Livestock by-product name		Unit of measure	Quantity Produced	Average or last Price per unit	Value of Production: Total
1		. . . .		.	.	.
2		. . . .		.	.	.
3		. . . .		.	.	.
4		. . . .		.	.	.
5		. . . .		.	.	.

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A.14 What was the total value of production from other on-farm activities of the holding?

Reference year: Last calendar year

(Fill in all that applies)

List up to 5 other major on-farm products produced by the holding

	Other on-farm products name	Unit of measure	Quantity Produced	Average or last Price per unit	Value of Production Total
○ 1			.	.	.
○ 2			.	.	.
○ 3			.	.	.
○ 4			.	.	.
○ 5			.	.	.

Add up Values of on-farm activities

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Variables to construct the sub-indicator

The construction of this sub-indicator requires information collected in section **A,** specifically in **questions A.2, A.11-A.12 and A.14**. Two aggregate variables and five sub-variables need to be constructed in order to derive the final indicator:

1. Total value of farm production, as aggregated by adding up the following five sub-variables;
    - Total value of crop production
    - Total value of crop by-product
    - Total value of livestock animal production
    - Total value of livestock by-product
    - Total value of on-farm activities that are not crop and livestock.
2. Total agricultural area.

The value of agricultural production is a monetary variable – as measured in local currency unit -- constructed by aggregating the total value of production by crop (up to 5 major crops), crops by product (up to 5 major crops by product), livestock animals production (up to 5 major animals) and livestock by-product (up to five major livestock by –product) and other on-farm products. The data items are derived from questions **A.11, A.12 and A.14.**

The variable capturing the total agricultural area of the holding is derived by aggregating the total agricultural area (once converted in hectares) in question **A.2** (codes from 1 to 9).

Table below associates the questions to the variables that must be constructed.

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Main variable	Sub-variable	Type of variable	Question number	Final indicator
tot_value_of_farm_production	tot_value_crop_production	monetary	A.11	Farm output value per hectare
	tot_value_crop_by_prdoduct_production	monetary	A.11	
	tot_value_livestock_production	monetary	A.12	
	tot_value_livestock_by_product_production	monetary	A.12	
	tot_value_of_on_farm_production	monetary	A.14	
tot_agricultural area		continuous (in hectares of land)	A.2 (code from 1 to 6)	

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Sub-indicator 2. Net farm income (NFI).

Description. The sub-indicator captures whether a farm is 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.

Sustainability criteria. The following sustainability criteria have been defined to classify the agricultural area of the farm by sustainability status:

- 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 consecutive years

Calculation steps: The steps for this indicator are as follows:

For each farm, calculate the net farm income.

If the required data items to calculate net farm income are not available (see box 2 below), a second simplified option is offered, based on respondent's declaration on agricultural holding profitability over the last 3 calendar years, as per question below:

"How often was this holding profitable? (profitable means that value of production was greater than total cost both fixed and variable)"

Reference year: last 3 calendar years
(Fill in one circle only)

◯ 1 Unprofitable for all three years

◯ 2 Profitable in one out of the three years

◯ 3 Profitable in two out of the three years

◯ 4 Profitable in three out of the three years

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Box 2. Alternative methods to calculate Net farm income

If the required information is available, net farm income is better calculated according to the methodology developed by Statistics Canada (available at https://www150.statcan.gc.ca/n1/en/pub/21-010-x/21-010-x2014001-eng.pdf?st=_8V1ikX6). The following formula is applied:

$$NFI = CR + Y_k - OE - Dep + \Delta In \quad [1]$$

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 charges
- Δ Inv = Value of inventory change.

The below table enlists all costs and revenues associated with agricultural production, as per formula 1 above.

Total revenues= Total farm cash receipts + Direct program payments + Income in kind + Change in inventory	Cost = Operating + Fixed cost + depreciation	Net farm Income
• Revenue = Quantity X Prices - Crops - Livestock - other on-farm activities / producst • Direct program payments • Income in kind • Value of inventory change	• Operating Expenses: - Labour expenses (Cash wages) - Fertilizers expenses - Pesticides expenses - Fuel expenses - Electricity expenses - Costs for feeding animals - Irrigation cost - Taxes - Others (see pag.30-32 of the above link) • Depreciation charges	$NFI = revenues - cost$

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Box 2 (cont'd). Alternative methods to calculate Net farm income

Farm cash receipts measure the gross revenue of farm businesses in current dollars. They include sales of crops and livestock products (except sales between farms in the same province) and program payments. Receipts are recorded when the money is paid to farmers before any expenses are paid. The farm cash receipts series includes agricultural products such as field crops, vegetables, fruits, floriculture and nursery products, maple and forest products, livestock, dairy products, poultry, eggs, fur, and honey.

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

Income in kind measures the value of agricultural commodities produced on farms and consumed by individuals living on these farm operations. The home-consumed products are valued at prevailing market prices such that income in kind represents the receipts producers would have received had the product been sold rather than consumed.

Value of inventory change measures the value of the change in producer-owned inventories between the beginning and the end of the calendar year. The annual value of inventory change (whether positive or negative), along with farm cash receipts and income in kind, represents the gross value of agricultural production.

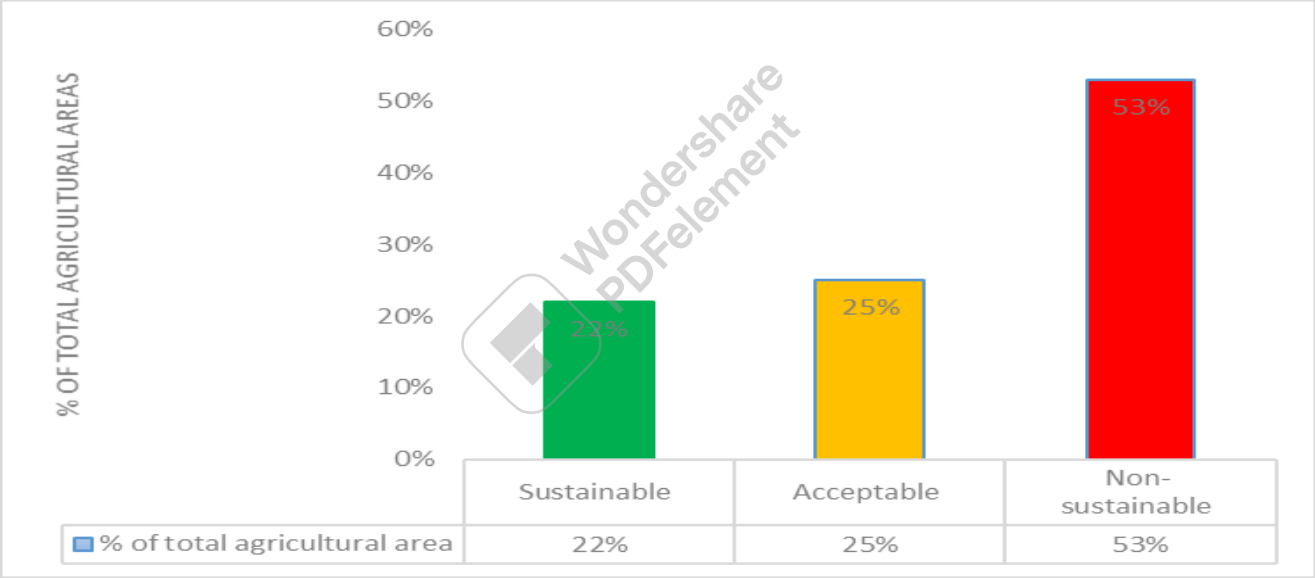
Farm operating expenses represent business costs incurred by farm operators for goods and services used in the production of agricultural commodities. All expense information is on a calendar year basis. If direct rebates are paid to farmers to reduce the cost of particular inputs, then the net expense estimates are used in the preparation of net income, although both gross and net expenses may be displayed. A full list of farm operating expenses can be found at pages 30-32 of the following link: https://www150.statcan.gc.ca/n1/en/pub/21-010-x/21-010-x2014001-eng.pdf?st=_8V1ikX6

Depreciation charges against the farm business are intended to account for economic depreciation or the loss in fair market value of the capital assets. Generally, depreciation is considered to occur as a result of ageing, wear and tear, and obsolescence. It represents the value of capital which is no longer available for future use. Economic depreciation should not be confused with accounting depreciation, tax depreciation, or capacity depreciation.

1. The second step is aimed at classifying farms according to their sustainability status, which is:

- Farm are classified as green (desirable) if net-farm income is above zero for past 3 consecutive years
- Farm are classified yellow (acceptable) if net-farm income is above zero for at least 1 of the past 3 consecutive years
- Farm are classified red (unsustainable) if net-farm income is below zero for all of the past consecutive years

2. Once farms have been classified according to their sustainability status -- as per criteria above -- the third and final step is to calculate the sustainable agricultural area by status. This is done by adding up the total agricultural area associated with farms classified as green, yellow or red in total agricultural area. Figure 2 below provides an example for Tanzania (farm survey 2010).



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Questions to collect data

A.15 How often was this holding profitable? (profitable means that value of production was greater than total cost both fixed and variable)

Reference year: Last 3 calendar years

(Fill in one circle only)

○	1	Unprofitable for all three years	Red (unsustainable)
○	2	Profitable in one out of the three years	Yellow (Acceptable)
○	3	Profitable in two out of the three years	Yellow (Acceptable)
○	4	Profitable in three out of the three years	Green (Desirable)

Variables to construct the sub-indicator

The construction of this sub-indicator requires information collected in section A. The indicator is made up of only one variable, "profitable_farms". The variable used to construct this sub-indicator is a categorical variable taking on values from 1 to 3 and constructed according to the information recorded in question **A.15**. Holdings that self-declared making a profit over the past three consecutive agricultural years are labelled as green (code for **A.15** is 4); the associated code is 1. Holdings that declared making a profit for at least one out of the past three consecutive years are labelled as yellow (code for **A.15** is 2 or 3); the corresponding code is 2. Finally, holdings that declared never making a profit over the past three consecutive years are labelled as red (code for **A.15** is 1) and coded as 3.

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Main variable	Sub-variable	Type of variable	Question number	Final indicator
profitable_farms		categorical (coded from1 to 3)	A.15	net-farm income

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Sub-indicator 3. Risk mitigation mechanisms (RMM).

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

- Access to or availed credit .
- 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. The following sustainability criteria are defined to classify the agricultural area of the farm by sustainability status:

- 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.

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Calculation steps: the calculation procedure for this indicator is two-step:

Classify farms according to the sustainability criteria mentioned above.

The following data items are used to identify farms that meet at least one of the following mitigation mechanisms:

1. *Agricultural holding access to credit, insurance or other financial instruments:*
    - *Credit (formal, informal)*
    - *Insurance*
2. *List of other on-farm activities apart from crops and livestock*
3. *Value of production for the listed on-farm commodities*

1. Once the farms have been classified according to their sustainability status --as per criteria above-- the second and final step is to calculate the proportion of sustainable agricultural area. This is done by adding up the total agricultural area associated with farms classified as green, yellow or red in total agricultural area.

Questions to collect data

A.16 Did this holding has access to or availed any of the following mechanisms for protection against external shocks (e.g. drought, floods, pests, market prices and others)?

Reference year: Last calendar year

(Fill in all that applies)

◯	1	This holding has access to or availed credit (i.e. formal and/or informal)	Farm is sustainable If 1 and 2 are filled
◯	2	This holding has access to or availed insurance	Farm is sustainable If only 1 (or 2) is filled and A.18 is Yes and A.14 is greater than 33 %
◯	3	No, the holding doesn't have access to or availed any of the above mechanisms	farm is acceptable If only 1 (or 2) is filled and A.14 is 1 and A.15 is greater than 66% of total value of production

A.13 Did the holding engage in other on-farm activities apart from crops and livestock? (Read the list)

Reference year: Last calendar year

(Fill in one circle only)

◯	1	Yes	Farm is acceptable if A.17 is 1 (or 2) and A.15 is greater than 66%
◯	2	No	Farm is unsustainable if A.17 is 3 and A.14 is 2 (or A.14 is 1 but A.15 is lower than 66 % of total agricultural production

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A.14 What was the total value of production from other on-farm activities of the holding?

Reference year: Last calendar year

(Fill in all that applies)

List up to 5 other major on-farm products produced by the holding

	Other on-farm products name	Unit of measure	Quantity Produced	Average or last Price per unit	Value of Production Total
○ 1			.	.	Add up total value of on-farm production and check whether it is greater than 66 % of total agricultural production
○ 2			.	.	
○ 3			.	.	
○ 4			.	.	
○ 5			.	.	

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Variables to construct the sub-indicator

The construction of this sub-indicator requires information collected in section A. The indicator is comprised of three main dummy variables. The first variable to be constructed is a dummy taking on a value of 1 if the holding had access to or availed credit and 0 otherwise; the second variable takes on value of 1 if the holding had access to or availed insurance and 0 otherwise. Both variables are extracted from question **A.16.**

The third and final variable is constructed from questions **A.13 and A.14**, and it is a dummy variable taking on a value of 1 if the holding has diversified its agricultural activity (question A.14) and the value of production (question **A.14**) from on-farm activities is greater than 66% of total holding production. It is important to know that the 66% threshold must be determined by benchmarking the value of production from on-farm activities with the variable accounting for the total value of production from agriculture.

The table below lists questions from which variables can be constructed.

Main variable	Sub-variable	Type of variable	Question number	Final indicator	Comments/notes
Access_to_credit		dummy	A.16		
Access_to_insurance		dummy	A.16		
On_farm_diversification		dummy	A.13 & A.14	Risk mitigation mechanism	Before coding as 1 or 0, benchmark total value From on-farm production (A.14) with variable **Value_of_crop_vestock_production** and check whether A.14 is greater (lower) than 66% of total value of agricultural production

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Environmental dimension

Sub-indicator 4. Prevalence of soil degradation (PSD)

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

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. The following sustainability criteria have been defined to classify the agricultural area of the farm by sustainability status:

- 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.

Calculation steps: the calculation procedure consists of two steps:

1. farms affected by one or more of the four above-identified threats are classified as red, green or yellow.
2. The second step involves calculation of the agricultural area by sustainability status

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Questions to collect data

B.1 Have you experienced any of the following soil degradation threats on your holding?

Reference year: Last 3 calendar years

(Fill in all that applies)

◯	1	Soil erosion (loss of topsoil through wind or water erosion)	Non sustainable (red or yellow), check B.2
◯	2	Reduction in soil fertility	Non sustainable (red or yellow), check B.2
◯	3	Waterlogging	Non sustainable (red or yellow), check B.2
◯	4	Salinization of irrigated land	Non sustainable (red or yellow), check B.2
◯	5	Other (specify	Non sustainable (red or yellow), check B.2
◯	6	None of the above	sustainable

B.2 What is the total area of the holding affected by any of the threats identified above?

Reference year: Last 3 calendar years

	Area	Unit of measure		
Total area affected				The percentage of area affected by threats is calculated over total agricultural area from question A.2 (codes from 1 to 6)
◯				

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Variables to construct the sub-indicator

The construction of this sub-indicator requires information collected in section B. The indicator is constructed by extracting information on the percentage of land area affected by the threat from question **B.2**. If the reported percentage of area affected by the threat is less than 10 percent, agricultural holdings are labelled as green; if between 10 and 50 percent yellow; finally, if above 50 percent, agricultural holdings are labelled as red. The first indicator is a sub-variable expressed in percentage terms -- "perc_agr_area_affected"—used to measure the proportion of total agricultural areas affected by threat(s) in total agricultural areas. The second variable is the main categorical variable "agr_area_affected" coded from 1 to 3, depending on the proportion of agricultural area affected by threat(s), as follows:

1 if the proportion of total agricultural area affected by threat(s) is less than 10 %,

2 if the proportion of total agricultural area affected by threat(s) is between 10 and 50 percent; and

3 if the proportion of total agricultural area affected by threats is above 50 %.

Main variable	Sub-variable	Type of variable	Question number	Final indicator	Comments/ notes
soil degradation	perc_agr_area_affected	main: categorical from 1 to 3 sub-var: percentage	B.1 and B.2	**Prevalence of soil degradation**	In order to compute the percentage of agricultural area affected by threat(s), used var. "tot_agricultural_area" (Q.A.2, CODE from 1 to 6) as denominator

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Indicator 5. Variation in water availability

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. The following sustainability criteria have been defined to classify the agricultural area of the farm by sustainability status:

- Green (desirable): 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 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.

Calculation steps: the calculation procedure for this indicator envisages two steps:

1. Farms are classified by sustainability status as per above-identified criteria.
2. The proportion of agricultural area by sustainability status is calculated by deriving the agricultural areas associated with farms under a given sustainability status.

Questions to collect data

B.3 Did this agricultural holding use water to irrigate crops?

Reference year: Last 3 calendar years

(Fill in one circle only)

○	1	Yes (indicate the area or percentage of the total area of the holding)	Sustainable if area under Irrigation is less than 10 % (to be computed by calculating this area as a share of total agricultural area in A.2 Non-sustainable or acceptable: check B.4 and B.5
○	2	No, I don't need irrigation	Sustainable
○	3	No, I can't afford irrigation	Sustainable

B.4 Are you observing any reduction in water availability from well or other sources i.e. lake, canal and river?

Reference year: Last 3 calendar years

(Fill in one circle only)

○	1	No, water is always available in sufficient quantity when I need it	Sustainable area under irrigation is at least than 10%
○	2	Yes, water level in my well(s) is progressively going down	Acceptable if area under irrigation is at least 10% (B.3.) and B.5 is 1
○	3	Yes, water in river, lake or canal is getting scarce and I can't have reliable supply when I need it	Acceptable if area under irrigation is at least 10% (B.3.) and B.5 is 1
○	4	I do not know	Acceptable if area under irrigation is at least 10% (B.3.) and B.5 is 1

B.5 Are there organizations dealing with water allocation in the area where this holding is located?

Reference year: Last 3 calendar years

(Fill in one circle only)

○	1	Yes, and they are working well	Acceptable if area under irrigation is at least than 10% & B.4 is from 2 to 5
○	2	Yes, but they are not working well	Acceptable if area under irrigation is at least 10% & B.4 is from 2 to 5
○	3	No, there are none	Non-sustainable if areas under crop irrigation is at least 10% & B 4 is from 2 to 5

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Variables to construct the sub-indicator

The construction of this sub-indicator requires information collected in section B. The sub-indicator is comprised of three dummy variables, whose information is contained in question **B.3 -B.5**.

The first dummy variable -- "dummy_irrigation" -- distinguishes between holdings that irrigate crop (**B.3** is 2 or 3) or use water on less than 10 percent of total agricultural areas. This dummy is equals to 1 if the holding does not use water to irrigate **(B.3** is 2 or 3) or use water to irrigate on less than 10 % of the total agricultural area (B.3 is 1 but the proportion of agricultural area which is irrigated is less than 10 %); the same variable is equal to 0 if the holding irrigate their crops and the percentage of the total area of the holding is at least 10 % (B.3.is 1 and but the proportion of agricultural area which is irrigated is at least 10 %).

The second dummy – dummy_water_reduction – is equal to 1 if the holding did not experience any reduction in water availability (question **B4** is 1) and 0 otherwise. The third and final dummy, -- dummy_organization – is equal to 1 if there is an organization dealing with water allocation in the area of the holding (question **B.5** is 1 or 2) and 0 otherwise.

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Main variable	Sub-variable	Type of variable	Question number	Final indicator	Comments/ notes
dummy_irrigation		dummy	B.3	**variation in water availability**	
dummy_water_reduction		dummy	B.4		
dummy_organization		dummy	B.5		

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Sub-indicator 6. Management of fertilizers (MF)

Description: The proposed approach is based on questions to farmers about their use of fertilizer, in particular mineral or synthetic fertilizers, their awareness about the environmental risks associated with fertilizers (including manure), and their behaviour in terms of fertilizer and manure management. List of management measures that help reducing risk is as follows:

1. Follow protocols as per extension service or retail outlet recommendations or local regulations, not exceeding recommended doses
2. Use synthetic and mineral fertilizers in combination with organic sources of nutrients (including manure)
3. Use legumes as a cover crop, or component of a multi/crop system to reduce fertilizer inputs
4. Recycle nutrients where possible, such as composting residues, manures or other organic materials to use as fertilizers
5. Distribute fertilizer application over the growing period
6. Consider soil type and climate in deciding fertilizer application doses and frequencies
7. Perform regular nutrient budget calculations based on soil sampling
8. Perform site-specific nutrient management or precision farming.

Sustainability criteria. The following sustainability criteria have been adopted to classify the agricultural area of the farm by sustainability status:

- Green (desirable): The farm does not use fertilizers[2] or uses fertilizers and takes specific measures to mitigate environmental risks (at least four from the list above)
- 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.

Calculation steps: the calculation procedure envisages two steps:

1. Farms are classified by sustainability status as per above-identified criteria
2. Calculate the proportion of agricultural areas associated with farms classified green, yellow and red.

[2] Fertilizers to be considered include mineral and synthetic fertilizers as well as animal manure.

Questions to collect data

B.6 Did this agricultural holding use any synthetic or mineral fertilizer for crops?
Reference year: Last calendar year

(Fill in one circle only)

◯	1	Yes	Farm is non-sustainable (acceptable or non-sustainable check next answer)
◯	2	No	Sustainable

B.7 Are you aware of the environmental risks associated with the excessive use or misuse use of fertilizer?
Reference year: Last calendar year

(Fill in one circle only)

◯	1	Yes	Further checks (see next question)
◯	2	No	Further checks (see next question)

B.8 Did this agricultural holding take specific measures to mitigate the environmental risks associated with the use of synthetic and mineral fertilizers?
Reference year: Last calendar year

(Fill in one circle only)

◯	1	Yes	Further checks (see next question)
◯	2	No	Non-sustainable

B.9 If so, which specific measures did the agricultural holding take or adopt?
Reference year: Last calendar year

(Fill in all that apply)

◯	1	Follow protocols as per extension service or retail outlet recommendations or local regulations, not exceeding recommended doses	Farm is sustainable if at least four measures are taken Farm is acceptable if at least one measure is taken
◯	2	Use synthetic and mineral fertilizers in combination with organic sources of nutrients (including manure)	
◯	3	Use legumes as a cover crop, or component of a multi/crop system to reduce fertilizer inputs	
◯	4	Recycle nutrients where possible, such as composting residues, manures or other organic materials to use as fertilizers	
◯	5	Distribute fertilizer application over the growing period	
◯	6	Consider soil type and climate in deciding fertilizer application doses and frequencies	
◯	7	Perform regular nutrient budget calculations based on soil sampling	
◯	8	Perform site-specific nutrient management or precision farming	
◯	9	Other (specify	

Variables to construct the sub-indicator

The construction of this sub-indicator requires information collected in section B. The final indicator is comprised of two variables: certified crops and measures taken to mitigate the environmental risks associated with the excessive use or misuse use of fertilizers as per list below:

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The first variable -- use of fertilizers -- is constructed from question B.6 and is equal to 1 if the holding uses fertilizers and 0 otherwise.

The second and final variable is a categorical variable equal to the total number of measures taken or adopted (from 0 to 8) to avoid environmental risks associated with the use of fertilizers B.9.

Main variable	Sub-variable	Type of variable	Question number	Final indicator	Comments /notes
Use_of_fertilizers		dummy	B.6.	**Management of fertilizers**	
measures_adopted		categorical from 0 to 8	B.9		

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Sub-indicator 7. Management of pesticides (MP)

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. List of possible measures:

Health

1. Adherence to label recommendations for pesticide use
2. Use of personal protection equipment
3. Safe disposal of waste (cartons, bottles and bags)

Environment

1. Adjust planting time, or apply crop spacing, crop rotation, mixed cropping or inter-cropping for breaking the pest cycle
2. Perform biological pest control or use biopesticides
3. Adherence to label recommendations for pesticide use
4. Adopt pasture rotation to suppress livestock pest population
5. Use of pest resistant/tolerant cultivars and livestock breeds and standard/certified seed and planting material
6. Systematic removal of plant parts attacked by pests
7. Regular cleansing of machinery and equipment to reduce pest dissemination

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Sustainability criteria. The following sustainability criteria have been developed to classify the agricultural area of the farm by sustainability status:

- Green (desirable): farmers does not use pesticides, uses only moderately or slightly hazardous[3] pesticides, and adheres to all three health-related measures and at least three of the environment-related measures (including adherence to label recommendation)

- Yellow (acceptable): farmer uses only moderately or slightly hazardous pesticides and takes some measures to mitigate environmental and health risks (at least two from each of the lists above, including adherence to label recommendations)

- Red (unsustainable): farmer uses highly or extremely hazardous pesticides or uses moderately or slightly hazardous pesticides but does not take specific measures to mitigate environmental or health risks associated with their use.

Calculation steps: the calculation procedure for this indicator is two-fold:

1. Sustainability status is assigned to each farm using the criteria listed above.

2. Calculate the proportion of agricultural areas associated with farms classified green, yellow and red.

[3] As defined by WHO classification (http://www.who.int/ipcs/publications/pesticides_hazard_2009.pdf, or equivalent national classification

Questions to collect data

B.10 Did this agricultural holding use any pesticides for crop production?

Reference year: Last calendar year

(Fill in one circle only)

◯	1	Yes	**Further checks**
◯	2	No	Farm is sustainable

B.11 What type of pesticides did this agricultural holding used?

Reference year: Last calendar year

(Fill in one circle only)

◯	1	Moderately or slightly hazardous	**Further checks**
◯	2	Highly or extremely hazardous	**Further checks**

B.13 Did this agricultural holding take specific measures to protect people from health-related risks?

Reference year: Last calendar year

(Fill in one circle only)

◯	1	Yes	**Further checks**
◯	2	No	Farm is non-sustainable

B.14 Which of the following measures did this agricultural holding adopt to protect people from health-related risks?

Reference year: Last calendar year

(Fill in all that apply)

◯	1	Adherence to label recommendations for pesticide use	Farm is sustainable if all 3 measures to protect people from health-related risks are adopted and at least 3 measures to avoid environmental related risks are adopted (B.16) Sustainability status of the farm is acceptable if B.11 is No and at least 1 health-related measure is adopted and 1 environmental related measure is adopted (B.16)
◯	2	Use of personal protection equipment	
◯	3	Safe disposal of waste (cartons, bottles and bags)	
◯	4	Other (specify	
◯	5	None of the above	Farm is non-sustainable

B.15 Did this agricultural holding adopt specific measures to avoid environment-related risks?

Reference year: Last calendar year

(Fill in one circle only)

◯	1	Yes	**Further checks**
◯	2	No	Farm is non-sustainable

B.16 Which of the following measure did this agricultural holding adopt to avoid environment-related risks?

Reference year: Last calendar year

(Fill in all that apply)

○	1	Adjust planting time for breaking the pest cycle	Farm is sustainable if all 3 measures to protect people from health-related risks are adopted (B.13) and at least 3 measures to avoid environmental related risks are adopted. Sustainability status of the farm is acceptable if B.11 is No and at least 1 health-related measure is adopted (B.14) and 1 environmental related measure is adopted
○	2	Apply crop spacing for breaking the pest cycle	
○	3	Apply crop rotation for breaking the pest cycle	
○	4	Apply mixed cropping or inter-cropping for breaking the pest cycle	
○	5	Perform biological pest control or use biopesticides	
○	6	Adherence to label recommendations for pesticide use	
○	7	Adopt pasture rotation to suppress livestock pest population	
○	8	Use of pest resistant/tolerant cultivars	
○	9	Use of pest resistant/tolerant livestock breeds	
○	10	Systematic removal of plant parts attacked by pests	
○	11	Regular cleansing of machinery and equipment to reduce pest dissemination	
○	12	Other (specify	

Variables to construct the sub-indicator

The construction of this sub-indicator requires information collected in section B. The final sub-indicator is comprised of four variables: use of pesticides, use of highly or extremely hazardous pesticides and health measures and environmental measures

The first variable -- use of pesticides -- is constructed from question **B.10** and is equal to 1 if the holding uses pesticides and 0 otherwise.

The second variable --use of highly hazardous pesticides -- is constructed from question **B.11** and is equal to 1 if the holding uses highly or extremely hazardous pesticides and 0 otherwise.

The third variable is a categorical variable equals to the total number of measures taken/adopted to protect people from health-related risks associated with the use of pesticides **B.15**.

The fourth variable is a categorical variable that equals the total number of measures taken or adopted to avoid environmental risks associated with the use of pesticides **B.16**.

Main variable	Sub-variable	Type of variable	Question number	Final indicator	Comments/ notes
Use_of_pesticides		dummy	B.10	Management of pesticides	
use_of_highly_hazardous_pesticides		dummy	B.11		
environmental_measures		categorical	B.14		
health_measures		categorical	B.16		

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Sub-indicator 8. Use of biodiversity-supportive practices (UBSP)

Description: This sub-indicator measures the level of adoption of biodiversity-supportive practices by the farm at ecosystem, species and genetic levels. This indicator addresses both crops and livestock. 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 , 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; 2) trees or tree products; 3) livestock or animal products; 4) fish.
- Practices crop or crop/pasture rotation involving at least 3 crops on at least 80% of the farm area.
- The area under a single continuous commodity is not larger than 2 hectares (excluding pasture).
- Areas larger than 2 hectares under a single commodity use at least two different varieties
- At least 50% of each animal species' population consists of locally adapted breeds or breeds at risk of extinction .

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Sustainability criteria. The following sustainability criteria have been defined to classify the agricultural area of the farm by sustainability status:

- Green (desirable): The agricultural holding meets at least five of the above criteria
- Yellow (acceptable): The agricultural holding meets between two and four of the above
- Red (unsustainable): The agricultural holding meets less than two of the above criteria
- **Calculation steps:** the calculation procedure for this indicator is two-fold:

1. Farms are classified by sustainability status as per above-identified criteria.
2. The proportion of agricultural area by sustainability status is calculated by adding up total agricultural areas under a given sustainability status.

Questions to collect data

B.10. Did this agricultural holding use any pesticides for crop production?

Reference year: Last calendar year

(Fill in one circle only)

◯	1	Yes	
◯	2	No	**Criterion No.2:** Note for data analysts: create a dummy variable equals to 1 If B.6 is No and B.10 is No

B.18. What is the total area of the holding area covered by any natural or diverse vegetation identified above?

Reference year: Last calendar year

		Area	Unit of measure	
◯	Total area covered			**Criterion No.1:** Note for data analysts: create a dummy variable equals to 1 If the recorded percentage is >=10; 0 otherwise

B.19. Where does the animal feed used on this agricultural holding come from (report percentage)?

Reference year: Last calendar year

(Fill in all that apply)

◯	1	Produced on this agricultural holding	**Criterion No.2:** Note for data analysts: create a dummy variable equals to 1 If the does not purchase more than 50% of the feed for livestock; 0 otherwise
◯	2	Purchased from outside this holding	

B.20. Are you using antimicrobials as growth promoter for your livestock?

Reference year: Last calendar year

(Fill in one circle only)

◯	1	Yes	
◯	2	No	**Criterion No.2:** Note for data analysts: create a dummy variable equals to 1 If

does not use antimicrobials as growth promoters

B.21. What is the percentage of the agricultural area on which crop rotation or crop/pasture rotation involving at least three crops is practiced?

Reference year: Last calendar year

(Leave it bank if not practiced)

○	1	Percentage of agricultural area

Criterion No.4:
Note for data analysts: create a dummy variable equals to 1 if the reported area is at least 80% of the farm area

B.22. For each species of animal (max. 3) that are raised on this agricultural holding, list the different breeds and the percentage of animals they represent

Reference year: Last calendar year

(Leave it blank if none)

		Species Name		Breeds/ Crossbreed Name		Number of heads
○	1		1			
			2			
			3			
○	2		1			
			2			
			3			
○	3		1			
			2			
			3			

Criterion No.7:
Note for data analysts: create a dummy variable equals to 1 if. For each animal species' population at least 50% consists of locally adapted breeds or breeds at risk of extinction

A.11. What was the total value of crops and its by-products produced by the holding?

Reference year: Last calendar year

(Fill in all that apply)

List up to 5 major crops and 5 major crop by-products produced

		Crop name	Area	Unit of measure	Nr. varieties
○	1				
○	2				

Criterion No.5:

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3				Note for data analysts: create a dummy variable equals to 1 if the area under a single commodity crop is NO larger than 2 hectares
4				Criterion No.6:
5				Note for data analysts: create a dummy variable equals to 1 if the area under a single commodity crop in which at least to varieties are used is larger than 2 hectares

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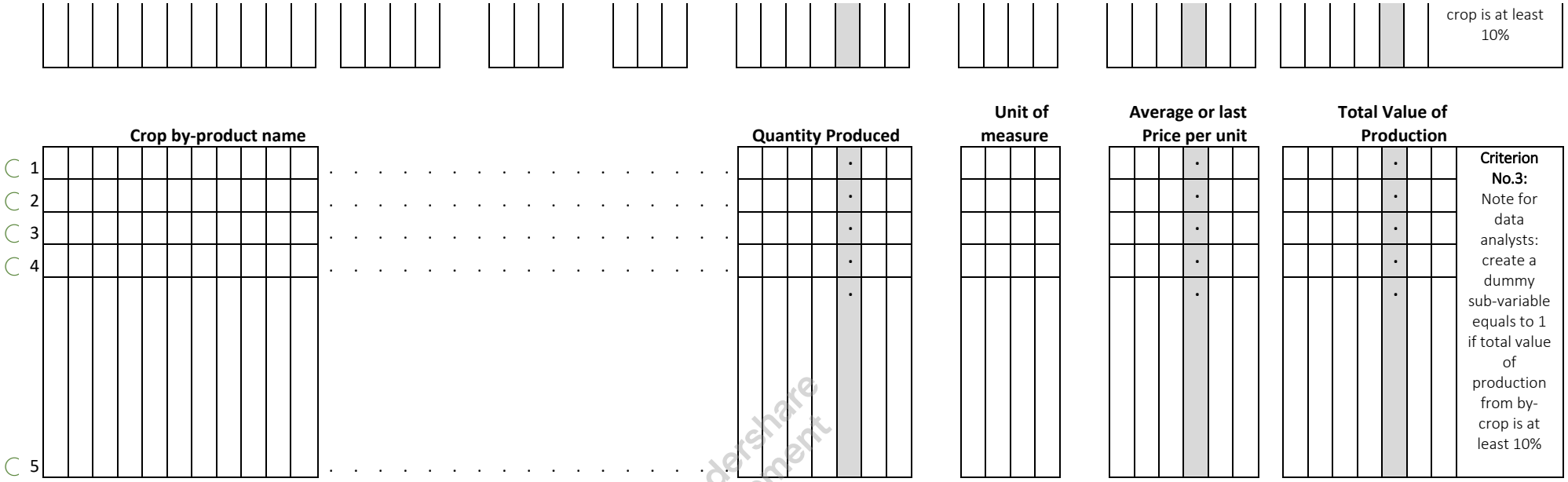
A.11 What was the total value of crops and its by-products produced by the holding?

Reference year: Last calendar year

(Fill in all that apply)

List up to 5 major crops and 5 major crop by-products produced

	Crop name	Area	Unit of measure	Number of varieties	Produced	Unit of measure	Price per unit	Value of Production	
1					.		.	.	Criterion No.3: Note for data analysts: create a dummy variable equals to 1 if total value of production from
2					.		.	.	
3					.		.	.	
4					.		.	.	
5					.		.	.	

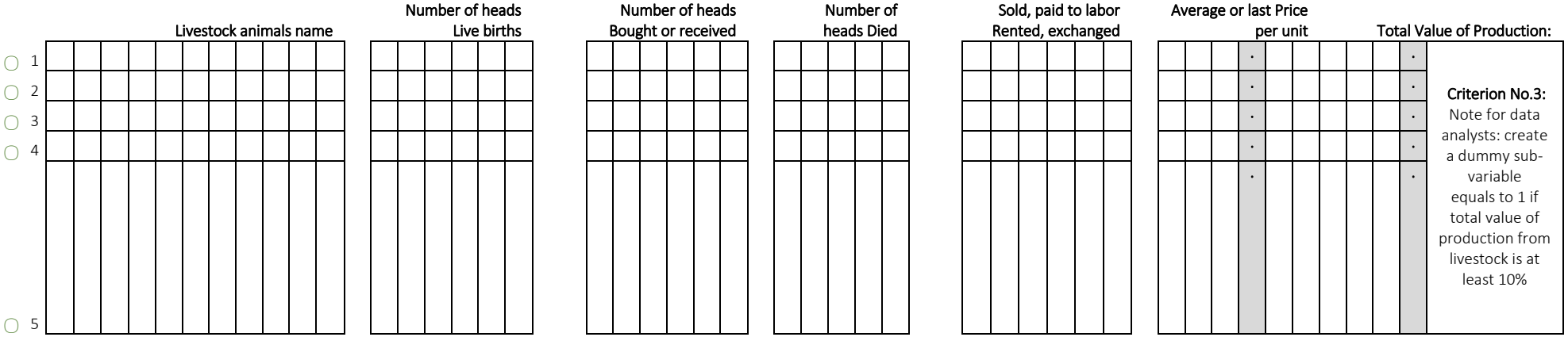


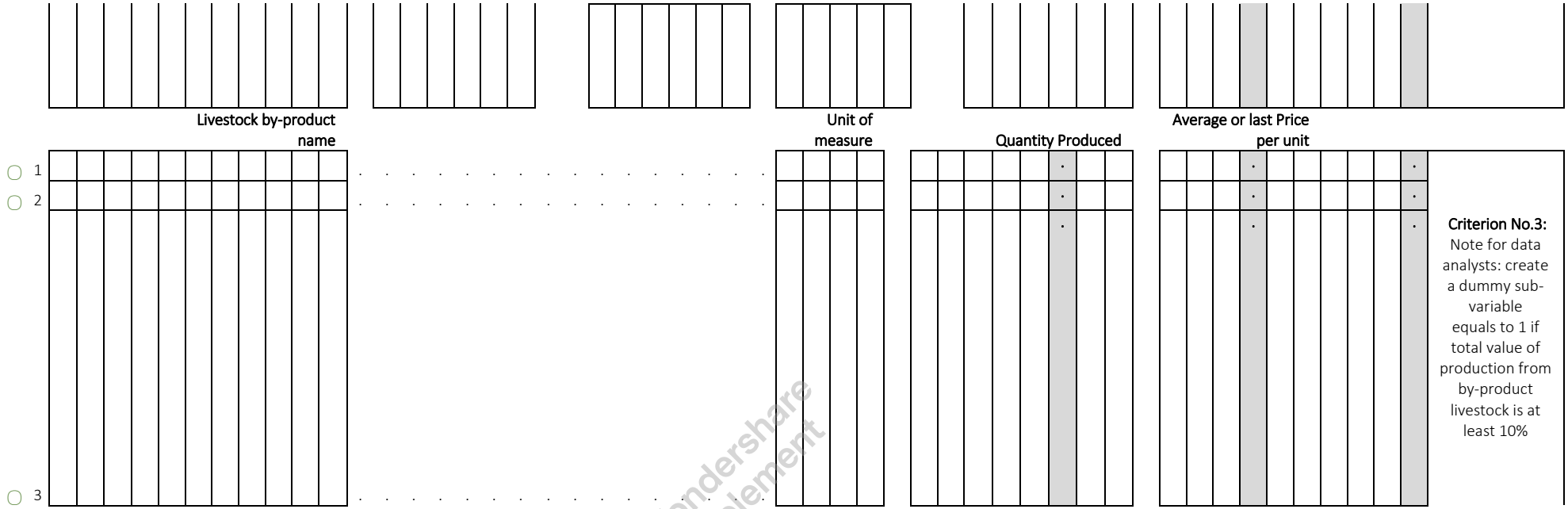
A.12 What was the total value of livestock and its by-products production of the holding?

Reference year: Last calendar year

(Fill in all that applies)

List up to 5 major livestock and 5 major livestock by-products produced





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A.14 What was the total value of production from other on-farm activities of the holding?

Reference year: Last calendar year

(Fill in all that applies)

List up to 5 other major on-farm products produced by the holding

	Other on-farm products name	Unit of measure	Quantity Produced	Average or last Price per unit	Value of Production Total
○ 1					**Criterion No.3:** Note for data analysts: create a dummy sub-variable equals to 1 if total value of production from trees or tree products, or fish is at least 10%
○ 2					
○ 3					
○ 4					
○ 5					

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Variables to construct the sub-indicator

The construction of this sub-indicator requires information collected in section B using questions from **B.18** to **B.22 and question B.10.** It also requires information collected in section A, questions **A.12, A.13** and **A.15**. The final indicator is comprised of seven dummy variables, capturing the seven criteria identified for biodiversity-supportive practice.

- The first dummy -- "biodiversity 1" -- is extracted from question **B.18** and is equal to 1 if at least 10 % of total agricultural areas is not cultivated because it is covered by natural or diverse vegetation.

- The second dummy variable -- "biodiversity 2"-- is constructed by using information from questions **B.19** and **B.20** and **question** and **B.10.** It is equal to 1 if the holding does not use synthetic pesticides (**B.10**), does not purchase more than 50% of the feed for livestock **(B.19)** and does not use antimicrobials as growth promoters (**B.20**).

- The third dummy variable – "biodiversity 3" -- is constructed by using information from question **A.14, A.11 and A.13.** It is advisable to construct **four sub-variables as follows:**
    1. Sub-variable 1 **--** biodiversity 3_1-- is equal to 1 if at least 10 % of the total value of production comes from crop (question A.11)
    2. Sub-variable 2 **--** biodiversity 3_2-- is equal to 1 if at least 10 % of the total value of production comes from livestock of livestock or by-product livestock (question A.12)
    3. Sub-variable 3 **--** biodiversity 3_3-- is equal to 1 if at least 10 % of the total value of production comes from livestock of fish or trees (trees product) or pasture, (question A.14)

  The final sub-variable **--** biodiversity 3 -- to 1 if at least two out of the three of the above-mentioned sub-variables are equal to 1

- The fourth dummy variable -- "biodiversity 4" -- is constructed by using information from question **B.21.** It is equal to 1 if the holding practices crop or crop/pasture rotation involving at least 3 crops on at least 80% of the farm area.

- The fifth dummy variable -- "biodiversity 5" -- is constructed by using information from question **A.11.** It is equal to 1 if the area under a single continuous commodity is not larger than 2 hectares.

- The sixth dummy variable -- "biodiversity 6" -- is constructed by using information from question **A. 11.** It is equal to 1 if the area under a single commodity crop in which at least to varieties are used is larger than 2 hectares

- The seventh and final dummy variable -- "biodiversity 7" -- is constructed by using information from question **B.22.** It is equal to 1 if at least 50% of each animal species' population consists of locally adapted breeds or breeds at risk of extinction.

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The below table lists questions from which environmental-related variables can be constructed.

Main variable	Sub-variable	Type of variable	Question number	Final indicator	Comments /notes
biodiversity_1		dummy	B.18	Use of biodiversity-supportive practices	
biodiversity_2		dummy	B.10 & B.19-B.20		
biodiversity_3	biodiversity 3_1	dummy	A.11		
	biodiversity 3_2	dummy	A.12		
	biodiversity 3_3	dummy	A.14		
biodiversity_4		dummy	B.21		
biodiversity_5		dummy	A.11		
biodiversity_6		dummy	A.11		
biodiversity_7		dummy	B.22		

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Social dimension

Sub-indicator 9. Wage rate in agriculture (WRA)

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

Sustainability criteria: The following sustainability criteria have been developed classify the agricultural area of the farm by sustainability status:

- Green (desirable): if the farm does not hire any labour or if the holding has fair labour certification or if the wage rate paid to unskilled labour is above the minimum national wage rate or minimum agricultural sector wage rate (if available).
- Yellow (acceptable): if the wage rate paid to unskilled labour is equal 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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Calculation Steps: The calculation procedure for this indicator is three-fold:

1. For each farm, calculate the farm output value per hectare:

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

To calculate the daily wage rate in agriculture, the following data items are required:

- **Unskilled workers hired on the agricultural holding (Yes/No).** Unskilled workers as defined according to the International Standard Classification of occupation (ISCO, '08)
  Unskilled workers are workers performing basic and routine tasks in the agricultural sector (elementary occupation group, 09, as per ISCO).
- **Average pay in-cash and/or in-kind for a hired unskilled worker per day (of 8 hours)**
- **Minimum agricultural sector wage rate (if available) or minimum national wage rate**

2. Once the daily wage is calculated, farms are classified by sustainability status by benchmarking the daily wage rate against the national or agricultural sector minimum wage.

- Farms are classified as green (desirable) if their daily wage rate paid to unskilled workers is greater than minimum national wage rate or minimum agricultural sector wage rate (if available).
- Farm are classified as yellow (acceptable) if their daily wage rate paid to unskilled workers is equal to the minimum national wage rate or minimum agricultural sector wage rate (if available).

- Farm are classified as yellow red (unsustainable) if their daily wage rate paid to unskilled workers is equal to the minimum national wage rate or minimum agricultural sector wage rate (if available).

Important note: the sustainability status of farms that have a fair labour certification is green by default.

3. The third and final step is aimed at calculating the proportion of sustainable agricultural area by sustainability status. This is done by adding up the total agricultural area associated with farms classified as having a given sustainability status (green, yellow or red) in total agricultural area. It is important to notice that the final sub-indicator only accounts for total agricultural area associated with farms employing paid labour.

Questions to collect data

C.1 Did this agricultural holding hire any unskilled workers?
Reference year: Last calendar year
(Fill in one circle only)

○	1	Yes	Calculate daily wage from C.2
○	2	No	Farm is sustainable

C.2 How much did this agricultural holding pay on average in cash and/or in-kind for an unskilled worker per day (of 8 hours)?
Reference year: Last calendar year
(Fill in all that apply)

○	1	Daily average wage in local currency units	Add up wage in cash and in-kind to derive the indicator
○	2	Daily average wage paid in-kind and converted in local currency units	

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Variables to construct the sub-indicator

The construction of this sub-indicator requires information collected in section C. The indicator is comprised of two variables as extracted from question C.1. The first variable, which is monetary, captures the daily average wage in local currency units paid in-cash (question C.1). The second variable, also monetary, captures the daily average wage in local currency units paid in-kind (question C.1), as converted during data collection. These two variables are added up to obtain the final indicator.

Main variable	Sub-variable	Type of variable	Question number	Final indicator	Comments/notes
daily_wage_cash		monetary	C.2	Wage rate in agriculture	
daily_wage_kind		monetary	C.2		

Sub-indicator 10. Food Insecurity Experience Scale (FIES).

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Description of the sub-indicator 10: Food Insecurity Experience Scale (FIES). The sub-indicator on Food Insecurity Experience Scale (FIES) is a measure of the severity of food insecurity experienced by individuals or households. The proportion of sustainable (non-sustainable) agricultural area by this indicator is calculated by accounting for the area associated with household farms that do not experience food insecurity.

Definition of the sustainability criteria. The following sustainability criteria have been adopted to classify the agricultural area of the household farm by sustainability status:

- Green (desirable): the household farm has mild food insecurity
- Yellow (acceptable): the household farm has moderate food insecurity
- Red (unsustainable): the household farm has severe food insecurity

Calculation steps: the calculation procedure for this indicator is three-fold:

1. The methodology to calculate SDG indicator 2.1.2 on the severity of food insecurity is used. SDG indicator 2.1.2 provides estimates of the proportion of household farms facing moderate or severe difficulties in accessing food. Specifically, the approach used to analyze FIES data comes from Item Response Theory (IRT), a branch of statistics that permits the measurement of unobservable traits through analysis of responses to surveys and tests.
   The Rasch model provides a theoretical base and a set of statistical tools to 1) assess the suitability of a set of survey questions ("items") for constructing a measurement scale and to 2) compare a scale's performance across different populations and survey contexts.
   The analysis of FIES data involves the following steps:

   - Parameter estimation: calculation of the severity of food insecurity associated with each survey item and each respondent.

   - Statistical validation: The assessment of whether, depending on the quality of the data collected, the measure is valid, i.e. is reliable enough for the intended policy and research uses.

   - Calculation of measures of food insecurity:

     - Individual probabilities: For each sampled individual or household (each case in the data), the probability of the individual/household experiencing food insecurity above a given level of severity is calculated, based on their responses to the FIES items.

     - Population prevalence estimates: The probabilities are used to estimate the prevalence of food insecurity at moderate and severe levels in the population.

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Statistical validation assesses the quality of the FIES data collected by testing their consistency with the assumptions of the Rasch model. This analysis involves the interpretation of several statistics that reveal 1) items that do not perform well in a given context, 2) cases with highly erratic response patterns, 3) pairs of items that may be redundant, and 4) the proportion of total variance in the population that is accounted for by the measurement model.

2. Once the FIES has been calculated for each household farm, farms are classified by sustainability status, as per the criteria above.

- Farm are classified as green (desirable) if their level of food insecurity is mild
- Farm are classified as green (desirable) if their level of food insecurity is moderate
- Farm are classified as green (desirable) if their level of food insecurity is severe

3. The third and final step is aimed at calculating the proportion of sustainable agricultural area by sustainability status. This is done by adding up the total agricultural area associated with farms classified as having a given sustainability status (green, yellow or red) in total agricultural area. It is important to notice that the final sub-indicator only accounts for the agricultural area associated with household farms.

Questions to collect data

C.3 During the last 12 months, was there a time when you (or any other household in the household) were worried that you would not have enough food to eat because of a lack of money or other resources?

Reference year: Last calendar year

(Fill in one circle only)

○	1	Yes
○	2	No

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C.4 Still thinking about the last 12 months, was there a time when you (or any other household in the household) were unable to eat healthy and nutritious food because of a lack of money or other resources?

Reference year: Last calendar year

(Fill in one circle only)

○	1	Yes
○	2	No

C.5 Was there a time when you (or any other household in the household) ate only a few kinds of foods because of a lack of money or other resources?

Reference year: Last calendar year

(Fill in one circle only)

○	1	Yes
○	2	No

C.6 Was there a time when you (or any other household in the household) had to skip a meal because there was not enough money or other resources to get food?

Reference year: Last calendar year

(Fill in one circle only)

○	1	Yes
○	2	No

C.7 Still thinking about the last 12 months, was there a time when you (or any other household in the household) ate less than you thought you should because of a lack of money or other resources?

Reference year: Last calendar year

(Fill in one circle only)

○	1	Yes
○	2	No

C.8 Was there a time when you (or any other household in the household) ran out of food because of a lack of money or other resources?

Reference year: Last calendar year

(Fill in one circle only)

○	1	Yes
○	2	No

C.9 Was there a time when you (or any other household in the household) were hungry but did not eat because there was not enough money or other resources for food?

Reference year: Last calendar year

(Fill in one circle only)

○	1	Yes
○	2	No

C.10 During the last 12 months, was there a time when you (or any other household in the household) went without eating for a whole day because of a lack of money or other resources?

Reference year: Last calendar year

(Fill in one circle only)

○	1	Yes
○	2	No

Variables to construct the sub-indicator

The eight standard short-questions related to this indicator are used to calculate a score that goes from 0 to 8 depending on how many yesanswers are given. A categorical variable --"FIES_score"-- coded from 0 to 8 is constructed accordingly. Once the score has been computed by using questions from **C.3 to C.10,** the FIES indicator is calculated. The statistical procedure applied to extract the FIES indicator from survey questions is contained in the box below (FAO, 2014).

Main variable	Sub-variable	Type of variable	Question number	Final indicator	Comments/ notes
Fies_score		categorical (from 0 to 8)	From C.3 to C.10	**Food insecurity experience scale**	

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Box 3. Extracting the Food Insecurity Experience Scale indicator from survey questions

Example:

The approach used to analyze FIES data comes from Item Response Theory (IRT), a branch of statistics that permits the measurement of unobservable traits through analysis of responses to surveys and tests. As food security itself is an inherently unobservable characteristic, such as attitude or intelligence, it can be measured only by examining its observable manifestations applied to FIES data is the Rasch model (see http://www.rehab-scales.org/rasch-measurement-model.html), which is widely used in health, education and psychology (Nord, M. 2014).

The Rasch model provides a theoretical base and a set of statistical tools to 1) assess the suitability of a set of survey questions ("items") for constructing a measurement scale and to 2) compare a scale's performance across different populations and survey contexts.

The analysis of FIES data involves the following steps:

1. *Parameter estimation: calculation of the severity of food insecurity associated with each survey item and each respondent.*
2. *Statistical validation: The assessment of whether, depending on the quality of the data collected, the measure is valid, i.e. is reliable enough for the intended policy and research uses.*
3. *Calculation of measures of food insecurity:*

o Individual probabilities: For each sampled individual or household (each case in the data), the probability of the individual/household experiencing food insecurity above a given level of severity is calculated, based on their responses to the FIES items.

o Population prevalence estimates: The probabilities are used to estimate the prevalence of food insecurity at moderate and severe levels in the population.

Statistical validation assesses the quality of the FIES data collected by testing their consistency with the assumptions of the Rasch model. This analysis involves the interpretation of several statistics that reveal 1) items that do not perform well in a given context, 2) cases with highly erratic response patterns, 3) pairs of items that may be redundant, and 4) the proportion of total variance in the population that is accounted for by the measurement model.

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Box 3 (cont'd). Extracting the Food Insecurity Experience Scale indicator from survey questions

To prepare the data collected through the FIES questions for analysis, each item should be coded so that 0 is used for a NO response and 1 for a YES response, as per example below:

Household number	WORRIED	HEALTHY	FEWFOOD	SKIPPED	ATELESS	RUNOUT	HUNGRY	WHLDAY
1	0	0	0	0	1	1	1	1
2	1	1	1	1	0	0	0	0
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	1	1	1	1	1	1	1	1
6	1	0	0	0	0	0	0	1
7	0	0	1	1	0	0	0	0

The FIES indicator is calculated for each household by calculating the row score, which is the number of items reported by each household, as per table below:

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Question N	ITEM associated with questions	Raw score	Number of household farm per number of items reported in the survey
1	WORRIED	0	8,782.86
2	HEALTHY	1	973.23
3	FEWFOOD	2	558.50
4	SKIPPED	3	572.03
5	ATELESS	4	427.86
6	RUNOUT	5	275.46
7	HUNGRY	6	230.41
8	WHLDAY	7	139.13
		8	316.97
		Total	**12,276.45**

For each row score reported, the percentage of households is calculated accordingly:

Raw score	**Percentage of individuals**
0	71.5%
1	7.9%
2	4.5%
3	4.7%
4	3.5%
5	2.2%
6	1.9%
7	1.1%
8	2.6%

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Box 3 (cont'd). Extracting the Food Insecurity Experience Scale indicator from survey questions

The Rasch model is one several models in item response theory (IRT) applied for the analysis of FIES data
The logic behind the Rasch model is that the likelihood of a respondent reporting an experience of food insecurity depends on the distance along the scale between the severity of that respondent and that of the item associated with that experience. The following example is useful in visualizing the scale to better understand this concept.

The more severe a respondent's food insecurity is, relative to that of the item, the more likely he/she is to answer "yes."

Mild									Severe
	yes	yes	yes	?	?	?	?	?	
	WORRIED	HEALTHY	FEWFOOD	SKIPPED	ATELESS	RUNOUT	HUNGRY	WHLDAY	

A respondent who answers yes to a question can be expected to also answer yes to all less severe questions

The item parameter is estimated based on the overall pattern of responses given by all respondents. A question representing a less severe experience will have a smaller parameter value, whereas question representing a more severe experience will have a larger parameter value.
The calculation of the probability to be food insecure (moderate or severe) requires the following parameters corresponding to each raw score (see table below).
The parameters corresponding to the 8 items are as follows as per **FAO global scale 2014-2016**

FAO global scale 2014-2016	
Items	FAO global scale parameters
WORRIED	-2.1286
HEALTHY	-1.4743
FEWFOOD	-1.9243
SKIPPED	0.6109
ATELESS	-0.5426
RUNOUT	0.8815
HUNGRY	1.3134
WHLDAY	3.2642

There is no absolute interpretation of the numerical values of the parameters, as they only indicate the relative severity of the item along the scale.

Box 3 (cont'd). Extracting the Food Insecurity Experience Scale indicator from survey questions

A respondent's raw score is the basis for calculating the respondent parameter. The raw score is the number of affirmative responses given to the eight FIES questions—it is an integer with a value between 0 and 8. An essential point to understand is that every respondent who answers yes to the same number of questions (irrespective of which ones) will be assigned the same parameter (see table below).

Raw score	Number of household farm per number of items reported in the survey
0	8,782.86
1	973.23
2	558.50
3	572.03
4	427.86
5	275.46
6	230.41
7	139.13
8	316.97
Total	**12,276.45**

The raw score parameters are presented in the table below:

Raw score	Severity ***
0	-4.27
1	-2.81
2	-1.75
3	-0.92
4	-0.12
5	0.73
6	1.71
7	2.98
8	4.00

A respondent with a raw score of 6 is more food secure than a respondent with a raw score of 7 and less food insecure than a respondent with a raw score of 5. The raw score is therefore an ordinal measure of the severity of food insecurity.

The final step implying calculating the percentage of household farms in the survey that are likely to be food insecure/secure. The underlying scale of food insecurity severity is defined on a continuum that goes from being food secure to being severely food insecure. The corresponding agricultural area can be calculated accordingly.

Box 3 (cont'd). Extracting the Food Insecurity Experience Scale indicator from survey questions

WORRIED	HEALTHY	FEWFOOD	ATELESS	SKIPPED	RUNOUT	HUNGRY	WHLDAY
-1.22	-1.11	-0.85	-0.31	0.35	0.51	0.75	1.88

ATELESS AND **WHLDAY** are further from the other items. This means that they are sufficiently far from others to represent a clearly detectable difference in food insecurity severity.

The above thresholds can finally be used to classify farms into three different sustainability status as associated with their food (in)security: mild (green), moderate (yellow) and severe (red).
Once these farms have been classified on the basis of their food (in)security level, the corresponding share of agricultural area that follow under a given sustainability status of food (in) security can be calculated accordingly:

$$FIES_{sustainable} = \frac{total\ agricultural\ area\ of\ household\ farms\ with\ mild\ food\ insecurity}{total\ agricultural\ area}$$

$$FIES_{acceptable} = \frac{total\ agricultural\ area\ of\ household\ farms\ with\ moderate\ \ food\ insecurity}{total\ agricultural\ area}$$

$$FIES_{unsustainable} = \frac{total\ agricultural\ area\ of\ household\ farms\ with\ severe\ \ food\ insecurity}{total\ agricultural\ area}$$

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Sub-indicator 11. Secure Tenure Rights to Land (STRL).

Description. The sub-indicator measures 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. The following sustainability criteria have been adopted to classify the agricultural area of the household farm by sustainability status:

- 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

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Calculation steps: the calculation procedure for this indicators is two-fold:

1. Classification of farms by sustainability status on the basis of the following criteria of the above-mentioned sustainability criteria.

2. Once farms have been classified according to their sustainability status (sustainable, acceptable and unsustainable), the proportion of agricultural area by sustainability status can be derived accordingly. This is done by adding up the total agricultural area associated with farms classified as having a given sustainability status (green, yellow or red) in total agricultural area.

Questions to collect data

C.11 Does the holder/holding have a formal document for any of the agricultural land that it holds (alternatively 'possess, use, occupy) issued by the Land Registry/Cadastral Agency?

Reference year: Last calendar year

(Fill in all that apply)

◯	1	Title deed	Farm is sustainable if C.12 is Yes
◯	2	Certificate of customary tenure	Farm is sustainable if C.12 is Yes

◯	3	Certificate of occupancy	Farm is sustainable if C.12 is Yes
◯	4	Registered will or registered certificate of hereditary acquisitions	Farm is sustainable if C.12 is Yes
◯	5	Registered certificate of perpetual / long term lease	Farm is sustainable if C.12 is Yes
◯	6	Registered rental contract	Farm is sustainable if C.12 is Yes
◯	7	Other (specify)	Farm is sustainable if C.12 is Yes
◯	8	No document	Check C.13 & C.14
◯	9	Don't know	
◯	10	Refuses to respond	

C.12 Is the name of the holder or any other member of the holding is listed as an owner or use right holder on any of the legally recognized documents?

Reference year: Last calendar year

(Fill in one circle only)

◯	1	Yes	Farm is sustainable
◯	2	No	Farm is acceptable if C.11 is coded from 1 to 7
◯	3	Don't know	
◯	4	Refuses to respond	

C.13 Does the holder/holding have the rights to sell any of the parcel of the holding (alternatively 'parcel possessed, used or occupied')?

Reference year: Last calendar year

(Fill in one circle only)

◯	1	Yes	Farm is sustainable
◯	2	No	Farm is non-sustainable if C.11 is coded from 8 to 10
◯	3	Don't know	
◯	4	Refuses to respond	

C.14 Does the holder/holding have the rights to bequeath any of the parcel of the holding (alternatively 'parcel possessed, used or occupied')?

Reference year: Last calendar year

(Fill in one circle only)

◯	1	Yes	Farm is sustainable
◯	2	No	Farm is non-sustainable if C.11 is coded from 8 to 10 & C.14 is coded 2 (No)
◯	3	Don't know	
◯	4	Refuses to respond	

Variables to construct the sub-indicator

The construction of this sub-indicator requires information collected in section C, questions from C.11 to C.14. The final indicator is comprised of two dummy variables. A first -- land owned – is constructed from question C.11 and is equal to 1 if the reported code is from 1 to 6. A second dummy – rights to sell or bequeath — is equal to 1 if question C.12 or C.13 is "yes" (code 1).

Main variable	Sub-variable	Type of variable	Question number	Final indicator	Comments/ notes

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land_owned		dummy	C.11	Secure tenure rights to land	
rights_to_sell_beaqueth		dummy	C.13-C-14		

Annex I: Sub-indicators construction based on questions asked

The construction of the 11-sub-indicators is done by inferring the statistical information conveyed in the survey module. The approach to be adopted for constructing the sub-indicators is that, for each of them, appropriate criteria to assess sustainability levels are developed. The concept of sustainability implies an idea of continuous progress and improvement towards better performance across all themes, and as such, can therefore be more or less sustainable. In order to capture the concept of continuous progress towards sustainability, a '**traffic light**' approach is proposed, in which three levels are proposed for each sub-indicator: Green (desirable); Yellow (acceptable); and Red (unsustainable). While a certain level of subjectivity is unavoidable, this approach allows identification, for each theme, conditions of critical unsustainability (red), conditions that can be considered "ideal," and, in between, intermediate conditions that would deserve improvement. The traffic light approach used for the computation of the 11 sub-indicators will highly depend on the responses given to questions asked in the survey module, and, to a larger extent, on the information collected through the survey module designed.

Some of the sub-indicators can be directly constructed by using one single question, as presented in one of the 3 sections of the survey module (economic, environmental and social). Others, on the other hand, call for a combination of questions and/or sections. The section below explains how the 11-sub-indicators can be derived by and constructed from the survey module.

Sub-indicator												
Questions	1	2	3	4	5	6	7	8	9	10	11	Notes/comments
A.1												filter question
A.2												question used to construct sub-indicators
A.3												filter question
A.4												filter question
A.5												filter question
A.6												question used to construct sub-indicators
A.7												question used to construct sub-indicators
A.8												filter question
A.9												filter question

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A.10											filter question
A.11											filter question
A.12											question used to construct sub-indicators
A.13											question used to construct sub-indicators
A.14											question used to construct sub-indicators
A.15											question used to construct sub-indicators
A.16											question used to construct sub-indicators
B.1											question used to construct sub-indicators
B.2											question used to construct sub-indicators
B.3											question used to construct sub-indicators
B.4											question used to construct sub-indicators
B.5											question used to construct sub-indicators
B.6											question used to construct sub-indicators
B.7											question used to construct sub-indicators
B.8											filter question
B.9											question used to construct sub-indicators
B.10											question used to construct sub-indicators
B.11											question used to construct sub-indicators
B.12											filter question
B.13											filter question
B.14											question used to construct sub-indicators
B.15											filter question
B.16											question used to construct sub-indicators
B.17											question used to construct sub-indicators
B.18											question used to construct sub-indicators
B.19											question used to construct sub-indicators
B.20											question used to construct sub-indicators
B.21											question used to construct sub-indicators
B.22											
C.1											filter question
C.2											question used to construct sub-indicators
C.3											question used to construct sub-indicators
C.4											question used to construct sub-indicators
C.5											question used to construct sub-indicators
C.6											question used to construct sub-indicators
C.7											question used to construct sub-indicators
C.8											question used to construct sub-indicators
C.9											question used to construct sub-indicators
C.10											question used to construct sub-indicators
C.11											question used to construct sub-indicators
C.12											question used to construct sub-indicators
C.13											question used to construct sub-indicators

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C.14											question used to construct sub-indicators

Annex II: final dataset to construct the 11 sub-indicator

To construct the 11 sub-indicators -- according to data collected through survey module -- a variable indicating the sustainability status of the farm should first be constructed and coded so that: 1 is used if the farm is desirable, 2 if the farm is acceptable and 3 if the farm is unsustainable, as per example below. Before classifying farms by sustainability status, it is essential to construct beforehand a variable reporting the total agricultural area of the farm. The below dataset explains how to present the sustainability status of the farms by indicators.

Farm number	Total agricultural area in hectares	Farm output value per hectare	Net farm income	Risk mitigation mechanisms	Prevalence of soil degradation	Variation in water availability	Management of fertilisers	Management of pesticides	Use of biodiversity-supportive practices	Wage rate in agriculture	Food insecurity experience scale (FIES)	Secure tenure rights to land
1	6	2	3	3	3	3	2	3	1	1	2	3
2	42	2	3	2	1	3	2	2	2	3	1	1
3	2	3	2	1	1	1	2	1	3	2	2	3
4	15	2	3	1	2	3	1	3	1	1	2	2
5	49	1	3	3	2	1	1	2	2	2	3	2
6	9	1	1	2	2	2	1	1	1	1	3	1
7	1	2	3	1	3	1	2	3	1	1	2	2
8	37	3	1	2	3	1	3	1	3	2	2	1
9	12	1	2	2	1	1	1	3	1	3	1	2
10	14	3	1	1	2	1	1	3	3	2	3	1
11	46	1	3	2	3	2	1	1	2	3	2	3
12	36	3	2	3	2	3	2	1	3	1	1	2
13	9	3	2	2	1	1	3	2	2	3	2	1
14	11	1	3	2	3	2	3	1	2	3	2	2
15	26	3	2	2	2	2	1	3	3	3	3	3
16	48	3	2	3	3	1	2	1	2	3	3	1
17	2	1	2	1	2	1	1	2	3	1	3	1
18	12	2	1	3	3	3	1	1	2	3	2	2
19	26	3	3	1	2	1	1	3	2	2	1	3
20	13	1	3	3	1	1	2	3	3	2	2	3
21	21	2	2	3	3	3	2	3	1	3	2	3
22	15	1	1	3	2	1	2	2	3	1	1	3
23	15	1	3	3	1	2	2	2	2	1	2	2

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24	8	3	2	1	3	1	2	2	3	2	3	2
25	43	2	3	3	3	1	2	1	3	1	3	3
26	35	1	1	1	2	1	3	3	3	3	2	1
27	2	1	2	2	1	3	3	2	3	3	1	1
28	18	3	2	3	2	3	2	3	2	2	2	2

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From the above sustainability classification of sampled farms, the 11 sub-indicators are calculated accordingly, as per the dataset below:

Aggregate level	**Tot_agricultural area in the country (Hectares)**	**Area:** Farm output value per hectare (**Hectares**)	**Area:** Net farm income (**Hectares**)	**Area:** Risk mitigation mechanisms (**Hectares**)	**Area:** Prevalence of soil degradation (**Hectares**)	**Area:** Variation in water availability (**Hectares**)	**Area:** Management of fertilisers (**Hectares**)	**Area:** Management of pesticides (**Hectares**)	**Area:** Use of biodiversity-supportive practices (**Hectares**)	**Area:** Wage rate in agriculture (**Hectares**)	**Area:** Food insecurity experience scale (FIES) (**Hectares**)	**Area:** Secure tenure rights to land (**Hectares**)
Sustainable	573	209	122	103	95	314	211	244	64	142	133	198
Acceptable		140	184	194	245	107	268	142	276	167	241	177
Unsustainable		224	267	276	233	152	94	187	233	264	199	198
Total agricultural Area in the country (Hectares)		573	573	573	573	573	573	573	573	573	573	573
% Sustainable		36.5%	21.3%	18.0%	16.6%	54.8%	36.8%	42.6%	11.2%	24.8%	23.2%	34.6%
% Acceptable		24.4%	32.1%	33.9%	42.8%	18.7%	46.8%	24.8%	48.2%	29.1%	42.1%	30.9%
% Unsustainable		39.1%	46.6%	48.2%	40.7%	26.5%	16.4%	32.6%	40.7%	46.1%	34.7%	34.6%
Total agricultural Area in the country (Hectares)		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

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