

# Guidance for responding companies: sector module guidance

Food, beverage and tobacco sector module  
2017

CDP  
[respond@cdp.net](mailto:respond@cdp.net)  
[www.cdp.net](http://www.cdp.net)

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# Version Control

Version Nr.	Revision Date	Released	Revision Summary
0.2	January 2017	January 2017	Version 0.2 of the 2017 CDP food, beverage and tobacco sector module guidance has been prepared for the disclosure period commencing in February 2017. It is a re-release of the advance version of this guidance (version 0.1, released in December 2016).

## Contents

<b>Introduction to the FBT Module Guidance .....</b>	<b>3</b>
General guidance .....	3
Why did CDP introduce this FBT sector module?.....	3
Development of the module .....	3
Module content.....	4
Module structure .....	4
Relevant questions for the FBT sector in the core climate change questionnaire.....	5
<b>FBT1: Agriculture .....</b>	<b>6</b>
Question Pathway .....	6
General Guidance .....	8
Specific Question Guidance.....	10
<b>FBT2: Processing/ Manufacturing .....</b>	<b>27</b>
Question Pathway .....	27
General Guidance .....	28
Specific Question Guidance.....	29
<b>FBT3: Distribution .....</b>	<b>33</b>
Question Pathway .....	33
General Guidance .....	34
Specific Question Guidance.....	35
<b>FBT4: Consumption .....</b>	<b>39</b>
Question Pathway .....	39
General Guidance .....	39
Specific Question Guidance.....	40
<b>Appendix A.....</b>	<b>41</b>
Agricultural management practices.....	41

# Introduction to the FBT Module Guidance

## General guidance

CDP has developed this sector module for food, beverage and tobacco (FBT) companies responding to the CDP climate change information request. The module was introduced in 2014.

The FBT module should be completed by companies producing agricultural, food, beverage and tobacco products and it should be completed alongside the core climate change questionnaire presented to all companies responding to CDP's climate change information request. Other companies that feel this module is relevant for them can choose to complete it voluntarily. In 2017 the module responses will not be scored.

## Why did CDP introduce this FBT sector module?

According to the *Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (2014)*, agriculture contributes 10-12% of global anthropogenic greenhouse gas (GHG) emissions. Considering additional emissions from processing, transport and consumption, it is apparent that the production of foods, beverages and tobacco are major sources of national and global GHGs, directly or indirectly. The FBT sector is also exposed, directly and indirectly through its supply chain, to the impacts of climate change. These two characteristics make FBT a meaningful target for the development of a sector-specific module. With a sector focused approach, CDP is able to provide better guidance, facilitate better benchmarking where feasible and ensure that companies are being asked the appropriate questions to truly reflect their areas of activity and the impact of their emissions.

Data on agricultural emissions is hard to account for and therefore not prevalent in the marketplace. This sector module seeks to address this information gap by focusing on the process of quantifying and reporting agricultural emissions from FBT companies' direct operations and value chains.

## Development of the module

To develop this module CDP has had input from a technical working group including representatives from FBT companies, investor organizations, NGOs, governmental organizations and academic institutions. This group has helped in the formulation of the question sets which feature in the module.

Please also note that this sector module is complementary to the core climate change questionnaire. Many relevant aspects of FBT company performance (such as emissions, emission reduction activities and risks and opportunities) are already included within the core climate change questions. A particular challenge in the development of this module has been to design it in a way that facilitates linkage to questions that already exist in the core climate change questionnaire. In order to reduce the reporting burden, areas of overlap have been minimized through cross-referencing between the FBT module and the core climate change questionnaire. Please answer as many relevant questions as you can and we will use the responses and further consultation to refine the module in future years. You are also encouraged to provide feedback on the module through the CDP's online feedback from which can be found [here](#).

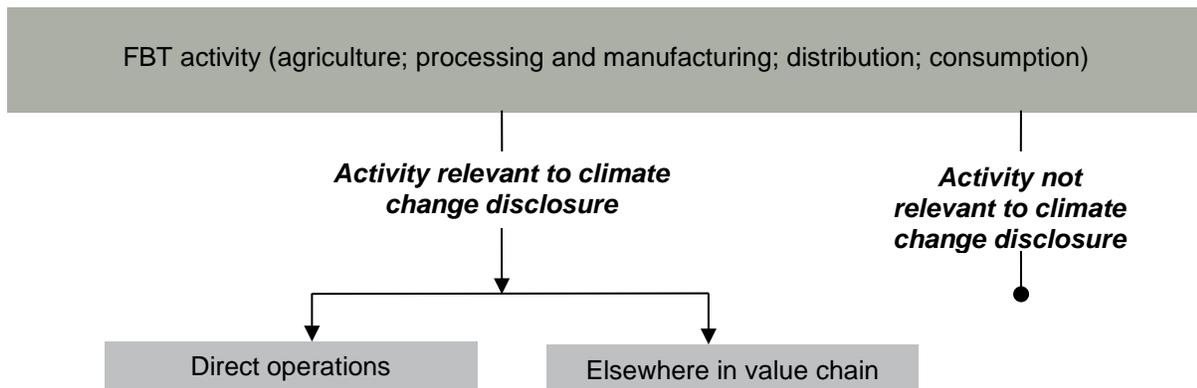
## Module content

A significant part of the sector’s exposure to climate change is related to its use of agricultural commodities as the raw materials for its processes and products. Thus, the degree of exposure to risk and consequent impacts are heavily dependent on agricultural supply chains. Moreover, agriculture is the second largest sector contributing to climate change after the energy sector. For these reasons, the module includes a question set on agricultural activities, covering both agricultural emissions and agricultural management practices, within companies’ direct operations and in their value chains. The module also features question sets on other activities that can be associated with significant emissions for FBT companies including processing, distribution and consumption.

## Module structure

In terms of the structure, companies will first indicate whether the activity is relevant to their climate change disclosure. We encourage companies to assess the relevance of activities in accordance with the principles of *The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (Revised Edition)* developed by the World Resources Institute and the World Business Council for Sustainable Development (referenced as [The GHG Protocol Corporate Standard](#) hereafter). According to these principles information is relevant if it contains the detail that users, both internal and external to the company, need for their decision-making.

If the activity is relevant, organizations will then identify whether it takes place within their direct operations and/or elsewhere their value chain, and will be presented with appropriate question sets depending on their response to this question. Both the direct operations and value chain question pathways feature sector-specific questions on exclusions, emissions and emission reduction activities.



## Relevant questions for the FBT sector in the core climate change questionnaire

The core climate change questionnaire contains a number of questions that are of particular relevance for FBT sector companies. This includes:

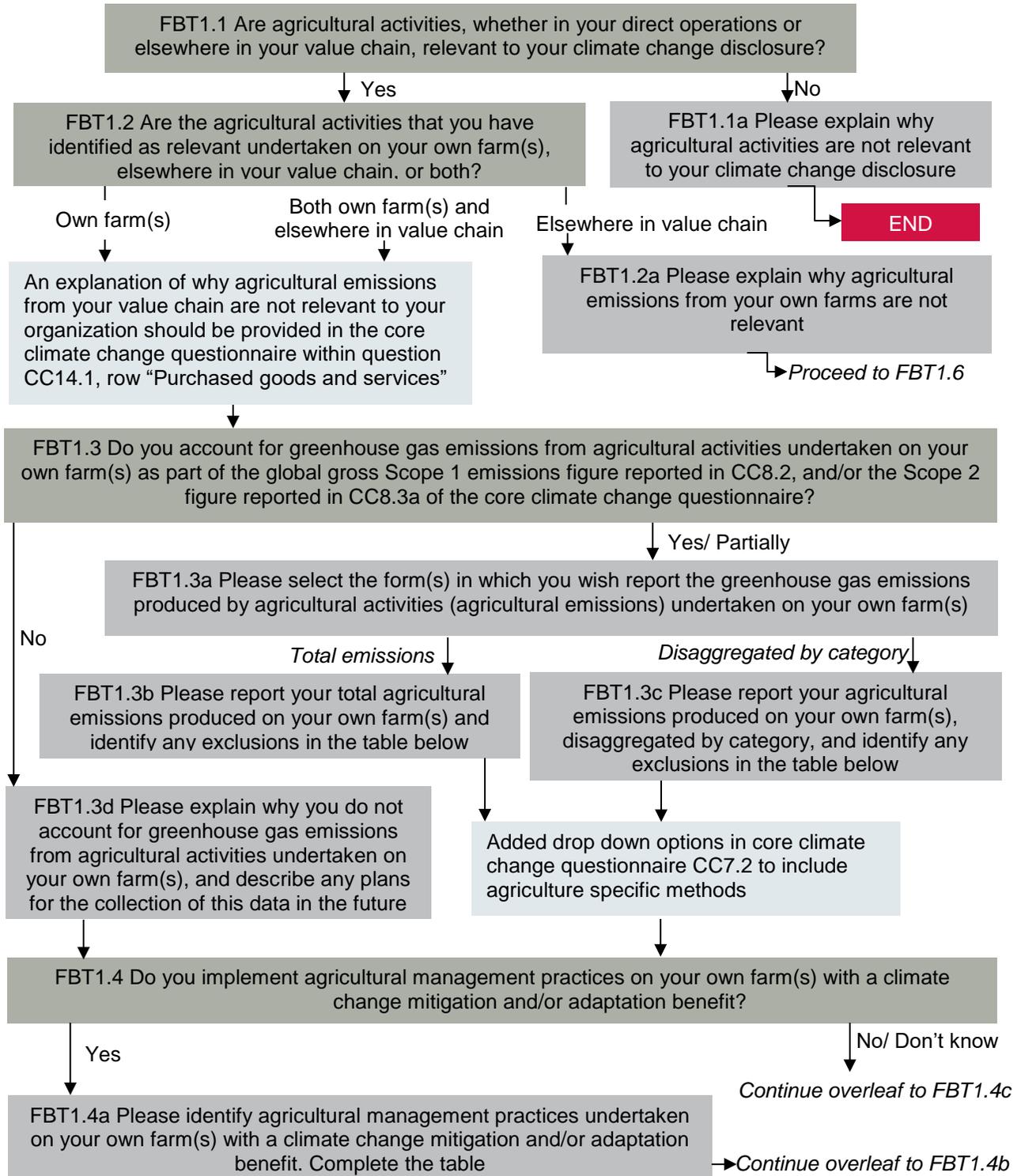
- **Question CC3.3 on emission reduction activities:** There are a number of opportunities available to FBT companies with regard to emissions reductions in agricultural activities, processing and manufacturing, transportation and consumption. Companies are encouraged to report on activities taking place within their direct operations, as well as initiatives being implemented elsewhere in their value chain as a result of their engagement efforts. Both implemented and future emissions reduction initiatives can be captured in this question.
- **Question CC5 on climate change risks:** Agricultural production is particularly susceptible to the impacts of climate change. FBT companies are encouraged to report on the risks posed to agricultural activities taking place within their direct operations and/or their agricultural value chain where appropriate. FBT companies should also explain any climate change risks to processing, transportation and consumption activities.
- **Question CC6 on climate change opportunities:** FBT companies are encouraged to report any climate change opportunities, in particular pertaining to agricultural, processing, transportation and consumption activities.
- **Question CC7.2 on standards, protocols or methodologies used to collect activity data:** There are numerous standards, protocols, methodologies and guidance materials available to calculate agricultural emissions. These have been added to the existing selection in question CC7.2 of the core climate change questionnaire. FBT companies that use specific methodologies to calculate their agricultural emissions should identify these in question CC7.2.
- **Question CC8.2 on Scope 1 emissions:** Scope 1 emissions encompass all direct GHG emissions that occur from sources that are owned or controlled by a company. Direct emissions from agricultural, processing and/or transportation activities should be reported as part of Scope 1 emissions in question CC8.2 of the core climate change questionnaire.
- **Question CC8.3a on Scope 2 emissions:** Scope 2 emissions encompass GHG emissions from the generation of purchased electricity consumed by the company. Scope 2 emissions from the use of electricity for agricultural, processing and/or transportation activities should be reported as part of Scope 2 emissions in question CC8.3a of the core climate change questionnaire.
- Please note that when responding to the FBT module, companies are only required to provide one Scope 2 figure. Please use the 'Comment' field in all FBT questions where Scope 2 emissions are required to disclose whether you have used a location-based or market-based figure.
- **Questions CC14.1 on Scope 3 emissions:** The most relevant Scope 3 categories for a company will depend on its areas of operation. FBT companies are encouraged to provide emissions data for all the categories relevant to them. However, those that are likely to be of particular importance for the FBT sector are "Purchased goods and services", "Processing of sold products", "Upstream transportation and distribution", "Downstream transportation and distribution", "Use of sold products" and "End of life treatment of sold products".

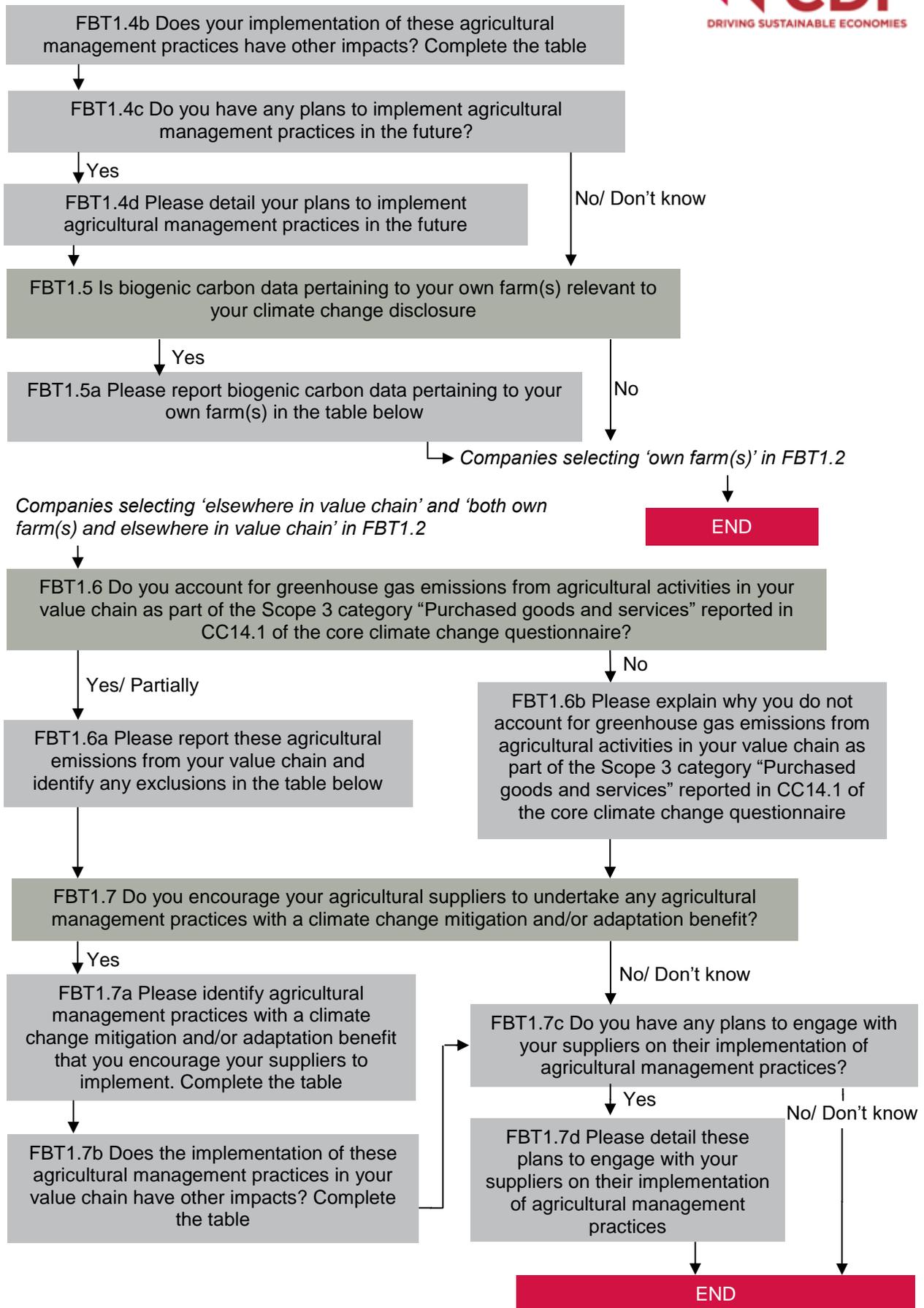
FBT companies are encouraged to respond fully to these questions within the climate change questionnaire, while making reference to the specific activities covered in this sector module where appropriate (agriculture, processing and manufacturing, distribution and consumption).

# FBT1: Agriculture

## Question Pathway

The following questions are shown on the Agriculture page.





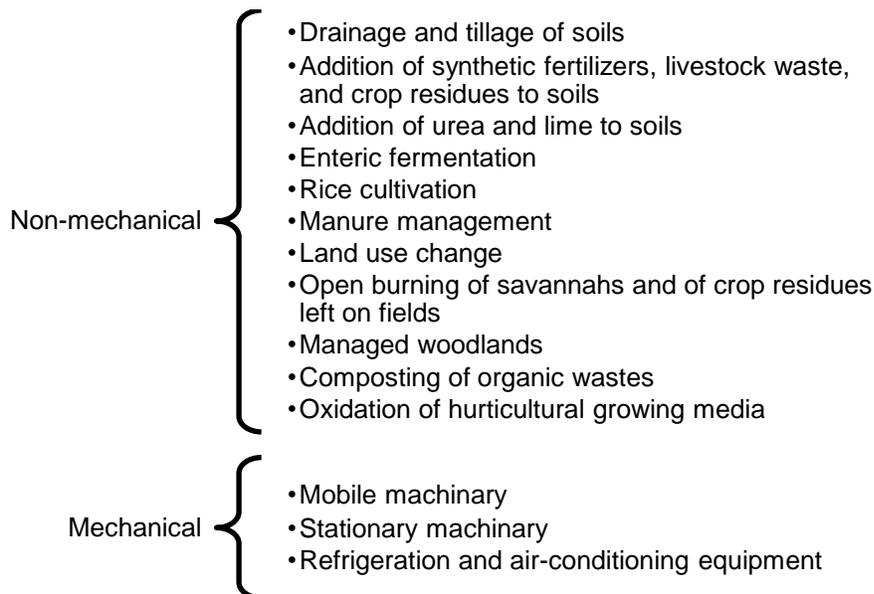
## General Guidance

A significant part of the FBT sector’s exposure to climate change is related to its reliance on agricultural inputs, regardless of whether these raw materials are produced within a company’s direct operations or elsewhere in agricultural value chains. More specifically, the degree of exposure to risk and consequent impacts are heavily dependent on agricultural production, which requires essential natural ecosystem inputs and conditions such as adequate water quantity and quality, soil nutrients, biodiversity, temperature and atmospheric carbon dioxide<sup>1</sup>. The ecosystem services that provide these have always been affected by natural climate variability and extreme climate events which, at times, have caused significant disruption to agricultural production. Increasingly, these natural inputs and conditions are also directly and indirectly affected by climate change, which exacerbates the risk in agricultural production systems<sup>2</sup>.

The relationship between climate change and agriculture is not one-way. The agricultural sector is the second largest sector contributing to climate change after the energy sector, accounting for 10-12% of global anthropogenic GHG emissions<sup>3</sup>. The sources of these emissions predominantly comprise the following:

- Carbon dioxide from the decay or burning of biological or soil organic matter, fuel combustion and electricity generation in farm operations;
- Methane from the decomposition of organic materials in oxygen-deprived conditions, notably from the digestion of livestock, from stored manures and from rice growing;
- Nitrous oxide from transformation of nitrogen in soils and manures (including fertilizer application and indirect emissions from fertilizer production in your supply chain).

The sources of these agricultural GHG emissions can include both mechanical and non-mechanical sources highlighted below<sup>4</sup>.



<sup>1</sup> [IAASTD, 2009](#)

<sup>2</sup> [Caldecott, B. et.al. \(2013\)](#)

<sup>3</sup> IPCC, 2014

<sup>4</sup> [Greenhouse Gas Protocol Agricultural Guidance](#)

Given the FBT sector's reliance on agricultural inputs, it is important for companies in this sector to address the exposure and contribution of agricultural production to climate change. Consequently, the questions in this section require FBT companies to disclose additional information about agricultural emissions. Please note, however, that the reporting requirements differ depending on whether agricultural activities take place within companies' own operations or elsewhere in value chains (See Box 1).

Adaptation and mitigation are complementary strategies which address the complex and interlinked relationship between climate change and the agricultural sector. While emission reduction measures are clearly essential to limit the magnitude and rate of climate change globally, the effects of reduced emissions will not emerge for several decades due to the inertia of the climate system; thus adaptation is becoming increasingly important. For this reason, this section also includes questions around the mechanisms adopted to address climate change mitigation and adaptation in agricultural production.

### **BOX 1: The Greenhouse Gas Protocol Agricultural Guidance**

#### **Who should use the guidance?**

The GHG Protocol Agricultural Guidance is intended for producers and companies that seek to develop Scope 1 and 2 inventories of their agricultural operations. The guidance is helpful to downstream or upstream companies seeking to understand their value chain GHG impacts from agriculture, however these companies should consult the GHG Protocol's Scope 3 Standard for the requirements and guidance on including agriculture in their GHG inventories.

CDP is seeking alignment with these new guidelines for the "own farm" question pathway of the Agriculture section of the FBT module; these additional requirements have not been reflected in the "elsewhere in value chain" questions.

#### **Additional recommendations for reporting GHG emissions from agriculture**

The GHG Protocol Agricultural Guidance provides the following minimum, best practice, recommendations for companies developing Scope 1 and 2 emissions inventories of their agricultural operations:

- ▼ Scope 1 emissions disaggregated by mechanical sources, emissions from land use change, and all other non-mechanical sources
- ▼ For non-mechanical sources: A description of whether the calculation methodologies are IPCC Tier 1,2 or 3, and a description of how those methodologies were chosen based on quality criteria
- ▼ Where land use change results in a reduction in the size of carbon stocks, the CO<sub>2</sub> emissions are reported in Scope 1; otherwise, all CO<sub>2</sub> fluxes (emissions and removals) from land use change are reported outside of the scopes in a separate category called 'Biogenic Carbon' that has three components: (1) CO<sub>2</sub> emissions and/or removals during land use management; (2) Sequestration during land use change; and (3) CO<sub>2</sub> emissions from biofuel combustion (Please refer to Box 4 for more information on biogenic carbon)
- ▼ A description of the methodology used (where relevant) to calculate the impacts of historical changes in the management of carbon stocks, including any assumptions regarding the use of proxy data as well as any assumptions

For more information, please consult the [GHG Protocol Agricultural Guidance: Interpreting the Corporate Accounting and Reporting Standard for the Agricultural Sector](#) (Referred to as the 'GHG Protocol Agricultural Guidance' hereafter)

## **BOX 2: How to report on agricultural waste**

If agricultural waste is produced as part of your direct operations and is managed within your organizational boundary, then GHG emissions associated with this waste should be reported as Scope 1 emissions. If agricultural waste is produced within your organizational boundary but is managed by a third party, then emissions associated with this waste should be reported within the Scope 3 category “Waste generated in operations” in the core climate change questionnaire CC14.1. If agricultural waste is produced by your suppliers and managed outside of your organizational boundary, emissions associated with this waste should be reported within the Scope 3 category “Purchased goods and services” in the core climate change questionnaire CC14.1.

### **Pre-population**

In the Agriculture section, pre-population is available for FBT1.1 and FBT1.1a.

### **Specific Question Guidance**

#### **FBT1.1 Are agricultural activities, whether in your direct operations or elsewhere in your value chain, relevant to your climate change disclosure?**

According to the principles of [The GHG Protocol Corporate Standard](#), the activity is relevant if it yields information that contains the detail that users, both internal and external to the company, need for their decision-making.

Please respond to this question by selecting “yes” or “no” from the drop down menu provided. Answering “yes” will direct you to FBT1.2, selecting “no” drives FBT1.1a.

#### **FBT1.1a Please explain why agricultural activities are not relevant to your climate change disclosure**

*This question only appears if you answer “no” to FBT1.1.*

You should respond to this question in the text box provided; your answer should be no more than 5000 characters in length. Please note that when copying from another document into the Online Response System (ORS), the formatting is not retained.

You will not be presented with any further questions on agriculture and can progress to the following page of the ORS using the “Next” button to the bottom right.

#### **FBT1.2 Are the agricultural activities that you have identified as relevant undertaken on your own farm(s), elsewhere in your value chain, or both?**

*This question only appears if you answer “yes” to FBT1.1.*

In this question you are asked to identify the part(s) of your value chain where relevant agricultural emissions have been identified. If your organization grows all of its agricultural inputs on own farms, i.e. if all agricultural activities take place within your company’s organizational boundary, please select “own farm(s)”. If you purchase all of your agricultural inputs from agricultural suppliers, please select “elsewhere in value chain”. If your organization grows some of its agricultural inputs but also buys some from agricultural suppliers, please select “both own farm(s) and elsewhere in value chain”.

Answering “own farm(s)” or “both own farm(s) and elsewhere in value chain” will drive FBT1.3, selecting ‘elsewhere in value chain’ will drive FBT1.2a.

### Own farm pathway

The following questions which feature in the “own farm(s)” pathway will only appear if “own farm(s)” or “both own farm(s) and elsewhere in value chain” is selected in FBT1.2.

#### **FBT1.3 Do you account for greenhouse gas emissions from agricultural activities undertaken on your own farm(s) as part of the global gross Scope 1 emissions figure reported in CC8.2, and/or the Scope 2 figure reported in CC8.3a of the core climate change questionnaire?**

This question only appears if you select “own farm(s)” or “both own farm(s) and elsewhere in value chain” in FBT 1.2.

This question aims to identify whether an emissions figure has been calculated for agricultural activities taking place within your organizational boundary, and is being reported as part of Scope 1 and/or Scope 2 emissions in the core climate change questionnaire. If your organization has calculated emissions from its own agricultural activities and these are included in the global gross Scope 1 and/or Scope 2 emissions figures reported in the core climate change questionnaire, please select “yes”. Otherwise, please select “no”.

Please note that Scope 1 emissions encompass all direct GHG emissions from sources owned or controlled by your organization, and Scope 2 emissions encompass GHG emissions from the generation of purchased electricity consumed by your organization, as per [The GHG Protocol Corporate Standard](#). According to the [GHG Protocol Agricultural Guidance](#), in agriculture, Scope 1 emissions can often include emissions from non-mechanical sources such as enteric fermentation, soils, manure management, land use change and waste management, as well as emissions from mechanical sources such as stationary equipment or mobile machinery (excluding purchased electricity). Emissions from purchased and consumed electricity, heat, steam or cooling (MWh) for use in agricultural operations within your company’s organizational boundary should be accounted for as Scope 2 emissions. See the General Guidance at the beginning of the Agriculture section (page 10 of this guidance) for a list of different agricultural emissions sources.

Answering “yes” or “partially” will direct you to FBT1.3a, selecting “no” drives FBT1.3d.

#### **FBT1.3a Please select the form(s) in which you wish to report the greenhouse gas emissions produced by agricultural activities (agricultural emissions) undertaken on your own farm(s)**

- Total agricultural emissions separated by Scope 1 and 2
- Agricultural emissions disaggregated by category (advised by the GHG Protocol)

This question only appears if you answer “yes” or “partially” to FBT1.3.

Please respond to this question by selecting either one option or both.

If you select “Agricultural emissions disaggregated by category”, you will be asked to breakdown your agricultural emissions by these categories:

- Non-mechanical (Scope 1): Emissions from biological processes shaped by climatic and soil conditions or the burning of crop residues
- Land use change (Scope 1): Emissions from land use change that results in a reduction in the size of carbon stocks e.g. from the conversion of native habitats into farm lands
- Mechanical (Scope 1): Emissions from equipment or machinery operated on farms
- Purchased energy (Scope 2): Emissions from purchased heat, steam and electricity consumed on the farm

A list of different agricultural emissions sources can be found in the General Guidance at the beginning of the Agriculture section (page 10 of this guidance).

Note that the GHG Protocol Agricultural Guidance recommends that Scope 1 emissions should be disaggregated by mechanical sources, emissions from land use change, and all other non-mechanical sources (BOX 1). If you wish to adhere to this guidance please select “Agricultural emissions disaggregated by category”, and report your emissions in FBT1.3c.

Selecting “Total agricultural emissions” will direct you to FBT1.3b, selecting “Agricultural emissions disaggregated by category” drives FBT1.3c.

**FBT 1.3b Please report your total agricultural emissions produced on your own farm(s) and identify any exclusions in the table below**

*This question appears if “Total agricultural emissions” is ticked in FBT1.3a*

The aim of this question is to account for the emissions from agricultural activities undertaken within your organizational boundary, separated by Scopes 1 and 2. You are also asked to specify the methodology used and clarify the coverage of this disclosure. You may provide information to supplement your response in the comments column, for example, any plans for data collection in the future.

Please note that when responding to the FBT module, companies are only required to provide one Scope 2 figure. Please use the ‘Comment’ field in all FBT questions where Scope 2 emissions are required to disclose whether you have used a location-based or market-based figure.

Please respond to this question by completing the table provided in the ORS and reproduced below.

Scope	Agricultural emissions (metric tonnes CO <sub>2</sub> e)	Methodology	Exclusions	Explanation	Comment
Scope 1					
Scope 2					

**Agricultural emissions (metric tonnes CO<sub>2</sub>e):**

Answers should be no more than 99999999999 (without commas) and using no more than 2 decimal places. Negative numbers are not allowed as reporting needs to be in gross, not net figures. Emissions figures should be for the reporting year only.

If you do not have a Scope 1/ Scope 2 emissions figure, you should leave the corresponding cells blank. Putting in zero would suggest that you do not have Scope 1/ Scope 2 emissions from agricultural activities.

*FBT companies can complete this column instead of CC9.2d/10.2c of the core climate change questionnaire.*

**Methodology:** Please select all that apply from the following drop-down list

- Default emissions factors: Involves the multiplication of activity data by an international default emissions factor (e.g. multiplying the number of cattle by an emissions factor that specifies how much methane is produced per cattle will provide an estimate of how much methane is produced from enteric fermentation).
- Region-specific emissions factors: Involves the multiplication of activity data by an emissions factor specific to the region.
- Empirical models: Involves using field measurements to develop statistical relationships between GHG data and agricultural management factors.
- Process-based models: Involves mathematically linking biogeochemical processes that control the production, consumption, and emission of GHGs
- Field measurements: These can be direct (e.g. livestock chambers that measure methane emissions from enteric fermentation) or indirect (e.g. measurement of carbon stocks before and after a change in management practices).
- Other, please specify

**Exclusions:** Please use this text field to identify any emissions sources which are not included in the Scope 1/ Scope 2 emissions figure reported in column 2. Use no more than 2,400 characters.

**Explanation:** Please use this column to describe why the source is excluded and its significance. Use no more than 2,400 characters

**Comment:** If reporting Scope 2 emissions, please use this field to state whether you have used a location-based or market-based figure. Use no more than 2,400 characters.

**Sample Response – for guidance only**

Scope	Emissions from agricultural activities (metric tonnes CO <sub>2</sub> e)	Methodology	Exclusions	Explanation	Comment
Scope 1	100,000	Field measurements	We have only calculated emissions from cattle and have consequently excluded emissions from agricultural crops and farm equipment.	Our main agricultural input is beef, and we understand that cattle can be a significant source of methane emissions (a potent GHG) due to enteric fermentation. Consequently, we consider cattle to be our most significant source of agricultural GHG emissions and have focused our attention and efforts toward quantifying these emissions to date.	In the next two years we plan to start collecting emissions data from our agricultural crops. We will initially target crops that we grow in largest quantities including sugar cane and barley. Once we have systems in place to calculate emissions from raw agricultural inputs (crops and animals), we will extend our inventories to include emissions from farm equipment and machinery (4-5 years).

**FBT1.3c Please report your agricultural emissions produced on your own farm(s), disaggregated by category, and identify any exclusions in the table below**

*This question appears if “Agricultural emissions disaggregated by category” is ticked:*

The aim of this question is to account for the emissions from agricultural activities undertaken within your organizational boundary, separated by categories specified by the [GHG Protocol Agricultural Guidance](#). You are also asked to specify the methodology used and clarify the coverage of this disclosure. You may provide information to supplement your response in the comments column, for example, any plans for data collection in the future.

Please respond to this question by completing the table provided in the ORS and reproduced below.

Emissions category	Agricultural emissions (metric tonnes CO <sub>2</sub> e)	Methodology	Exclusions	Explanation	Comment
Non-mechanical (Scope 1)					
Land use change (Scope 1)					
Mechanical (Scope 1)					
Purchased energy (Scope 2)					

**Emissions category:**

- Non-mechanical (Scope 1): Emissions from biological processes shaped by climatic and soil conditions or the burning of crop residues
- Land use change (Scope 1): Emissions from land use change that results in a reduction in the size of carbon stocks e.g. from the conversion of native habitats into farm lands.
- Mechanical (Scope 1): Include equipment or machinery operated on farms
- Purchased energy (Scope 2): Include emissions from purchased heat, steam and electricity consumed on the farm

**Agricultural emissions (metric tonnes CO<sub>2</sub>e):**

Answers should be no more than 99999999999 (without commas) and using no more than 2 decimal places. Negative numbers are not allowed as reporting needs to be in gross, not net figures. Emissions figures should be for the reporting year only.

If you do not have a Scope 1/ Scope 2 emissions figure, you should leave the corresponding cells blank. Putting in zero would suggest that you do not have Scope 1/ Scope 2 emissions from agricultural activities.

*FBT companies can complete this column instead of CC9.2d/10.2c of the core climate change questionnaire.*

**Methodology:** Please select all that apply from the following drop-down list

- Default emissions factors: Involves the multiplication of activity data by an international default emissions factor (e.g. multiplying the number of cattle by an emissions factor that specifies how much methane is produced per cattle will provide an estimate of how much methane is produced from enteric fermentation).
- Region-specific emissions factors: Involves the multiplication of activity data by an emissions factor specific to the region.
- Empirical models: Involves using field measurements to develop statistical relationships between GHG data and agricultural management factors.
- Process-based models: Involves mathematically linking biogeochemical processes that control the production, consumption, and emission of GHGs
- Field measurements: These can be direct (e.g. livestock chambers that measure methane emissions from enteric fermentation) or indirect (e.g. measurement of carbon stocks before and after a change in management practices).
- Other, please specify

**Exclusions:** Please use this text field to identify any emissions sources which are not included in the Scope 1/ Scope 2 emissions figure reported in column 2. Use no more than 2,400 characters.

**Explanation:** Please use this column to describe why the source is excluded and its significance. Use no more than 2,400 characters

**Comment:** If reporting Scope 2 emissions, please use this field to state whether you have used a location-based or market-based figure. Use no more than 2,400 characters.

**Sample Response – for guidance only**

Scope	Emissions from agricultural activities (metric tonnes CO <sub>2</sub> e)	Methodology	Exclusions	Explanation	Comment
Non-mechanical (Scope 1)	100,000	Field measurements	We have only calculated emissions from cattle and have consequently excluded emissions from agricultural crops.	Our main agricultural input is beef, and we understand that cattle can be a significant source of methane emissions (a potent GHG) due to enteric fermentation. Consequently, we consider cattle to be our most significant source of agricultural GHG emissions and have focused our attention and efforts toward quantifying these emissions to date.	In the next two years we plan to start collecting emissions data from our agricultural crops. We will initially target crops that we grow in largest quantities including sugar cane and barley. We plan to have systems in place to calculate emissions from raw agricultural inputs (crops and animals) by 4-5 years time.

**FBT1.3d Please explain why you do not account for greenhouse gas emissions from agricultural activities undertaken on your own farm(s), and describe any plans for the collection of this data in the future**

*This question only appears if you answer “no” to FBT1.3.*

This question aims to identify barriers and difficulties associated with calculating emissions data from agricultural activities. Where appropriate, please explain any plans you have for the collection of this data in the future, including the time-scale for the implementation of these plans.

You should respond to this question in the text box provided; your answer should be no more than 5000 characters in length. Please note that when copying from another document into the ORS, the formatting is not retained.

**FBT1.4 Do you implement agricultural management practices on your own farm(s) with a climate change mitigation and/or adaptation benefit?**

*This question only appears if you select “own farm(s)” or “both own farm(s) and elsewhere in value chain” in FBT1.2.*

Adaptation and mitigation are complementary strategies which are key to address the complex and interlinked relationship between climate change and the agricultural sector. While mitigation measures are essential to limit the magnitude and rate of climate change globally, the effects of reduced emissions will not emerge for several decades due to the inertia of the climate system; thus adaptation is increasingly important to make agricultural production resilient to the impacts of climate change.

A wide variety of agricultural management practices are being implemented on farms that either directly or indirectly have climate change mitigation and/or adaptation benefits; this question asks for you to indicate whether any such activities are undertaken on your own farms. A list of exemplary agricultural management practices can be found in Appendix A of this guidance document.

Please respond to this question by selecting “yes”, “no” or “don’t know” from the drop down menu provided. Answering “yes” will direct you to FBT1.4a, selecting “no” or “don’t know” drives FBT1.4c.

**FBT1.4a Please identify agricultural management practices undertaken on your own farm(s) with a climate change mitigation and/or adaptation benefit. Complete the table**

*This question only appears if you select “yes” in FBT 1.4.*

This question asks you to identify and explain the agricultural management practices that are being implemented on your own farms, and also asks you to identify the resulting climate change related benefit.

Please respond to this question by completing the table provided in the ORS and reproduced below.

Activity ID	Agricultural management practice	Description of agricultural management practice	Climate change related benefit	Comment

Use the “Add Row” button to the bottom right of the table to enter multiple rows.

**Activity ID:** If you implement multiple agricultural management practices, you should select a unique ID in this field from the drop-down menu provided to identify that management practice in FBT1.4b. Please select from 1-20.

**Agricultural management practice:** Please select from the following options. A description each agricultural management practice is provided in Appendix A of this guidance document.

Agroforestry Biodiversity considerations Change in the topography or landscapes Composting Crop diversity Contour farming Crop rotation Diversifying farmer income Equipment maintenance and calibration Governmental or institutional policies and programs Integrated pest management Knowledge sharing Land use change Low carbon energy use Low tillage and residue management Livestock management	Manure management Nutrient management Organic farming Permanent soil cover (including cover crops) Pest, disease and weed management practices Reducing energy use Restoration of degraded lands and cultivated organic soils Rice management Seed variety selection Species introduction Timing of farm operations Waste management Water Management Other; Please specify
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**Description of agricultural management practice:** Use no more than 2,400 characters

**Climate change related benefit:** Select all that apply from the following options

- Emissions reductions (mitigation)
- Increasing resilience to climate change (adaptation)
- Other, please specify

**Comment:** Use no more than 2,400 characters. Where possible, respondents are asked to provide further information in the comments column. Specifically:

- An indication of the scale and coverage of the activity;
- Whether impact from this practice is measured and how it is measured (or quantified); and
- The impacts of implementation and/or quantified results from this activity specifically with regard to climate change adaptation and/or mitigation.

If your organization undertakes many initiatives, please prioritize the reporting of those that have the greatest effect on emissions and cost saving for the business.

**Sample Response – for guidance only:**

Activity ID	Agricultural management practice	Description of agricultural management practice	Climate change related benefit	Comment
1	Permanent soil cover (including cover crops)	Increased our cover-cropping practices reduce soil exposure/ erosion, increase soil organic matter, water retention, soil structure and overall soil health.	Emissions reductions and increasing resilience	We quantified the GHG benefits from this practice using the Cool Farm Tool. Results: 1437 kg CO2e per hectare per year reduction in GHG emissions. As we manage 32 hectares we expect a total emissions reduction per year of 46 tCO2e.

**FBT1.4b Does your implementation of these agricultural management practices have other impacts? Complete the table**

*This question only appears if you select “yes” in FBT 1.4*

This question asks for you to identify and then explain any other impacts that may be occurring as a result of your implementation of any of the agricultural management practices detailed above in question FBT1.4a. If you have not evaluated impacts on the given variables, there is an option to state this in your response. If you have adopted any methods/ techniques to manage these other impacts, please explain these in the last column of this table.

Please respond to this question by completing the table provided in the ORS and reproduced below.

Activity ID	Impact on yield	Impact on cost	Impact on soil quality	Impact on biodiversity	Impact on water	Other impact	Description of impacts	Comment

Use the “Add Row” button to the bottom right of the table to enter multiple rows.

**Activity ID:** If you have reported an agricultural management practice in FBT1.4a, please select that same ID for the corresponding practice in this question. Select from 1-20.

**Impact on yield/ Impact on cost/ Impact on soil quality/ Impact on biodiversity/ Impact on water:** For each variable please select from the following options:

- Evaluated - beneficial impact
- Evaluated - detrimental impact
- Evaluated - no impact
- Not evaluated

**Other impact:** Please state another variable that is impacted by your implementation of the selected agricultural management practice. Use no more than 500 characters

**Description of impacts:** Use no more than 2,400 characters. If you are not aware of any other impacts, please leave this text field blank.

**Comment:** Use no more than 2,400 characters. If you are not aware of any other impacts, please leave this text field blank.

**FBT1.4c Do you have any plans to implement agricultural management practices in the future?**

*This question only appears if you select “own farm(s)” or “both own farm(s) and elsewhere in value chain” in FBT1.2. The question appears irrespectively of your answer to 1.4, (on current agricultural management practices) as you may also have future plans that you might want to disclose.*

Please indicate whether your organization has any agricultural management practices that are in the planning phase. You should respond to this question by selecting “yes” or “no” from the drop down menu provided. If you select “yes” you will be directed to FBT1.4d; if you select “no” or “don’t know” you will be directed to FBT1.5.

**FBT1.4d Please detail your plans to implement agricultural management practices in the future**

*This question only appears if you select “yes” in FBT 1.4c.*

Please provide further information on your plans to implement agricultural management practices in the future, including a description of the practices you plan to implement, your reasons for implementing them, and the time-scale in which you plan to implement them.

You should respond to this question in the text box provided; your answer should be no more than 5000 characters in length. Please note that when copying from another document into the ORS, the formatting is not retained.

**FBT1.5 Is biogenic carbon pertaining to your own farm(s) relevant to your climate change disclosure?**

*This question only appears if you select “own farm(s)” or “both own farm(s) and elsewhere in value chain” in FBT1.2.*

Please respond to this question by selecting “yes”, “no” or “don’t know” from the drop down menu provided. Answering “yes” will direct you to FBT1.5a. If you select “No” or “Don’t know” in response to this question and selected “Own farm(s)” in FBT1.2, you will not be presented with any further questions on agriculture and can progress to the following page using the “Next” button to the bottom right of the ORS.

According to the principles of [The GHG Protocol Corporate Standard](#), the activity is relevant if it yields information that contains the detail that users, both internal and external to the company, need for their decision-making.

Please consult the [GHG Protocol Agricultural Guidance](#) (Chapters 8 & 9) for more information on biogenic carbon. A summary of recommendations is provided in Box 4.

**BOX 3: Biogenic carbon**

Biogenic carbon refers to carbon which is contained in biomass (both above-ground and below-ground), dead organic matter, soil organic matter, and harvested products. This information box summarises guidance from the [GHG Protocol Agricultural Guidance](#) on how **companies developing Scope 1 and 2 emissions inventories of their agricultural operations** should account for biogenic carbon in their GHG inventories. Please refer to the guidance directly for more information.

The full guidance document explains that there are two specific features of agricultural systems that determine how carbon stocks should be included within GHG inventories:

1. Stocks of carbon are reversible – i.e. any carbon sequestered in stocks will eventually be emitted to the atmosphere; and
2. Changes in carbon stocks can take decades to reach equilibrium following a change in agricultural management or land use.

#### **What should be included?**

The guidance states that the following fluxes (emissions/removals) should be considered:

- CO<sub>2</sub> emissions from, and atmospheric removals by, organic carbon stocks in mineral and organic soils
- CO<sub>2</sub> emissions from, and atmospheric removals by, below-ground and above-ground woody biomass (e.g., woody vegetation in orchards, vineyards and agroforestry systems)
- CO<sub>2</sub> emissions from the combustion of herbaceous biomass (e.g., open burning of crop residues)
- CO<sub>2</sub> emissions from dead organic matter (DOM)

#### **How should it be reported?**

The guidance recommends that these emissions/ removals should be reported outside of the scopes in a separate category ('Biogenic Carbon') that has three components:

1. CO<sub>2</sub> fluxes (emissions or removals) during land use management;
2. Sequestration during land use change (LUC); and
3. CO<sub>2</sub> emissions from biofuel combustion

CO<sub>2</sub> emissions from soils and woody biomass that result from LUC should be reported within the scopes (not the Biogenic Carbon category) because they effectively constitute permanent losses of carbon to the atmosphere.

As well, CH<sub>4</sub> and N<sub>2</sub>O emissions from all carbon stocks (e.g., from biomass or DOM combustion) shall always be reported in the scopes.

#### **What is 'Amortization'?**

Shifts in management practices during the reporting period will often have long-lasting effects on carbon stocks that may persist for decades. Amortizing the CO<sub>2</sub> fluxes from changes in carbon stocks involves allocating these fluxes across time (and therefore multiple inventories) to ensure the more consistent accounting of carbon stock impacts. Please refer to the full version of the GHG Protocol's Agricultural Guidance (Chapter 8.3) for more information on how to amortize CO<sub>2</sub> fluxes.

**If you are an agricultural producer, please refer to the [GHG Protocol Agricultural Guidance](#) for more information on how to report biogenic carbon.**

#### **FBT 1.5a Please report biogenic carbon data pertaining to your own farm(s) in the table below**

*This question only appears if you answer "yes" in FBT1.5.*

If you select "Own farm(s)" in FBT1.2, you will not be presented with any further questions on agriculture and can progress to the following page using the "Next" button to the bottom right of the ORS.

CO2 flux	Emissions/ Removals (metric tonnes CO <sub>2</sub> e)	Methodology	Exclusions	Explanation	Comment
CO2 emissions from land use management					
CO2 removals from land use management					
Sequestration during land use change					
CO2 emissions from biofuel combustion					

**CO<sub>2</sub> flux:** Carbon fluxes refer to the transfer of carbon from one carbon pool to another.

- CO<sub>2</sub> emissions from land use management: Movement of CO<sub>2</sub> from carbon stocks in soils, above and below-ground woody biomass, and DOM stocks, and the combustion of crop residues for non-energy purposes
- CO<sub>2</sub> removals from land use management: Movement of CO<sub>2</sub> to carbon stocks in soils, above and below-ground woody biomass, and DOM stocks, and the combustion of crop residues for non-energy purposes
- Sequestration during land use change: CO<sub>2</sub> removals by soils and biomass following afforestation or reforestation
- CO<sub>2</sub> emissions from biofuel combustion: Combustion of biodiesel in farm machinery

**Emissions/ Removals (metric tonnes CO<sub>2</sub>e):**

Answers should be no more than 9999999999 (without commas) and using no more than 2 decimal places. Figures should be for the reporting year only.

Negative numbers are not allowed; both emissions and removals should be reported as positive numbers. If you do not have an emissions/removals figure, you should leave the corresponding cells blank. Putting in zero would suggest that you do not have emissions/removals from the stated CO<sub>2</sub> flux.

**Methodology:** Please select all that apply from the following drop-down list

- Default emissions factors: Involves the multiplication of activity data by an international default emissions factor.
- Region-specific emissions factors: Involves the multiplication of activity data by an emissions factor specific to the region.
- Empirical models: Involves using field measurements to develop statistical relationships between GHG data and agricultural management factors.
- Process-based models: Involves mathematically linking biogeochemical processes that control the production, consumption, and emission of GHGs
- Field measurements: These can be direct (e.g. livestock chambers that measure methane emissions from enteric fermentation) or indirect (e.g. measurement of carbon stocks before and after a change in management practices).
- Other, please specify

**Exclusions:** Please use this text field to identify any emissions sources which are not included in the emissions/removals figure reported in column 2. Use no more than 2,400 characters.

**Explanation:** Please use this column to describe why the source is excluded and its significance. Use no more than 2,400 characters

**Comment:** Please use this text box to provide further information that you think is relevant, such as whether and how you have amortized your biogenic carbon data. Use no more than 2,400 characters.

Please consult the [GHG Protocol Agricultural Guidance](#) (Chapters 8 & 9) for more information on how to report biogenic carbon. A summary of recommendations is provided in Box 4.

**Sample Response – for guidance only:**

CO2 flux	Emissions/ Removals (metric tonnes CO <sub>2</sub> e)	Methodology	Exclusions	Explanation	Comment
Sequestration during land use change	10,000	Process-based models	We have only conducted this calculation for our Brazilian cattle farm. Our other farms (in the USA and Australia) have been excluded	This is the first year that we have accounted for sequestered carbon resulting from land use change. As a pilot exercise have focused our attention on a single farm before rolling this effort out to all farms.	The flux has not been amortized so the reported figure does not account for historical changes in land use.

Value chain pathway

The following questions which feature in the “value chain” pathway will only appear if “elsewhere in value chain” or “both own farm(s) and elsewhere in value chain” is selected in FBT1.2

**FBT1.2a Please explain why agricultural emissions from your own farms are not relevant**

*This question only appears if you answer “elsewhere in value chain” in FBT1.2.*

You should respond to this question in the text box provided; your answer should be no more than 5000 characters in length. Please note that when copying from another document into the ORS, the formatting is not retained.

**FBT1.6 Do you account for greenhouse gas emissions from agricultural activities in your value chain as part of the Scope 3 category “Purchased goods and services” reported in CC14.1 of the core climate change questionnaire?**

*This question only appears if you answer “elsewhere in value chain” or “both own farm(s) and elsewhere in value chain” in FBT1.2.*

Scope 3 emissions are a consequence of the activities undertaken by your organization but originate from sources not owned or controlled by your organization, as per [The GHG Protocol Corporate Standard](#). As such, if your organization is purchasing agricultural inputs from an agricultural supplier, emissions from the production of these agricultural inputs should be included as part of your organization’s Scope 3 inventory. According to the [GHG Protocol Agricultural Guidance](#), Scope 3 emissions from agriculture could include your agricultural supplier’s emissions from non-mechanical sources (e.g. enteric fermentation, soils, manure management, land use change, waste management), their emissions from mechanical sources (e.g. from stationary equipment or mobile machinery), and their emissions from purchased electricity. Scope 3 emissions could also include emissions from upstream processes e.g. fertilizer production, diesel production, pesticide production etc. for use in agricultural activities. The GHG Protocol’s [Corporate Value Chain \(Scope 3\) Accounting and Reporting Standard](#) identifies 15 different categories of Scope 3 sources; agricultural emissions from value chains should be reported as part of “Purchased goods and services” (category #1 in the Scope 3 Standard).

Please respond to this question by selecting “yes”, “partially” or “no” from the drop down menu provided. Answering “yes” or “partially” will direct you to FBT1.6a, selecting “no” drives FBT1.6b.

**FBT1.6a Please report these agricultural emissions from your value chain and identify any exclusions in the table below**

*This question only appears if you answer “yes” or “partially” in FBT1.6.*

Scope	Agricultural emissions (% of the emissions reported in the category “Purchased goods and services”)	Exclusions	Explanation	Comment
Scope 3				

**Agricultural emissions (% of the emissions reported in the category “Purchased goods and services”):** Please select a % range to indicate the proportion of Scope 3 emissions reported in the “Purchased goods and services” category of CC14.1 that comprise agricultural emissions.

**Exclusions:** Please use this text field to identify any emissions sources which are not accounted for in the % range reported in column 2. Use no more than 2,400 characters.

**Explanation:** Please use this column to describe why the source is excluded and its significance. Use no more than 2,400 characters

**Comment:** Use no more than 2,400 characters.

**Sample Response – for guidance only:**

Scope	Agricultural emissions (% of the emissions reported in the category “Purchased goods and services”)	Exclusions	Explanation	Comment
Scope 3	0-100%	We exclude Scope 3 agricultural emissions that do not pertain to the production of sugar.	Although we use a number of different agricultural crops, sugar is by far the most relevant one in terms of the quantity that we procure. At this time we focus our efforts on engagement with sugar suppliers. Through close engagement, we have helped our sugar suppliers build capacity to measure GHGs that we then incorporate into our Scope 3 inventory.	The flux has not been amortized so the reported figure does not account for historical changes in land use.

**FBT1.6b Please explain why you do not account for greenhouse gas emissions from agricultural activities in your value chain as part of the Scope 3 category “Purchased goods and services” reported in CC14.1 of the core climate change questionnaire**

*This question only appears if you answer “no” in FBT1.6.*

This question aims to identify barriers and difficulties associated with gathering agricultural emissions data from your value chain. Where appropriate, please explain any plans you have for the collection of this data in the future, including the time-scale for the implementation of these plans.

You should respond to this question in the text box provided; your answer should be no more than 5000 characters in length. Please note that when copying from another document into the ORS, the formatting is not retained.

**FBT1.7 Do you encourage your agricultural suppliers to undertake any agricultural management practices with a climate change mitigation and/or adaptation benefit?**

*This question only appears if you answer “elsewhere in value chain” or “both own farm(s) and elsewhere in value chain” in FBT1.2.*

Adaptation and mitigation are complementary strategies which are key to address the complex and interlinked relationship between climate change and the agricultural sector. While mitigation measures are essential to limit the magnitude and rate of climate change globally, the effects of reduced emissions will not emerge for several decades due to the inertia of the climate system; thus adaptation becomes imperative to make agricultural production resilient to the impacts of climate change.

A wide variety of agricultural management practices are being implemented on farms that either directly or indirectly have climate change mitigation and/or adaptation benefits; this question asks for you to indicate whether you have any involvement in your agricultural suppliers’ undertaking of such practices.

Please respond to this question by selecting “yes”, “no” or “don’t know” from the drop down menu provided. Answering “yes” will direct you to FBT1.7a, and FBT1.7b selecting “no” or “don’t know” drives FBT1.7c.

A list of exemplary agricultural management practices can be found in Appendix A of this guidance document. Methods of engagement could include the following roles:

- Financial – where you are providing financial support for agricultural management practices undertaken by your suppliers
- Knowledge sharing – where you are supporting knowledge sharing of agricultural management practices amongst your suppliers or your peer organizations
- Operational – where you have operational control over the growing activities that fall outside of your organizational boundary. This is possible when the organizational boundary approach you have chosen is financial control or equity share.
- Procurement – where you are encouraging specific agricultural management practices through requirements in your procurement relationships

**FBT1.7a Please identify agricultural management practices with a climate change mitigation and/or adaptation benefit that you encourage your suppliers to implement. Complete the table**

*This question only appears if you answer “yes” in FBT1.7.*

This question asks you to identify and explain the agricultural management practices that are being implemented by your agricultural suppliers, and asks for you to explain your involvement in their undertaking of these activities.

Please respond to this question by completing the table provided in the ORS and reproduced below.

Activity ID	Agricultural management practice	Description of agricultural management practice	Your role in the implementation of this practice	Explanation of how you encourage implementation	Climate change related benefit	Comment

Use the “Add Row” button to the bottom right of the table to enter multiple rows.

**Activity ID:** If you encourage your suppliers to implement multiple agricultural management practices, you should select a unique ID in this field from the drop-down menu provided to identify that management practice in FBT1.7b. Please select from 1-20.

**Agricultural management practice:**

Agroforestry Biodiversity considerations Change in the topography or landscapes Composting Crop diversity Contour farming Crop rotation Diversifying farmer income Equipment maintenance and calibration Governmental or institutional policies and programs Integrated pest management Knowledge sharing Land use change Low carbon energy use Low tillage and residue management Livestock management	Manure management Nutrient management Organic farming Permanent soil cover (including cover crops) Pest, disease and weed management practices Reducing energy use Restoration of degraded lands and cultivated organic soils Rice management Seed variety selection Species introduction Timing of farm operations Waste management Water Management Other; Please specify
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Please select from the options given above. A description of each agricultural management practice is provided in Appendix A of this guidance document.

**Description of agricultural management practice:** Use no more than 2,400 characters

**Your role in the implementation of this practice:** Please select all that apply:

- Financial – where you are providing financial support for agricultural management practices undertaken by your suppliers
- Knowledge sharing –where you are supporting knowledge sharing of agricultural management practices amongst your suppliers or your peer organizations
- Operational – where you have operational control over the growing activities that fall outside of your organizational boundary
- Procurement – where you are encouraging specific agricultural management practices through requirements in your procurement relationships
- None
- Other; please specify

**Explanation of how you encourage implementation:** Please explain your role in the implementation of this practice. Use no more than 2,400 characters.

**Climate change related benefit:** Select all that apply from the following options

- Emissions reductions (mitigation)
- Increasing resilience to climate change (adaptation)
- Other, please specify

**Comment:** Use no more than 2,400 characters. Where possible, respondents are asked to provide further information in the comments column. Specifically:

- An indication of the scale and coverage of the activity;
- Whether impact from this practice is measured and how it is measured (or quantified); and
- The impacts of implementation and/or quantified results from this activity specifically with regard to climate change adaptation and/or mitigation.

If your agricultural suppliers undertake many initiatives, please prioritize the reporting of those that have the greatest effect on emissions and cost saving for the business.

**Sample Response – for guidance only:**

Activity ID	Description of activities	Your role	Description of role	Driver	Comment
1	30 percent of our farmer-suppliers switched from conventional to reduced tillage over the last 10 years with a resulting increase in soil organic matter.	Knowledge sharing	We organized a series of workshops for our agricultural suppliers on the benefits of implementing sustainable farming practices. This provided an opportunity for our suppliers to share their knowledge and experiences with one-another as well.	Emissions reductions and increasing resilience	<p>Emissions reductions were quantified using the Cool Farm Tool.</p> <p>Results: 499 kg CO<sub>2</sub>e per hectare per year reduction in GHG emissions.</p> <p>Emissions per hectare went from 1,403 kg CO<sub>2</sub>e to 904 kg CO<sub>2</sub>e</p> <p>Emissions per metric tonne went from 178 kg CO<sub>2</sub>e to 114 kg CO<sub>2</sub>e</p> <p>We have 15,000 suppliers in our value chain so this resulted in an overall reduction of 7,485t CO<sub>2</sub>e</p>

**FBT1.7b Does the implementation of these agricultural management practices in your value chain have other impacts? Complete the table**

*This question only appears if you answer “yes” in FBT1.7.*

This question asks for you to identify and then explain any other impacts that may be occurring as a result of the implementation of any of the agricultural management practices detailed above in question FBT1.7a. If you have not evaluated impacts on the given variables, there is an option to state this in your response. If any methods/ techniques have been adopted to manage these other impacts, please explain these in the final column of this table.

Please respond to this question by completing the table provided in the ORS and reproduced below.

Activity ID	Impact on yield	Impact on cost	Impact on soil quality	Impact on biodiversity	Impact on water	Other impact	Description of impacts	Comment

Use the “Add Row” button to the bottom right of the table to enter multiple rows.

**Activity ID:** If you have reported an agricultural management practice in FBT1.7a, please select that same ID for the corresponding practice in this question. Select from 1-20.

**Impact on yield/ Impact on cost/ Impact on soil quality/ Impact on biodiversity/ Impact on water:** For each variable please select from the following options:

- Evaluated - beneficial impact
- Evaluated - detrimental impact
- Evaluated - no impact
- Not evaluated

**Other impact:** Please state another variable that is impacted by the implementation of the selected agricultural management practice. Use no more than 500 characters

**Description of impacts:** Use no more than 2,400 characters. If you are not aware of any other impacts, please leave this text field blank.

**Comment:** Use no more than 2,400 characters. If you are not aware of any other impacts, please leave this text field blank.

**FBT1.7c Do you have any plans to engage with your suppliers on their implementation of agricultural management practices?**

*This question only appears if you answer “elsewhere in value chain” or “both own farm(s) and elsewhere in value chain” in FBT1.2. The question appears irrespectively of your answer to 1.7, (on current engagement with suppliers on agricultural management practices) as you may also have future plans that you might want to disclose.*

Please indicate whether your organization has any plans to work with agricultural suppliers in implementing agricultural management practices. You should respond to this question by selecting “yes” or “no” from the drop down menu provided. If you select “yes” you will be directed to FBT1.7d; if you select “no” or “don’t know” you can proceed to FBT2 on the next page of the ORS.

**FBT1.7d Please detail these plans to engage with your suppliers on their implementation of agricultural management practices**

*This question only appears if you answer “yes” in FBT1.7c*

Please provide further information on your plans to engage with agricultural suppliers on their implementation of agricultural management practices. Where possible, please explain your reasons for involvement and the time-scales you plan to adhere to.

You should respond to this question in the text box provided; your answer should be no more than 5000 characters in length. Please note that when copying from another document into the ORS, the formatting is not retained.

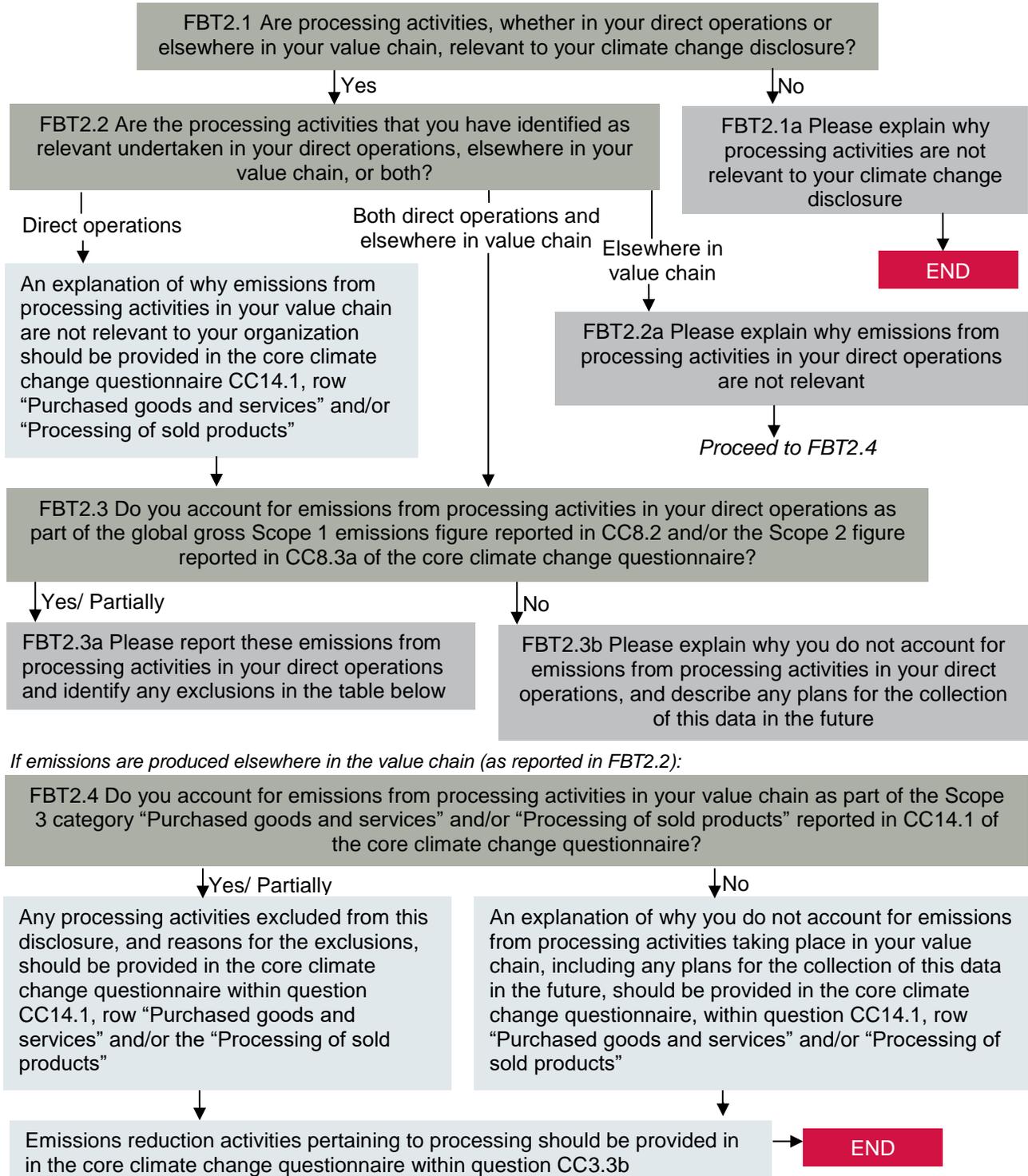
You will not be presented with any further questions on this page and can progress to the following page of the ORS using the “Next” button to the bottom right.

# FBT2: Processing/ Manufacturing

The following questions are shown on the Processing page.

## Question Pathway

The following questions are shown on the Processing page.



## General Guidance

Processing includes all processes adopted, and all methods and techniques used, to transform raw agricultural inputs into final products ready for human consumption. Direct and indirect emissions from processing result from the operation of machinery and equipment, as well as from heating, cooling, and refrigeration.

Processing of food, beverage and tobacco products could include the following:

- Pre-processing (relevant if companies use processed inputs e.g. sugar)
- Primary grading/ screening to ensure uniformity
- Storage during different processing stages - humidity, temperature, atmospheric conditions and hygiene often need to be controlled
- Cleaning to remove and separate off-specification material, organic and non-organic debris, metals, and pesticide residues among other contaminants
- Cutting, trimming, rolling and peeling to re-shape and remove inedible parts
- Cooking, canning, evaporating, drying and freezing
- Pulping and filtration
- Packaging of the final product to provide containment, protection, communication, and convenience
- Packaging for transport in, for example, crates or pallets
- Waste generated during processing activities

Given that processing activities are prevalent across the FBT sector, this section allows companies to provide additional information on processing, thus also encouraging transparency.

### **BOX 4: How to report on waste from processing**

If waste is produced as part of your own processing activities and is managed within your organizational boundary, it should be reported as Scope 1 emissions. If waste is produced during processing activities within your organizational boundary but is managed by a third party, then emissions associated with this waste should be reported within the Scope 3 category “Waste generated in operations” in the core climate change questionnaire CC14.1. If waste from processing activities is produced outside of your organizational boundary and is also managed outside of your organizational boundary, emissions associated with this waste should be reported within the Scope 3 category 1 “Purchased goods and services” and/or “Processing of sold products” in the core climate change questionnaire CC14.1, where relevant.

### **Pre-population**

Pre-population is available for FBT2.1, FBT2.1a, FBT2.2 and FBT2.2a.

## Specific Question Guidance

### **FBT2.1 Are processing activities, whether in your direct operations or elsewhere in your value chain, relevant to your climate change disclosure?**

According to the principles of [The GHG Protocol Corporate Standard](#), the activity is relevant if it yields information that contains the detail that users, both internal and external to the company, need for their decision-making.

Please respond to this question by selecting “yes” or “no” from the drop down menu provided. Answering “yes” will direct you to FBT2.2, selecting “no” drives FBT2.1a.

#### **FBT2.1a Please explain why processing activities are not relevant to your climate change disclosure**

*This question only appears if you answer “no” to FBT2.1.*

You should respond to this question in the text box provided; your answer should be no more than 5000 characters in length. Please note that when copying from another document into the ORS, the formatting is not retained.

You will not be presented with any further questions on this page and can progress to the following page of the ORS using the “Next” button at the bottom right of the page.

### **FBT2.2 Are the processing activities that you have identified as relevant undertaken in your direct operations, elsewhere in your value chain, or both?**

*This question only appears if you answer “yes” to FBT2.1.*

In this question, you are asked to identify the part(s) of your value chain where relevant processing emissions have been identified. If your organization undertakes all processing activities to transform raw products to goods ready for use within its organizational boundary, please select “direct operations”. If all processing activities take place outside of your organizational boundary, please select “elsewhere in value chain”. If your organization undertakes some processing activities itself but outsources others, please select “both direct operations and elsewhere in value chain”.

Answering “direct operations” or “both direct operations and elsewhere in value chain” will drive FBT2.3, selecting “elsewhere in value chain” will drive FBT2.2a.

#### *Direct operations pathway*

*The following questions which feature in the “direct operations” pathway will only appear if “direct operations” or “both direct operations and elsewhere in value chain” is selected in FBT2.2.*

### **FBT2.3 Do you account for emissions from processing activities in your direct operations as part of the global gross Scope 1 emissions figure reported in CC8.2 and/or the Scope 2 figure reported in CC8.3a of the core climate change questionnaire?**

*This question only appears if you select “direct operations” or “both direct operations and elsewhere in value chain” in FBT 2.2*

This question aims to identify whether an emissions figure has been calculated for processing activities that take place within your organization’s direct operations, and is being reported as part of Scope 1 and/or Scope 2 emissions in the core climate change questionnaire. If your organization has calculated emissions from its own processing activities and these are included in the global gross Scope 1 and/or Scope 2



emissions figures reported in the core climate change questionnaire in full please select “yes”. If only some of these emissions have been accounted for please select “partially”. Otherwise, please select “no”.

Please note that Scope 1 emissions encompass all direct GHG emissions from sources owned or controlled by your organization, and Scope 2 emissions encompass GHG emissions from the generation of purchased electricity consumed by your organization, as per [The GHG Protocol Corporate Standard](#). For example, if your organization owns an independent generator to run processing machinery or equipment, emissions from the combustion of fuel used in these generators should be accounted for as part of Scope 1 emissions. Fugitive emissions from own processing equipment and machinery, such as from air conditioning or refrigeration leaks, should also be included as Scope 1 emissions. If waste from processing activities is managed within your company’s organizational boundary, associated emissions should be accounted for as Scope 1 emissions as well. Emissions from purchased and consumed electricity, heat, steam or cooling for, for example, operating processing equipment or machinery owned by your organization should be accounted for as Scope 2 emissions.

Answering “yes” or “partially” will direct you to FBT2.3a, selecting “no” drives FBT2.3b.

**FBT2.3a Please report these emissions from processing activities in your direct operations and identify any exclusions in the table below**

*This question only appears if you answer “yes” or “partially” to FBT2.3.*

The aim of this question is to clarify the coverage of your disclosure with regards to the emissions reported from processing activities in your direct operations. You may provide information to supplement your response in the comments column, for example, any plans for data collection in the future.

Please note that when responding to the FBT module, companies are only required to provide one Scope 2 figure. Please use the ‘Comment’ field in all FBT questions where Scope 2 emissions are required to disclose whether you have used a location-based or market-based figure.

Please respond to this question by completing the table provided in the ORS and reproduced below.

Scope	Emissions from processing activities (metric tonnes CO <sub>2</sub> e)	Exclusions	Explanation	Comment
Scope 1				
Scope 2				

**Emissions from processing activities (metric tonnes CO<sub>2</sub>e):**

Answers should be no more than 99999999999 (without commas) and using no more than 2 decimal places. Negative numbers are not allowed as reporting needs to be gross, not net figures. Emissions figures should be for the reporting year only.

If you do not have a Scope 1/Scope 2 emissions figure, you should leave this question blank. Putting in zero would suggest that you do not have Scope 1 emissions from processing activities.

*FBT companies can complete this column instead of CC9.2d/10.2c of the core climate change questionnaire.*

**Exclusions:** Please use this text field to identify any emissions sources which are not included in the Scope 1/ Scope 2 emissions figure reported in column 2. Use no more than 2,400 characters.

**Explanation:** Please use this column to describe why the source is excluded and its significance. Use no more than 2,400 characters

**Comment:** If reporting Scope 2 emissions, please use this field to state whether you have used a location-based or market-based figure. Use no more than 2,400 characters.

**Sample Response – for guidance only**

Scope	Emissions from processing activities (metric tonnes CO <sub>2</sub> e)	Exclusions	Explanation	Comment
Scope 1	300,000	Fugitive emissions	We have not calculated fugitive emissions from our refrigeration units as all of our refrigeration equipment is new and has not yet been serviced.	The refrigeration units are due to be serviced in 6 months. We have requested fugitive emissions (HFCs and PFCs) to be included in our service log. We will plan to report these emissions in the next disclosure cycle.

If you selected “direct operations” in response to FBT2.2, you will not be presented with any further questions on processing and can progress to the following page using the “Next” button to the bottom right of the ORS.

**FBT2.3b Please explain why you do not account for emissions from processing activities in your direct operations, and describe any plans for the collection of this data in the future**

*This question only appears if you answer no” to FBT2.3.*

This question aims to identify barriers and difficulties associated with calculating emissions data from processing activities. Where appropriate, please explain any plans you have for the collection of this data in the future, including the time-scale for the implementation of these plans.

You should respond to this question in the text box provided; your answer should be no more than 5000 characters in length. Please note that when copying from another document into the ORS, the formatting is not retained.

If you selected “direct operations” in response to FBT2.2, you will not be presented with any further questions on processing and can progress to the following page using the “Next” button to the bottom right of the ORS.

Value chain pathway

*The following questions which feature in the “value chain” pathway will only appear if “elsewhere in value chain” or “both direct operations and elsewhere in value chain” is selected in FBT2.2.*

**FBT2.2a Please explain why emissions from processing activities in your direct operations are not relevant**

*This question only appears if you select “elsewhere in value chain” in FBT 2.2.*

You should respond to this question in the text box provided; your answer should be no more than 5000 characters in length. Please note that when copying from another document into the ORS, the formatting is not retained.

**FBT2.4 Do you account for emissions from processing activities in your value chain as part of the Scope 3 category “Purchased goods and services” and/or “Processing of sold products” reported in CC14.1 of the core climate change questionnaire?**

*This question only appears if you select “elsewhere in value chain” or “both direct operations and elsewhere in value chain” in FBT 2.2.*



Please respond to this question by selecting “yes”, “partially” or “no” from the drop down menu provided.

Scope 3 emissions are a consequence of the activities undertaken by your organization but originate from sources not owned or controlled by your organization, as per [The GHG Protocol Corporate Standard](#). As such, if your organization is purchasing processed inputs from a supplier or outsources processing activities, emissions from these sources should be included as part of your organization’s Scope 3 inventory. Scope 3 emissions from processing could include emissions from operating machinery or equipment used by suppliers, or emissions associated with the disposal of any waste by a third party. The GHG Protocol’s [Corporate Value Chain \(Scope 3\) Accounting and Reporting Standard](#) identifies 15 different categories of Scope 3 sources. Depending on the activity, emissions from processing activities in your value chain should be reported as part of “Purchased goods and services” and/or “Processing of sold products” (category #1 and #10 respectively in the Scope 3 standard).

If companies are not able to account for processing emissions as part of their Scope 3 inventories, they are encouraged to explain the barriers and difficulties faced in calculating these emissions in question CC14.1 of the core climate change questionnaire.

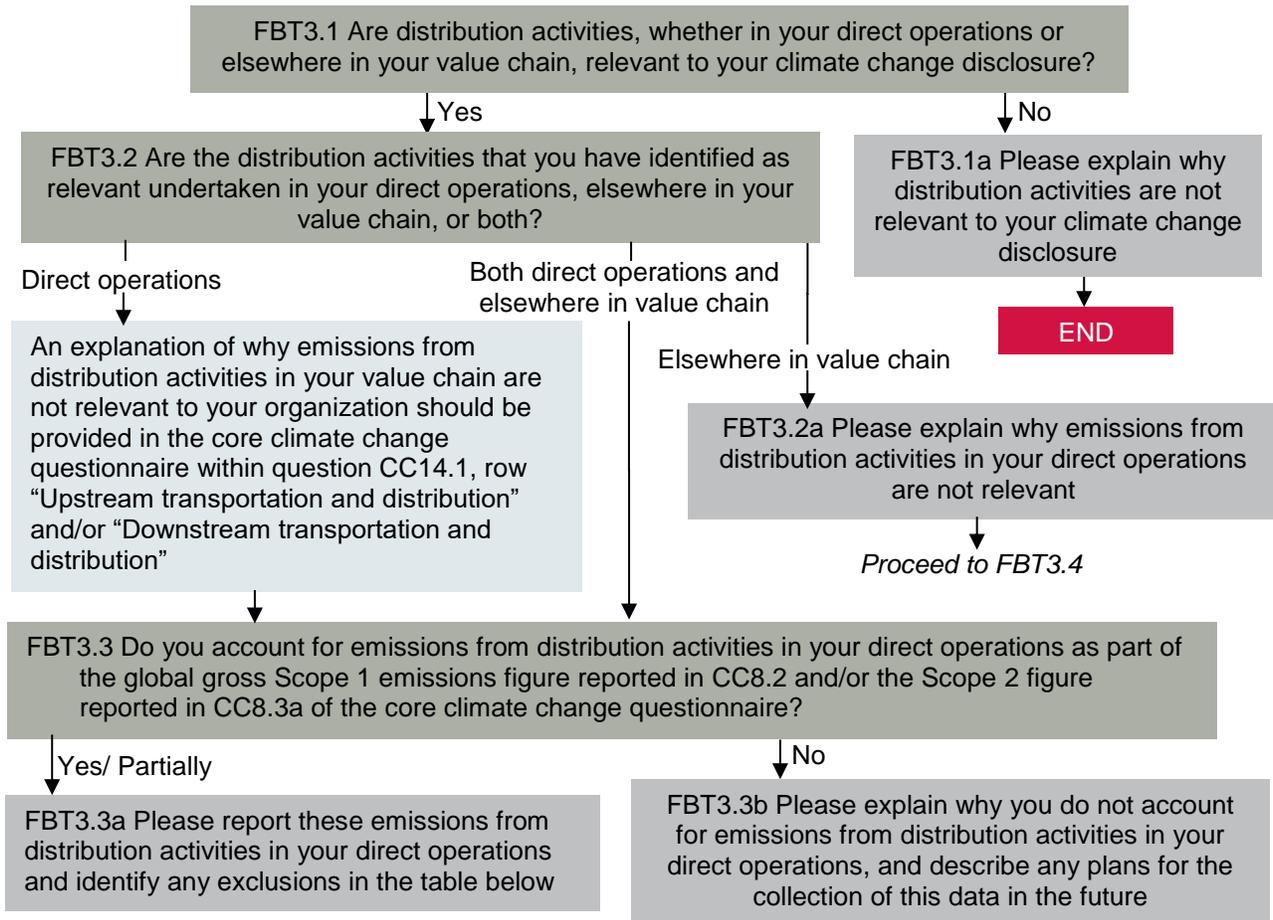
You will not be presented with any further questions on processing and can progress to the following page of the ORS using the “Next” button to the bottom right.

# FBT3: Distribution

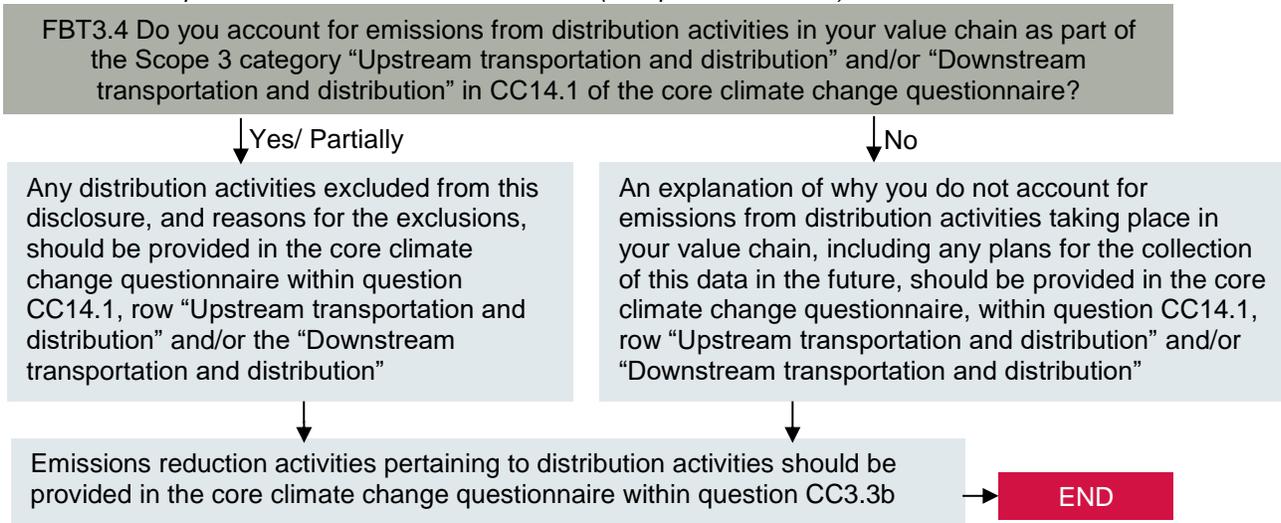
The following questions are shown on the Distribution page.

## Question Pathway

The following questions are shown on the Distribution page.



*If emissions are produced elsewhere in the value chain (as reported in FBT3.2):*



## General Guidance

Distribution encompasses the entire network required to move products through the value chain from the farm to the retail location. The total travel distance and the mode of transport will impact the amount of emissions produced: air transport has by far the highest GHG emissions, followed by road, then ocean freight and rail<sup>5</sup>.

Different stages of distribution which should be included in FBT companies' GHG inventories could include the following:

- Transportation of raw agricultural products to processing facilities;
- Transportation of material inputs to processing facilities, for example, packaging materials, chemicals and any other ingredients;
- Product distribution from processing facilities to the retailer/customer;
- Transportation of waste to disposal sites or to points of re-use.

In each of the cases listed above, empty return journeys should also be included. In addition, emissions from the storage of goods during distribution should be accounted for as this can often require specific controls for humidity, temperature, atmospheric conditions and hygiene requirements. Emissions from any waste generated during transportation should also be accounted for in this section.

In order to reduce emissions, the following practices could be adopted by FBT companies:

- Minimizing the total distance by prioritizing local sales, sourcing and consumption;
- Planning and implementing more efficient distribution systems;
- Choosing more energy efficient modes of transportation;
- Fuel switching within the same mode of transportation.

FBT companies can often have very complex distribution systems. Mapping these systems and measuring emissions from them will not only facilitate transparency to stakeholders, but will also provide an opportunity to identify areas of climate change impacts, risks and opportunities pertaining to distribution systems. The questions in this section require FBT companies to disclose additional information about emissions from distribution.

### BOX 5: How to report on waste from distribution

If waste is produced as part of your own distribution activities and is managed within your organizational boundary, it should be reported as Scope 1 emissions. If waste is produced during distribution activities within your organizational boundary but is managed by a third party, then emissions associated with this waste should be reported within the Scope 3 category "Waste generated in operations" in the core climate change questionnaire CC14.1. If waste from distribution activities is produced outside of your organizational boundary and is also managed outside of your organizational boundary, emissions associated with this waste should be reported within the Scope 3 category 1 "Upstream transportation and distribution" and/or "Downstream transportation and distribution" in the core climate change questionnaire CC14.1, where relevant.

### Pre-population

Pre-population is available for FBT3.1, FBT3.1a, FBT3.2 and FBT3.2a.

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<sup>5</sup> [IATP, 2009](#)

## Specific Question Guidance

### **FBT3.1 Are distribution activities, whether in your direct operations or elsewhere in your value chain, relevant to your climate change disclosure?**

According to the principles of [The GHG Protocol Corporate Standard](#), the activity is relevant if it yields information that contains the detail that users, both internal and external to the company, need for their decision-making.

Please respond to this question by selecting “yes” or “no” from the drop down menu provided. Answering “yes” will direct you to FBT3.2, selecting “no” drives FBT3.1a.

#### **FBT3.1a Please explain why distribution activities are not relevant to your climate change disclosure**

*This question only appears if you answer “no” to FBT3.1.*

You should respond to this question in the text box provided; your answer should be no more than 5000 characters in length. Please note that when copying from another document into the ORS, the formatting is not retained.

You will not be presented with any further questions on distribution and can progress to the following page of the ORS using the “Next” button to the bottom right.

### **FBT3.2 Are the distribution activities that you have identified as relevant undertaken in your direct operations, elsewhere in your value chain, or both?**

*This question only appears if you answer “yes” to FBT3.1.*

In this question you are asked to identify the part(s) of your value chain where relevant emissions from distribution activities have been identified. If all distribution activities take place within your company’s organizational boundary, i.e. if your organization owns all of its own transportation fleet, please select “direct operations”. If all distribution activities are outsourced, please select “elsewhere in value chain”. If your organization owns some of its own transportation fleet but outsources some of its distribution activities, please select “both direct operations and elsewhere in value chain”.

Answering “direct operations” or “both direct operations and elsewhere in value chain” will drive FBT3.3, selecting “elsewhere in value chain” will drive FBT3.2a.

#### *Direct operations pathway*

*The following questions which feature in the “direct operations” pathway will only appear if “direct operations” or “both direct operations and elsewhere in value chain” is selected in FBT3.2.*

### **FBT3.3 Do you account for emissions from distribution activities in your direct operations as part of the global gross Scope 1 emissions figure reported in CC8.2 and/or the Scope 2 figure reported in CC8.3a of the core climate change questionnaire?**

*This question only appears if you select “direct operations” or “both direct operations and elsewhere in value chain” in FBT 3.2*

This question aims to identify whether an emissions figure has been calculated for distribution activities that take place within your company’s organizational boundary, and is being reported as part of Scope 1 and/or Scope 2 emissions in the core climate change questionnaire. Please note that reporting emissions from distribution as part of Scope 1 and/or 2 emissions would entail that your organization owns the transportation fleet used in the distribution of goods. If your organization has calculated emissions from its own distribution



activities and these are included in the global gross Scope 1 and/or Scope 2 emissions figures reported in the core climate change questionnaire in full, please select “yes”. If only some of these emissions have been accounted for please select “partially. Otherwise, please select “no”.

Please note that Scope 1 emissions encompass all direct GHG emissions from sources owned or controlled by your organization, and Scope 2 emissions encompass GHG emissions from the generation of purchased electricity consumed by your organization, as per [The GHG Protocol Corporate Standard](#). In distribution, Scope 1 emissions can include emissions from the combustion of fuels used in transport fleet. Emissions from purchased and consumed electricity, heat, steam or cooling should be accounted for as Scope 2 emissions.

Please respond to this question by selecting “yes”, “partially” or “no” from the drop down menu provided. Answering “yes” or “partially” will direct you to FBT3.3a, selecting “no” drives FBT3.3b.

**FBT3.3a Please report these emissions from distribution activities in your direct operations and identify any exclusions in the table below**

*This question only appears if you answer “yes” or “partially” to FBT3.3.*

The aim of this question is to clarify the coverage of your disclosure with regards to the emissions reported from distribution activities in your direct operations. You may provide information to supplement your response in the comments column, for example, any plans for data collection in the future.

Please note that when responding to the FBT module, companies are only required to provide one Scope 2 figure. Please use the ‘Comment’ field in all FBT questions where Scope 2 emissions are required to disclose whether you have used a location-based or market-based figure.

Please respond to this question by completing the table provided in the ORS and reproduced below.

Scope	Emissions from distribution activities (metric tonnes CO <sub>2</sub> e)	Exclusions	Explanation	Comment
Scope 1				
Scope 2				

**Emissions from distribution activities (metric tonnes CO<sub>2</sub>e):**

Answers should be no more than 99999999999 (without commas) and using no more than 2 decimal places. Negative numbers are not allowed as reporting needs to be gross, not net figures. Emissions figures should be for the reporting year only.

If you do not have a Scope 1/Scope 2 emissions figure, you should leave this question blank. Putting in zero would suggest that you do not have Scope 1 emissions from distribution activities.

*FBT companies can complete this column instead of CC9.2d/10.2c of the core climate change questionnaire.*

**Exclusions:** Please use this text field to identify any emissions sources which are not included in the Scope 1/ Scope 2 emissions figure reported in column 2. Use no more than 2,400 characters.

**Explanation:** Please use this column to describe why the source is excluded and its significance. Use no more than 2,400 characters

**Comment:** If reporting Scope 2 emissions, please use this field to state whether you have used a location-based or market-based figure. Use no more than 2,400 characters.

**Sample Response – for guidance only**

<b>Scope</b>	<b>Emissions from distribution activities (metric tonnes CO<sub>2</sub>e)</b>	<b>Exclusions</b>	<b>Explanation</b>	<b>Comments</b>
Scope 1	120,000	Transportation of raw inputs to processing plants	We only include the emissions associated with transporting finished goods in our emissions inventory.	We plan to start calculating the totality of distribution emissions, including raw materials to our processing units, within the next 3 years.

If you selected “direct operations” in response to FBT3.3, you will not be presented with any further questions on distribution and can progress to the following page using the “Next” button to the bottom right.

**FBT3.3b Please explain why you do not account for emissions from distribution activities in your direct operations, and describe any plans for the collection of this data in the future**

*This question only appears if you answer no” to FBT3.3.*

This question aims to identify barriers and difficulties associated with calculating emissions data from distribution activities. Where appropriate, please explain any plans you have for the collection of this data in the future, including the time-scale for the implementation of these plans.

You should respond to this question in the text box provided; your answer should be no more than 5000 characters in length. Please note that when copying from another document into the ORS, the formatting is not retained.

If you selected “direct operations” in response to FBT3.2, you will not be presented with any further questions on distribution and can progress to the following page using the “Next” button to the bottom right of the ORS.

**Value chain pathway**

*The following questions which feature in the “value chain” pathway will only appear if “elsewhere in value chain” or “both direct operations and elsewhere in value chain” is selected in FBT3.2.*

**FBT3.2a Please explain why emissions from distribution activities in your direct operations are not relevant**

*This question only appears if you select “elsewhere in value chain” in FBT3.2.*

You should respond to this question in the text box provided; your answer should be no more than 5000 characters in length. Please note that when copying from another document into the ORS, the formatting is not retained.

**FBT3.4 Do you account for emissions from distribution activities in your value chain as part of the Scope 3 category “Upstream transportation and distribution” and/or “Downstream transportation and distribution” in CC14.1 of the core climate change questionnaire?**

*This question only appears if you select “elsewhere in value chain” or “both direct operations and elsewhere in value chain” in FBT3.2.*

Scope 3 emissions are a consequence of the activities undertaken by your organization but originate from sources not owned or controlled by your organization, as per [The GHG Protocol Corporate Standard](#). As such, if the transportation fleet used in the distribution of your organization's goods is not included within your organizational boundary, emissions from distribution activities should be included as part of your organization's Scope 3 inventory. Scope 3 emissions from distribution will include emissions from the combustion of the fuel required to run the transportation fleet. Emissions associated with the disposal of any waste produced should also be accounted for as part of Scope 3 emissions. The GHG Protocol's [Corporate Value Chain \(Scope 3\) Accounting and Reporting Standard](#) identifies 15 different categories of Scope 3 sources. Depending on whether they are upstream or downstream activities, emissions from distribution activities undertaken by your suppliers should be reported as part of "Upstream transportation and distribution" and/or "Downstream transportation and distribution" (category #4 and #9 respectively in the Scope 3 standard).

If companies are not able to account for distribution emissions as part of their Scope 3 inventories, they are encouraged to explain the barriers and difficulties faced in calculating these emissions in question CC14.1 of the core climate change questionnaire.

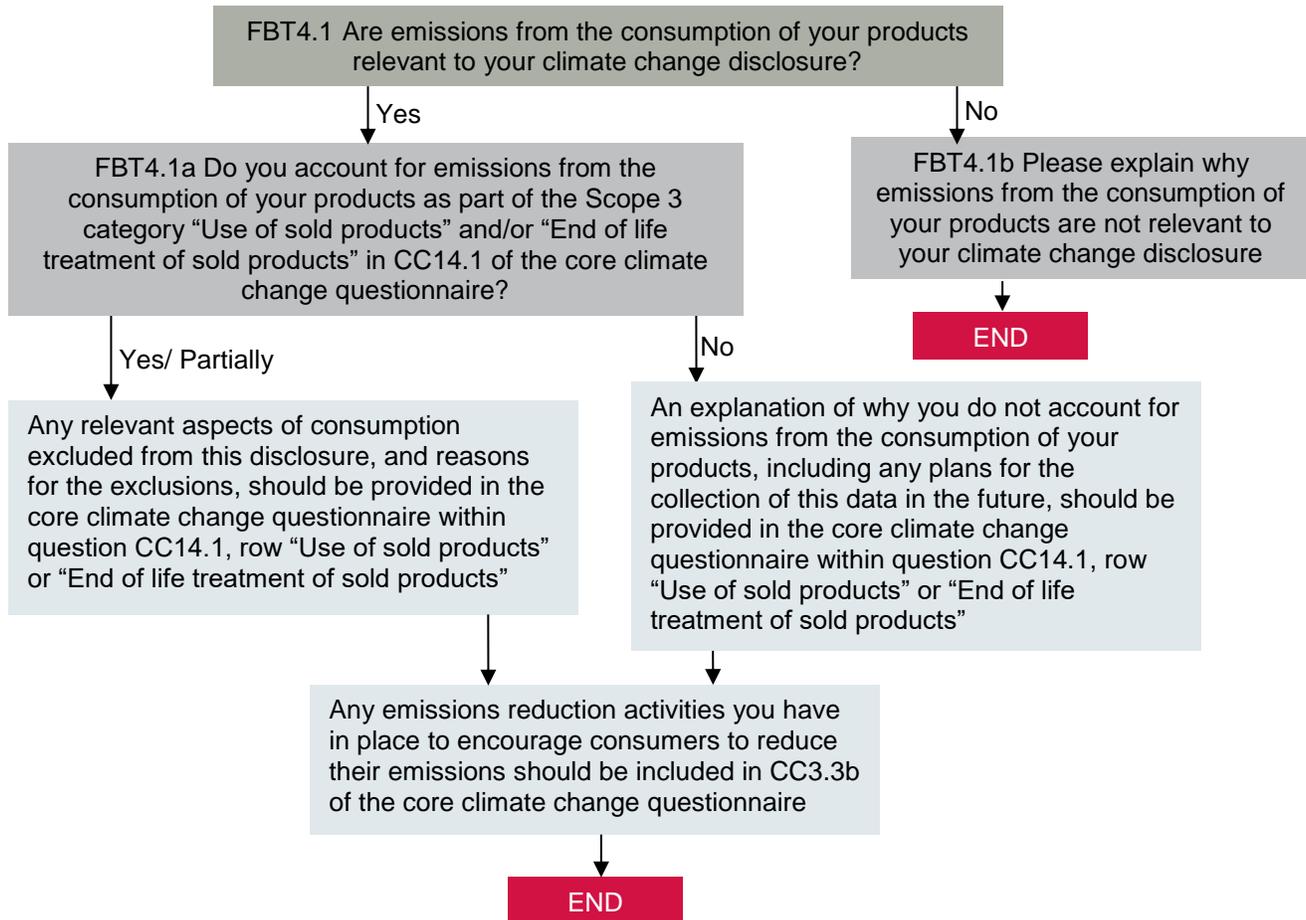
Please respond to this question by selecting "yes", "partially" or "no" from the drop down menu provided.

You will not be presented with any further questions on distribution and can progress to the following page of the ORS using the "Next" button to the bottom right.

# FBT4: Consumption

## Question Pathway

The following questions are shown on the Consumption page.



## General Guidance

The consumption stage of this questionnaire includes the use of goods in addition to waste disposal and end of life treatment of products sold by the reporting organization.

Emissions from the use of products includes emissions from the cooling, freezing and heating of products. Emissions from waste disposal and end of life treatment could include all emissions associated with land filling, incineration, composting, recycling and wastewater treatment.

The calculation of emissions associated with these activities may require reporting companies to make assumptions around the following:

- How consumers use products;
- Product lifetimes; and
- End of life treatment methods chosen by consumers.

## Pre-population

Pre-population is available for FBT4.1 and FBT4.1b.

## Specific Question Guidance

### **FBT4.1 Are emissions from the consumption of your products relevant to your climate change disclosure?**

According to the principles of [The GHG Protocol Corporate Standard](#), the activity is relevant if it yields information that contains the detail that users, both internal and external to the company, need for their decision-making.

Please respond to this question by selecting “yes” or “no” from the drop down menu provided. Answering “yes” will direct you to FBT4.1a, selecting “no” drives FBT4.1b.

### **FBT4.1a Do you account for emissions from the consumption of your products as part of the Scope 3 category “Use of sold products” and/or “End of life treatment of sold products” in CC14.1 of the core climate change questionnaire?**

*This question only appears if you answer “yes” to FBT4.1.*

Scope 3 emissions are a consequence of the activities undertaken by your organization but originate from sources not owned or controlled by your organization, as per [The GHG Protocol Corporate Standard](#). As such, emissions from the use and disposal of your products by consumers should be included as part of your organization’s Scope 3 inventory. Scope 3 emissions from the consumption of your products could include emissions from the cooling/ freezing and heating of products as well as emissions from waste disposal. The GHG Protocol’s [Corporate Value Chain \(Scope 3\) Accounting and Reporting Standard](#) identifies 15 different categories of Scope 3 sources; emissions from consumption should be reported as part of “Use of sold products” and/or “End of life treatment of sold products” (category #11 and #12 respectively in the Scope 3 standard).

If companies are not able to account for emissions from the consumption of their products as part of their Scope 3 inventories, they are encouraged to explain the barriers and difficulties faced in calculating these emissions in question CC14.1 of the core climate change questionnaire.

Please respond to this question by selecting “yes”, “partially” or “no” from the drop down menu provided.

You have reached the end of the FBT module.

### **FBT4.1b Please explain why emission from the consumption of your products are not relevant to your climate change disclosure**

*This question only appears if you answer “no” to FBT4.1.*

You should respond to this question in the text box provided; your answer should be no more than 5000 characters in length. Please use the buttons at the top of the text box to format your response as necessary. Please note that when copying from another document into the ORS, the formatting is not retained.

You have reached the end of the FBT module.

# Appendix A

## Agricultural management practices

**Agroforestry:** Agroforestry is a land management approach that combines the production of trees with other crops and/or livestock. Trees have high adaptive capacity because they are deep rooted and have large reserves of water and nutrients, and are less susceptible than annual crops to inter-annual variability or short-lived extreme events like droughts or floods. Additionally, trees improve soil quality and fertility by contributing to water retention and by reducing water stress during low rainfall years, and also have higher evapotranspiration rates than row crops or pastures and can thus pump excess water out of the soil. Trees can also reduce the impacts of weather extremes such as droughts or torrential rain and can stabilize the soil against landslides and raise infiltration rates

**Biodiversity considerations:** Enhancing agricultural biodiversity has significant potential to mitigate the impacts of greenhouse gases by increasing soil biodiversity to build soil organic matter, capturing carbon; using diverse leguminous crops to fix nitrogen in the soil, reducing the need for chemical fertilizers; introducing perennial crops to store carbon below ground; and planting temporary vegetative cover between successive crops to reduce nitrous oxide emissions by extracting unused nitrogen.

**Change in the topography or landscapes:** The use of hedges, vegetative buffer strips and other farm landscaping practices can have an enormous impact on adaptation to drought, heavy rains and winds. A change in topography can occur, for example, through the use of terraces which facilitate adaptation to climate change by optimizing water use.

**Composting:** The application of compost increases the amount of carbon sequestered in soils. The addition of Nitrogen reduces agricultural energy demand as a result of the increased infiltration and storage capacity of soils, thus reducing irrigation needs. The application of compost reduces the need for greenhouse gas (GHG) producing fertilizer, pesticides and herbicides.

**Crop diversity:** The use of germplasm (genes) of crops, forages and wild relatives that have evolved in other parts of the world, which are under similar climatic conditions to those in areas currently under stress from climate change.

**Contour farming:** Reduces erosion and carbon mineralization

**Crop rotation:** Better nutrient management through crop rotation can decrease nitrogen fertilizer use, substantially lowering related GHG emissions.

**Diversifying farmer income:** Many producers are including more livestock in their operations to make use of increased forage production and to add value on the farm. Livelihoods diversification into off-farm activities has the potential to reduce vulnerability to climate change impacts by reducing livelihood dependence upon farming activities. Increasing farmer resilience could ensure that the supply of agricultural inputs required by FBT companies can be maintained over time.

**Equipment maintenance and calibration:** Ensures reliability and accuracy of data.

**Governmental or institutional policies and programs:** Government programs and policies, such as tax credits, research support, trade controls and crop insurance regulations, significantly influence agricultural practices. Programs and policies may act to either promote or hinder adaptation to climate change.

**Integrated pest management:** Integrated Pest Management (IPM) is an effective and environmentally sensitive approach to pest management that relies on a combination of common-sense practices. IPM programs use current, comprehensive information on the life cycles of pests and their interaction with the environment. This information, in combination with available pest control methods, is used to manage pest damage. Consequently, carbon emissions from pesticide use can be reduced.

**Knowledge sharing:** Monitoring climate change, forecasting impacts and using early warning systems to disseminate data to a range of stakeholders from the national to the local level are all vital components to

successful long-term adaptation planning and implementation. Sharing of best practice in agriculture is an important component of this practice.

**Land use change:** One of the most effective methods of reducing emissions is to allow or encourage the reversion of cropland to another land cover, typically one similar to the native vegetation. The conversion can occur over the entire land area ('set-asides') or in localized spots such as grassed waterways or field margin. Such land cover change often increases storage of carbon; for example, converting arable cropland to grassland typically results in the gain of soil carbon owing to lower soil disturbance and reduced carbon removal in harvested products. Compared to cultivated lands, grasslands may also have reduced nitrous oxide emissions from lower nitrogen inputs and higher rates of methane oxidation.

Additionally, reforestation and afforestation initiatives can increase the amount of biomass in a given area of land, thereby sequestering carbon in plant material.

**Livestock management:** Livestock, predominantly ruminants such as cattle and sheep, are significant sources of methane emissions, accounting for approximately 18% of global anthropogenic emissions of this gas (Smith et.al.2008). The methane is produced primarily by enteric fermentation and voided by belching. Practices for reducing methane emissions from this source fall into three general categories: improved feeding practices, use of specific agents or dietary additives, and longer term management changes and animal breeding. There are also anti-methogen vaccines available.

Adaptations in field-based livestock include additional care to continuously match stock rates with pasture production, altered rotation of pastures, modification of times of grazing, and timing of reproduction, alteration of forage and animal species/breeds, altered integration within mixed livestock/crop systems including using adapted forage crops, reassessing fertilizer applications, care to ensure adequate water supplies, and use of supplementary feeds and concentrates. Other adaptation methods include adjusting shading and air conditioning, and the use of sprinklers to cool livestock during excessive summer heat.

**Low carbon energy use:** For example, the installation of on-site renewable energy systems for electricity.

**Low tillage and residue management:** Since soil disturbance tends to stimulate soil carbon losses through enhanced decomposition and erosion, reduced or no-till agriculture often results in soil carbon gain. Systems that retain crop residues also tend to increase soil carbon because these residues are the precursors for soil organic matter, the main store of carbon in the soil.

Low tillage or increases soil organic matter. Soil organic matter improves and stabilizes the soil structure so that the soils can absorb higher amounts of water. Soil organic matter also improves the water absorption capacity of the soil for during extended drought. Additionally, a no- or low-tilled soil conserves the structure of soil for fauna and related macrospores (earthworms, termites and root channels) to serve as drainage channels for excess water.

**Manure management:** Animal manures can release significant amounts of nitrous oxide and methane during storage, but the magnitude of these emissions varies. Methane emissions from manure stored in lagoons or tanks can be reduced by cooling or covering the sources, or by capturing the methane emitted. The manures can also be digested anaerobically to maximize retrieval of methane as an energy source. Storing and handling the manures in solid rather than liquid form can suppress methane emissions

**Nutrient management:** Good nutrient management practices help to reduce GHG emissions. Fertilizer type, application rate, timing and placement have been shown to influence the amount of nitrous oxide released to the atmosphere from some soils in some years. Improved fertilizer efficiency will also reduce the amount of excess nitrogen fertilizer that can be lost to the atmosphere or to surface or groundwater.

A good supply of phosphorous, nitrogen and potassium has been shown to exert a considerable influence on the susceptibility or resistance of plants towards many types of pests and diseases. Also, a crop receiving balanced nutrition is able to explore a larger volume of soil in order to access water and nutrients. In addition, under increasingly saline conditions, plants can be supplemented with potassium to maintain normal growth

**Organic farming:** Agriculture can make a significant contribution to mitigating climate change by taking carbon out of the air and sequestering it in the soil. The soil carbon benefit of organic farming results from

the fact that the system is based on inputs of organic matter to the soil and the decomposition of this by soil microbial activity for releasing nutrients for crop production, instead of using inorganic fertilizers. This process at the same time produces humus (stable soil carbon) and thereby raises the soil's carbon levels. As well, there is evidence that organic farming can have advantages in drought-conditions, such as higher yields compared to non-organic systems, because of the higher water-holding capacity of soils under organic management.

**Permanent soil cover (including cover crops):** The maintenance of permanent soil cover through crops, crop residues or cover crops increases soil organic matter. Surface mulch cover also acts to protect soil from excess temperatures and evaporation losses and can reduce crop water requirements by 30% (FAO, 2007).

**Pest, disease and weed management practices:** The introduction of new cultivated species and improved varieties of crop is a technology aimed at enhancing plant productivity, quality, health and nutritional value and/or building crop resilience to diseases, pest organisms and environmental stresses. Crop diversification refers to the addition of new crops or cropping systems to agricultural production on a particular farm.

**Reducing energy use:** Energy-related greenhouse gas emissions from the agricultural sector can be reduced in a number of ways, including the use of more fuel-efficient machinery.

**Restoration of degraded lands and cultivated organic soils:** Agricultural soil is a dynamic biological system that both stores and releases greenhouse gases. Whether or not the soil acts as a net source of CO<sub>2</sub> or a net sink for CO<sub>2</sub> can be influenced by soil management. By increasing soil organic matter levels growers can decrease CO<sub>2</sub> emissions and increase the soil carbon sink.

**Rice management:** Cultivated wetland rice soils emit significant quantities of methane. Emissions during the growing season can be reduced by many practices. For example, draining the wetland rice once or several times during the growing season effectively reduces methane emissions.

**Seed variety selection:** Varietal selection of seeds to minimize GHGs.

**Species introduction:** Introducing grass species with higher productivity or carbon allocation to deeper roots has been shown to increase soil carbon. For example, introducing legumes into grazing lands can promote soil carbon storage.

**Timing of farm operations:** A diversity of crop types and varieties are grown in rotation can help spread the risk of losing an entire year's production. Some producers also stagger their seeding and therefore harvesting dates by choosing a variety of crops that require a range of growing conditions so that crops are at different stages (and therefore more or less vulnerable) if and when climate/weather conditions start having a negative impact. A longer and warmer growing season may allow earlier planting and harvesting dates, so that the extremely arid conditions of late summer are avoided.

**Waste management:** The disposal and treatment of waste can produce emissions of several greenhouse gases (GHGs), which contribute to global climate change. Sustainable waste management encourages the generation of less waste, the re-use of consumables, and the recycling and recovery of waste that is produced.

**Water Management:** Irrigation measures can enhance carbon storage in soils through enhanced yields and residue returns. The drainage of agricultural lands in humid regions can also promote productivity (and hence soil carbon) and suppress nitrous oxide emissions by improving aeration.

A broad range of agricultural water management practices and technologies are available to spread and buffer production risks. Enhancing residual soil moisture through land conservation techniques assists significantly at the margin of dry periods while buffer strips, mulching and zero tillage help to mitigate soil erosion risk in areas where rainfall intensities increase. The inter-annual storage of excess rainfall and the use of resource efficient irrigation remain the only guaranteed means of maintaining cropping intensities.

The use of artificial systems to improve water use/availability and protect against soil erosion, is also considered to be an adaptation mechanism.

**Sources of information for Appendix A:**

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