An Introductory Guide for Net Zero Target Setting for Farm-Based Agricultural Emissions

Overview of best practices to operationalize banks' Net Zero commitments in the food system

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Please see the limitations described on page 5, which will continue to evolve and develop further over time.

Acknowledgements

This guidance was developed as part of the Banking for Impact on Climate in Agriculture (B4ICA) Initiative, that was launched in November 2021 by the World Business Council for Sustainable Development (WBCSD), the United Nations Environment Programme Finance Initiative (UNEP FI), the Partnership for Carbon Accounting Financials (PCAF), and the Environmental Defense Fund (EDF) in partnership with several banks. Participating banks and financial institutions hold combined total assets of USD $10 trillion and represent key lenders in the agriculture sector. This initiative brings together a coalition of banks, partners, and experts to develop methodologies, tools, and best practices to help financial institutions assess and disclose the emissions impact of their agriculture portfolios. B4ICA seeks to drive communication across pioneering banks and find practicable solutions in a sector that poses unique challenges to enable alignment of their portfolios to meet the Paris Agreement climate goals.

WBCSD, UNEP FI, PCAF, and EDF collaboratively developed this report in consultation with B4ICA member banks and with support from the Boston Consulting Group.

Foreword

Quotes from B4ICA Partners

"As the world works toward limiting global warming to below 1.5 degrees Celsius, financial institutions can play a role to support their clients and help accelerate the climate transition. In particular, the food system contributes approximately one-quarter of greenhouse gas (GHG) emissions and three-quarters of biodiversity loss, but also has massive opportunity for climate and nature-positive investment. WBCSD has worked with leading banks and expert partners through the Banking for Impact on Climate in Agriculture Initiative (B4ICA) to develop a guidance that aims to help operationalize banks' Net Zero commitments and deliver food system transformation. We are extremely excited to release this introductory guidance as a starting point, and to continue working with the B4ICA members to take action to address the emissions impact of their agriculture portfolios, and sustainably transition towards Net Zero."

Peter Bakker
President & CEO,
World Business Council for Sustainable Development (WBCSD)

"The agriculture sector is one of the largest contributors to global GHG emissions and poses unique challenges for banks driven by data complexity and methodology gaps. To address this, UNEP FI has been working closely with WBCSD and other partners on the B4ICA initiative to develop inaugural guidance on Net Zero target setting in the agriculture sector for banks. This report will serve as a robust starting point and foundation for UNEP FI members, including those in the Net Zero Banking Alliance, to begin addressing the emissions impact of their agriculture portfolios. As we look to build on top of this guidance, UNEP FI is excited to continue collaborating with partners and banks through the B4ICA initiative on supplemental target setting guidance, tools, and methodologies to support banks in aligning and working towards ambitious climate transition pathways in agriculture and land-use"

Remco Fischer
Climate Change Lead
United Nations Environment Programme Finance Initiative (UNEP FI)

"Reducing emissions from agriculture is essential to climate stability, food security and climate risk management for financial institutions. Agricultural finance providers have a pivotal role in supporting farmers who are transitioning to climate-smart agriculture. It is imperative that banks have access to resources and tools to better engage their farmer clients and support change at scale. This guidance fills a critical gap in knowledge for banks that are setting net zero emissions targets, providing a valuable starting point for implementing banks' climate commitments in the agriculture sector."

Britt Groosman
Vice President Climate Smart Agriculture
Environmental Defense Fund (EDF)

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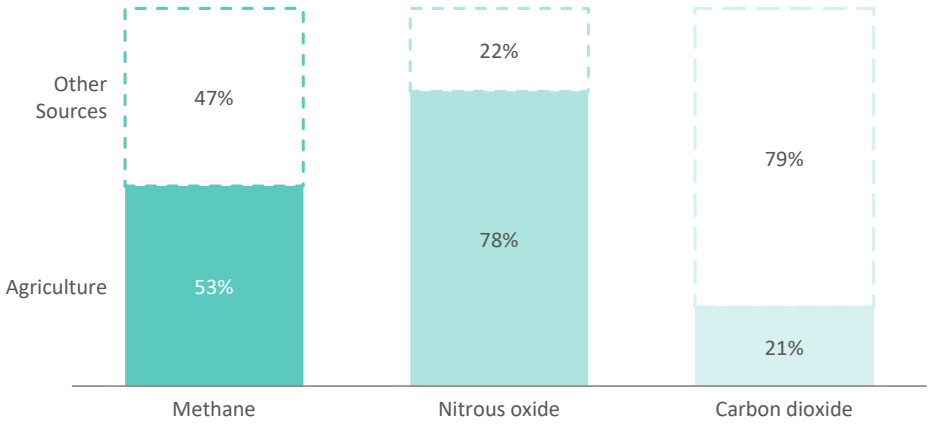
Context

As the world mobilizes to limit global warming to well below 2, preferably 1.5 degrees Celsius as agreed at the UN Conference of the Parties in Paris (COP21, 2015) and reaffirmed in Glasgow (COP26, 2021), it is critically urgent to reduce GHG emissions from the agriculture sector and its related land use.

The global agriculture system accounts for roughly one-fifth of anthropogenic GHG emissions and plays an outsized role in climate change, representing roughly 17 billion metric tons of carbon dioxide equivalent in 2019. For methane and nitrous oxide, both potent GHGs, the share of global emissions from agriculture is even higher (see Figure 1).

Figure 1: *Share of specific GHG emissions from agriculture and other sources*



Source: FAO (2021) The share of food systems in total greenhouse gas emissions. Global, regional and country trends, 1990–2019. FAOSTAT Analytical Brief Series No. 31. Rome.; Based on FAO-reported 54 billion metric tons CO2e global emissions in 2019, with appx 7 billion tons from farm-gate emissions, 4 billion tons from land use change, and 6 billion tons from pre-and post-production

Agriculture comprises a complex and extensive value chain, with varying sources, types, and quantities of GHG emissions. The climate impact of the sector is only expected to increase in the future, with global demand for agricultural products such as food, fuel, and feed projected to grow by 1.2% annually for the next decade, indicating a 41% increase from 2021 if this growth is maintained until 2050.[1] Without focused effort across the globe and throughout the system, agricultural emissions threaten our ability to limit warming.

Banks can play an important role, alongside stakeholders throughout the value chain, in supporting their clients to reduce GHG emissions from the agriculture sector. There is already momentum in the financial sector to act now, as demonstrated by the extent to which financial institutions are committing to measuring, disclosing, and supporting their clients' emission reduction efforts (e.g., via the Net-Zero Banking Alliance (NZBA), the Principles for Responsible Banking (PRB) and its Collective Commitment to Climate Action (CCCA), the Partnership for Carbon Accounting in Financials (PCAF),

[1] OECD-FAO (2021). Agricultural Outlook presents production, consumption, trade and price trends for the coming decade - Global agri-food systems need to transform to reach SDGs by 2030.

etc.). Banks around the world are doing their part to help clients in their agriculture portfolios reduce GHG emissions in alignment with global climate targets toward net zero.

However, banks are faced with significant challenges for target setting in the agriculture sector because there are currently no widely accepted methodologies or approaches for the sector. In comparison to other sectors, there are also larger data gaps and more complexities around the estimation of GHG emissions and transition pathways, which makes the measurement and disclosure of emissions attributable to banks' agriculture portfolios particularly difficult. Moreover, the existing landscape of accounting and emissions measurement standards and tools, such as the GHG Protocol and Cool Farm Tool, among others, remains fragmented and is not standardized.

While there are many helpful resources to guide target setting, banks' unique role in agriculture as well as the challenges posed by the sector drive the need for further support in this area.

Executive Summary

Agriculture accounts for roughly one fifth of anthropogenic GHG emissions and plays an outsized role in climate change.[2] Reducing emissions from this sector will play an important role in limiting warming to well below 2, preferably to 1.5 degrees Celsius, as agreed at COP21 in Paris in 2015 and reaffirmed at COP26 in Glasgow in 2021 (referred to as the Paris Agreement hereafter), especially as a growing global population puts greater demands on the agriculture sector.[3]

Given their unique position in the economy, banks will play an important role in the agriculture sector's climate transition. Many banks have already signed onto the Net-Zero Banking Alliance (NZBA) and have committed to setting emissions targets for high-emitting sectors, including agriculture. Banks can refer to existing guidance including from GHG Protocol, Glasgow Financial Alliance for Net Zero (GFANZ), PCAF, Science Based Targets initiative (SBTi), Sustainable Markets Initiative, and UNEP FI and NZBA, but the WBCSD-convened Banking for Impact on Climate in Agriculture (B4ICA) secretariat recognizes the need for additional guidance for banks focused on setting emissions targets for the agriculture sector. Through this report, B4ICA aims to provide banks with voluntary recommendations and guidance to navigate the target setting process for their agriculture portfolios across four domains: scope, scenarios and pathways, data and measurement, and climate transition approaches.

Agriculture is a broad sector with a value chain that spans manufacturing inputs such as tractors and fertilizer to distributing and selling food and other agricultural products. Farms are integral to that value chain and have influence on or directly contribute to agricultural emissions. Therefore, banks are encouraged to **focus the scope of their agriculture portfolio targets on the farm**. Though this report approaches target setting from the perspective of farms, banks might also consider setting targets and engaging with other players in the agriculture value chain.

Farm-level targets are recommended to include emissions directly resulting from farm activities (i.e., Scope 1 and 2 emissions) and the upstream inputs that enable them (i.e., upstream Scope 3 emissions). Given the core role of farms in the agriculture value chain, banks might have a greater ability to influence and support their clients in addressing these emissions. Downstream Scope 3 emissions might also be included when feasible, though they are currently difficult to track, measure, and influence at the farm-level. Banks are also recommended to be mindful to account for methane and nitrous oxide emissions in their agriculture targets since farms represent a major source of both greenhouse gases.

Often, the agriculture sector is grouped together with forestry. This report focuses on farm activities, including land use change within the farm boundaries; hence **banks are encouraged to keep forestry targets separate from agriculture**. Doing so is important due to the different types of clients and

[2] FAO (2021) The share of food systems in total greenhouse gas emissions. Global, regional and country trends, 1990–2019. FAOSTAT Analytical Brief Series No. 31. Rome.; Based on FAO-reported 54 billion metric tons CO2e global emissions in 2019, with appx 7 billion tons from farm-gate emissions, 4 billion tons from land use change, and 6 billion tons from pre-and post-production.

[3] OECD-FAO (2021). Agricultural Outlook presents production, consumption, trade and price trends for the coming decade - Global agri-food systems need to transform to reach SDGs by 2030.

transition pathways that exist between agriculture and forestry. Keeping those targets separate will better equip banks to support their clients in both sectors through the climate transition.

Banks will need to select scenarios and pathways upon which to set their targets. NZBA sets specific expectations for scenarios, including that they are science-based and aligned with transition pathways that aim to limit warming to 1.5 degrees Celsius with low to no overshoot .[4] Banks will also need to consider a scenario's relevance for agriculture. For example, the IEA scenario is commonly used for the energy sector but does not incorporate agriculture and so is not applicable for setting agriculture targets. In addition, banks are recommended to consider the granularity underpinning the scenarios and, as a result, the ability to disaggregate targets. Based on its portfolio composition, a bank might consider setting targets that are disaggregated by geography, by sub-sector (i.e., by type of agricultural output) or both. Specifically, banks might evaluate decarbonization pathways for individual commodities and sub-sectors, consistent with 1.5 degree scenarios, as an input to inform the target setting and execution process. **It is important that banks select scenarios that include pathways suitable for the types of targets they wish to set.**

Targets are recommended to be structured as absolute or intensity targets. NZBA and the GHG Protocol both leave this decision up to the banks, but there are tradeoffs to consider. Absolute targets set an emissions budget the bank aspires to comply with; these can be more clearly linked to an aggregate portfolio-level goal and a pathway to a net zero future, but risk creating perverse incentives to shift away from important agricultural activities. Intensity targets instead consider emissions per unit of production, which might provide a more straightforward way to understand changes over time with a specific farm client and throughout the sector. However, intensity targets can be more complicated to aggregate and might require more farm-level data to develop.

Banks are also recommended to choose between gross and net targets. Gross targets only account for emissions while net targets capture the impact of both emissions and removals (i.e., negative emissions). If choosing to set net targets, banks are recommended to disclose the impact of removals on their targets and pathways. Removals will without a doubt play a role in reaching net zero, but will not be directly addressed in this report, as there is still work to be done to establish guidelines and standards on how they should be accounted for.

Measuring agricultural emissions presents a unique set of challenges, including assessing farm-level emissions and the activities that influence them. Today, most banks use aggregate data and emission factors or proxies to determine emissions across their portfolios. To improve baseline measurements over time and to provide banks with the data needed to operationalize their targets, it will be essential to **increase the quality of emission factors used and level of visibility into farm-level outputs, yields, production methods, and GHG-minimizing practices**. To minimize the burdens of data collection and reporting placed on farmers, banks are encouraged to identify and leverage other sources for farm-level data.

Farmer engagement will be essential to progress toward the bank's emission-based agriculture portfolio targets. Banks themselves cannot reduce emissions, but they can play an important role in

[4] As noted in the UNEP FI Guidelines for Climate Target Setting for Banks Supporting Notes published in August 2022, which do not constitute an amendment to the original UNEP FI Guidelines for Climate Target Setting for Banks that remains the overarching reference for NZBA banks to abide by on a comply or explain basis

leading actors across the sector to adopt sustainable strategies, shaping the value proposition for farmers, and helping to finance the net zero transition in agriculture. As such, banks might also consider specific sub-sector decarbonization pathways to inform target setting and client engagement with other players across the broader agriculture value chain to support the transition of their overall portfolios.

Introduction

UNEP FI's Net-Zero Banking Alliance (NZBA) is an industry-led, UN-convened group of banks whose signatories have committed to aligning their lending and investment portfolios with net zero emissions by 2050. The agriculture sector is a major contributor to global GHG emissions, accounting for roughly one fifth of anthropogenic emissions, representing approximately 17 billion metric tons of carbon dioxide equivalent in 2019. Emissions targets in the agriculture sector will play a pivotal role in limiting global warming to well below 2 and striving for 1.5 degrees Celsius in alignment with the Paris Agreement and NZBA's ambition.

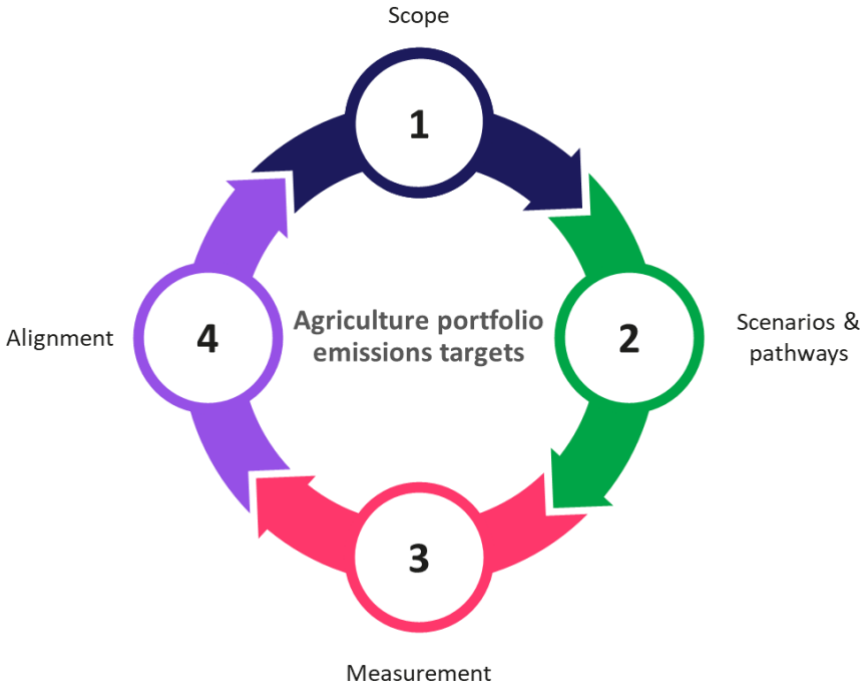
Many lessons can be taken from work done in other sectors, but target setting for agriculture presents unique challenges and requires banks to take a different approach. High levels of heterogeneity across agricultural practices, products, and conditions; a limited set of suitable scenarios and pathways; pronounced difficulties accessing high-quality emissions data; and the complexities of predicting future demand for agricultural products each present challenges that banks and their clients.

While reducing GHG emissions from agriculture is critical, it is also imperative to recognize the key role the sector plays in the world's food security. The agriculture sector will need to continue increasing production to meet current and future demand for agricultural products globally, including food, fuel, and feed. The efforts to reduce GHG emissions from agriculture must be sensitive to ensuring equitable outcomes for a growing global population. Banks can support their clients, and influence other actors in the agriculture sector to take a thoughtful pathway to net zero.

In this report, the WBCSD-convened B4ICA secretariat (referred to as B4ICA hereafter) aims to supplement existing guidance by providing banks with an approach and clear, pragmatic, and practical recommendations for setting targets to support companies within their agriculture sector portfolios to reduce GHG emissions, with special focus on farms. B4ICA acknowledges the important contributions that existing guidance from UNEP FI and NZBA, GHG Protocol, PCAF, SBTi, GFANZ, PACTA, Sustainable Markets Initiative, and other organizations have provided for banks pursuing net zero (see Appendix 2 for a list of existing guidance for reference). However, B4ICA also recognizes a critical gap in the existing guidance related to the bank's role in setting targets for farm-based agricultural emissions. This report draws on the experience and institutional knowledge of B4ICA members and partners, which includes global banks as well as agriculture and climate experts. Insights were gathered through a series of workshops and a detailed survey of participants.

This report will complement existing reports in this space and seeks to consolidate, highlight, and clarify key issues facing banks across four key steps as a starting point to setting emissions targets for their agriculture portfolios: 1) defining the scope, 2) selecting scenarios and pathways, 3) measuring emissions, and 4) envisioning opportunities to align banks' financed emissions to net zero targets.

Figure 2: *Four key steps to setting agriculture portfolio emissions targets*



Chapter 1 discusses the **scope of the net zero commitment in agriculture**, and what should be in-scope for banks' agriculture portfolio emissions targets:

- Defining the bounds of agriculture for the purpose of this report and agriculture sector targets
- Delineating the need for separate forestry sector targets
- Identifying which GHGs are most important to consider for agriculture targets

Chapter 2 provides a **framework for how banks can select scenarios and set targets for agriculture:**

- Laying out an approach to selecting appropriate NZBA-aligned scenarios for agriculture
- Providing guidance for determining geographic and product-level granularity
- Discussing tradeoffs between absolute and intensity targets, and net versus gross emissions

Chapter 3 offers practical guidance for **emissions measurement** in support of banks' emissions targets for their agriculture portfolio.

- Outlining how banks can leverage different methods to measure emissions
- Identifying key data inputs required to assess agricultural emissions
- Discussing different data sources banks can leverage for agricultural emissions
- Establishing guideposts for disclosures to ensure transparency and comparability

Chapter 4 looks ahead to ways the banking industry can work with clients to address the emissions impact attributable to their agriculture portfolios. Broader next steps are also identified to advance the net zero transition in agriculture.

- Discussing levers banks can use to help clients in their agriculture portfolios improve the measurement and management of emissions

- Defining key developments needed to support climate transition within the agriculture sector
- Identifying high-priority topics within agriculture that B4ICA might consider developing additional resources and tools to provide further support to banks

Chapter 1: Defining the scope of agriculture portfolio emissions targets

Key guidance on the scope of farm-level agriculture portfolio emissions targets:

- When setting emissions targets for their agriculture portfolios, banks are encouraged to focus on farms, including emissions originating from farm activities and land use change (LUC) associated with farmland.
- In addition to a farm's Scope 1 and 2 emissions, banks are recommended to include a farm's upstream Scope 3 emissions in their agriculture portfolio emissions targets to the extent practicable and can consider setting the downstream boundary at the farm gate.
- Banks are recommended to set separate portfolio emissions targets for agriculture (including land use change associated with farmlands) and for forestry.
- Agricultural methane, nitrous oxide, and carbon dioxide are recommended to be accounted for in emissions targets.

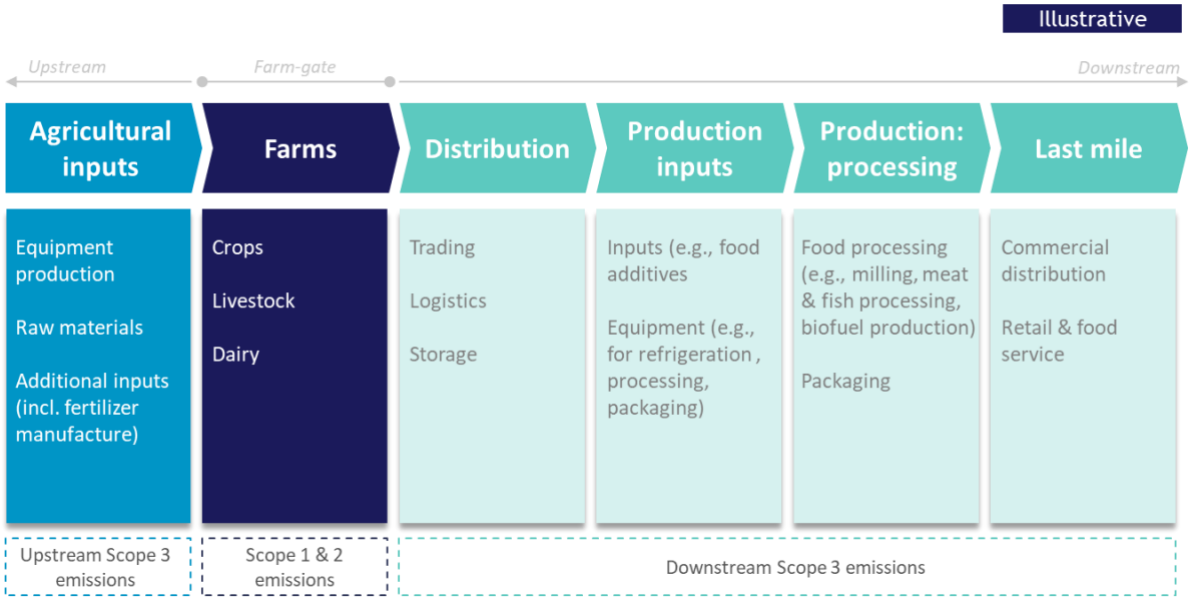
Defining agriculture and the bounds of farm-level agriculture portfolio emissions targets for banks

Given the complexities of the agriculture value chain and its intersections with other high-emitting sectors, alignment is needed on the sources and types of emissions for which banks should include in emissions targets for their agriculture portfolios. However, there is no clear consensus on the scope of agricultural emissions for bank target setting. For example, NZBA and the GHG Protocol both require targets for agriculture, but do not specify what is included therein.[5] SBTi Forest, Land and Agriculture (FLAG) Guidance provides a framework for agriculture targets but is not comprehensive of global agricultural products and is considered by some banks to be too difficult to apply, as it is not explicitly tailored for financial institutions. Other existing frameworks (e.g., PACTA) do not even cover the agriculture sector at all. This report aims to help resolve these issues by focusing on the emissions impact of agriculture financing and investments to farmers, establishing a clear approach for banks to determine which client emissions attributable to the banks' financing should be included in the context of farm-based targets, and identifying related topics that require further development.

The agriculture value chain includes a variety of activities that contribute to agricultural productivity and associated greenhouse gas emissions (see Figure 3). Upstream, manufacturing of farm equipment, fertilizers, and animal and plant genetics provide for critical agricultural inputs. Downstream, processing and distribution of agricultural products ensure the world has access to a range of food and agricultural by-products. Farms are at the core of this value chain.

[5] Note that the GHG Protocol Agriculture Guidance does provide guidance on measuring emissions from agriculture but does not specify bounds for targets.

Figure 3: *Illustrative agriculture value chain*[6]



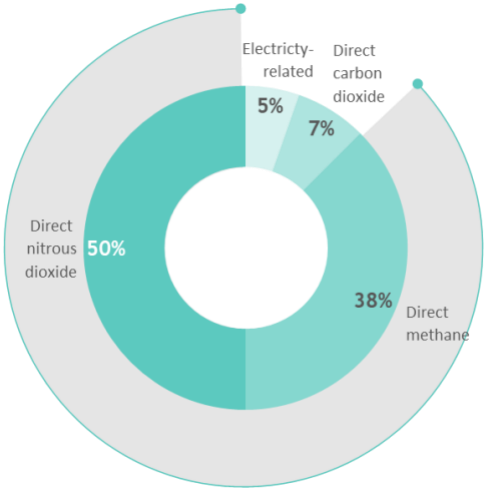
When setting emissions targets for their agriculture portfolios, banks are encouraged to focus on farm clients, covering emissions originating from farm activities and land use change (LUC) associated with farmland. These emissions, which for the purpose of target setting are described collectively as 'farm-gate emissions,' include GHG emissions generated within the boundaries of the farm from agricultural activities (e.g., enteric fermentation, manure management, fertilizer application) and from land use change associated with the farm. Farms are at the core of the agriculture value chain, and a focus on farmers will be pivotal to enabling the climate transition in agriculture and positioning banks to align their agriculture portfolios toward net zero. While this report focuses on setting targets for aggregated farm-based emissions, farm activities exist within broader economic value chains which may be associated with specific sub-sector transformation pathways. Though not covered in this report, banks could consider exploring opportunities to conceptualize, organize, and support these sectoral transformations as a different approach to target setting, disclosure, and engagement.

Setting targets focused on farms can empower banks to better collaborate with and assist their farming clients, such as connecting farms with products, solutions, and advice to support less emissions-intensive practices. Furthermore, a focus on farms will enable banks to set targets on activities that account for an important source of agricultural greenhouse gas emissions. Farm operations and land use change are a major source of greenhouse gas emissions. For example, one study in the U.S. indicates that direct nitrous oxide accounts for half of all carbon dioxide equivalent agricultural emissions, mainly resulting from the application of nitrogen-based fertilizers on farms,

[6] This sector-level view of the value chain is representative of agriculture as a whole. There is substantial variability across sub-sectors, markets, and actors that is not represented.

and methane accounts for more than one third of all CO_2 equivalent agricultural emissions, primarily from enteric fermentation and other livestock-related emissions occurring on farms.[7]

Figure 4: *Share of agricultural farm-based emissions*



Source: USDA, Economic Research Service using data from U.S. EPA, April 2022: Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2020

What are the boundaries of "farm-gate emissions" addressed in this report? In the context of measuring and setting farm-based emissions targets for banks' agriculture portfolios, banks are encouraged to focus on a farm's Scope 1, Scope 2, and upstream Scope 3 emissions.

A farm's Scope 1 emissions (direct emissions, such as from farm machinery diesel use or application of fertilizer) and Scope 2 emissions (indirect emissions from the generation of purchased energy, such as the fuel or electricity used to heat or cool a farm building) are in scope for a bank's agriculture portfolio emissions targets. In addition, Scope 3 upstream emissions are recommended to be included when possible. The GHG Protocol's Corporate Value Chain (Scope 3) Standard defines Scope 3 emissions as the "indirect GHG emissions (not included in Scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions." By including the farm's upstream Scope 3 emissions, the approach would include GHGs originating from the offsite production of farm inputs, such as emissions from the manufacture of fertilizers (an important source of GHGs), feed, and farm equipment. These emissions are recommended to be part of banks' agriculture portfolio targets because farms are likely to have greater influence over the related activities, providing opportunities for banks to support farm clients in addressing these emissions.

When including upstream Scope 3 emissions, banks are encouraged to be as comprehensive as possible, and to prioritize the most emissions-intensive segments of the agriculture value chain, such as fertilizer manufacturing. Practical considerations such as data availability, product traceability, and quality of proxies and emission factors might limit the breadth of Scope 3 emissions that banks are able to consider. Per PCAF guidance, banks are encouraged to consider relevance, completeness, accuracy, consistency, and transparency when determining which upstream activities to include among Scope 3 emissions.[8]

[7] USDA Economic Research Service using data from U.S. EPA, April 2022: Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2020.
[8] PCAF (2020). The Global GHG Accounting and Reporting Standard for the Financial Industry. First edition.

Banks can also consider incorporating farms' downstream Scope 3 emissions into their targets when feasible, or addressing those emissions by engaging with other players in the agriculture value chain beyond the farm. [9] However, B4ICA acknowledges the extreme difficulty of assessing and influencing downstream Scope 3 emissions past the farm-gate due to a range of barriers. First, there is little traceability across the value chain to track how farm products are used. Second, farmers often have very little influence on the emissions of downstream actors. And third, assessing emissions from downstream actors can be challenging due to insufficient data. While these challenges are not unique to downstream Scope 3 farm emissions, banks report them to be most acute downstream. Given the limited insight and influence over downstream activities and related emissions at the farm-level, banks can consider adopting different approaches to target setting and client engagement that consider the broader agriculture value chain and its emission drivers. However, exclusion of downstream Scope 3 emissions comes with tradeoffs and further insights on their relevance for agriculture target setting is an important space for future work.

When documenting farm-based emissions baselines and targets, banks are encouraged to make every effort to provide transparency as to which components of their farm clients' emissions are excluded from their targets to provide accountability and ease comparison and benchmarking. Banks can reference GHG's Corporate Value Chain (Scope 3) Accounting and Reporting Standard and Land Sector and Removals Guidance for more specific guidance on defining Scope 3 emissions for target setting and measurement.

While the recommended focus on farmers for emissions targets will address an important source of agricultural emissions and a critical group of stakeholder clients, there are still opportunities for banks to address other sources of agricultural emissions by engaging with other players in the agriculture value chain. Thus, there remains a need for further guidance on addressing the emissions impact of other aspects of the agriculture value chain which are not covered in this report.

[9] See Chapter 5 of the GHG Protocol Land Sector and Removals Guidance for further information on downstream emissions.

Important note on other approaches to defining the scope of agriculture and relevant emissions:

This report considers an approach to target setting focused on the central role that farmers play in the agriculture value chain, the pronounced share of emissions originating from farms and associated land use change, and the relative difficulty of assessing and influencing certain emissions at the farm-level. This approach assumes that farms will have an important role to play in reducing overall emissions from the agriculture sector. In addition to farms, there are also opportunities for banks to influence other players in the agriculture value chain that they engage with.

Each bank's approach is ultimately a matter of the bank's strategy, independent business decisions, and ability to engage with various players in the agriculture value chain. As each bank refines its approach, it might consider materiality of different GHG emissions sources, feasibility of data collection and target setting, and what levers they might actually apply to achieve emissions targets.

Relationship between Forestry and Agriculture

Some existing frameworks group forestry activities together with agriculture, such as the Intergovernmental Panel on Climate Change (IPCC)'s Agriculture, Forestry, and Other Land Use (AFOLU), the GHG Protocol's Land Use, Land-Use Change and Forestry (LULUCF), and SBTi's Forestry, Land Use, and Agriculture (FLAG). While each framework identifies an important relationship between agriculture and forestry, this report draws a necessary distinction between the two for the purpose of target setting for agricultural emissions.

When setting emissions targets for their agriculture portfolios, banks are encouraged to focus on farm-gate emissions, including from land use change associated with farmland, and address forestry occurring outside the farm separately. This is a necessary deviation from some existing frameworks given that banks finance distinct types of clients in both sectors, and each sector has a different approach to climate transition. Forestry, defined as the management of forests for the provision of goods and services such as forest products, carbon storage, and other ecosystems services,[10] represents the largest terrestrial carbon sink and provides a significant net carbon sequestration of 7.6 Gt annually.[11] Given the unique role that forestry plays in decarbonization, approaches to climate transition in the sector are markedly different than those for agriculture, and the constellation of clients involved in forestry is generally separate from those involved in agriculture. As such, the forestry sector leverages different intervention strategies, data collection methodologies, and transition pathways than the agriculture sector, which impacts the inputs and assumptions used to select scenarios and set targets.

Land use change associated with farmland, including deforestation and reforestation on farmland, is recommended to be considered in scope for agriculture portfolio emissions targets because they are occurring within the farmgate. For example, emissions from the removal of forest land for conversion to pasture or crop land would be considered land use change and in scope for agriculture targets.

[10] WBCSD Forest Solutions Group (2021). Forest Sector Net-Zero Roadmap Phase 1: Enabling the transition to a net-zero economy.
[11] Harris et al. (2021). Global maps of twenty first century forest carbon fluxes. Nature Climate Change, Vol. 11.

Likewise, agroforestry practices including alley cropping, forest farming, and silvopasture (the deliberate integration of trees and grazing livestock operations on the same land) are all recommended to be considered in scope for agriculture targets due to their association with farmland. Deforestation is only in scope for agriculture portfolio emissions targets if it is occurring on current or intended farmland. The draft GHG Protocol Land Sector and Removals Guidance recommends a twenty-year cut-off date for land use change-related emissions.[12] Deforestation related to farmland is one of the key sources of emissions that banks should consider when setting targets and engaging agriculture clients on climate transition strategies. There is an opportunity to develop supplemental guidance to further support banks in accounting for farm-related deforestation, which B4ICA may consider prioritizing in upcoming workstreams.

While **banks are encouraged to separate forestry from their agriculture portfolio emissions targets,** B4ICA acknowledges the importance for banks to set emissions targets for forestry where relevant to their portfolios given the vital role that forests will play in the climate transition. In such cases, banks are recommended to set separate targets for forestry occurring outside farmlands, and not group all forestry into agriculture targets. B4ICA would welcome the development of additional resources to establish a clear and consistent expectation for banks related to forestry targets**.** For more information on the role of GHG emissions and carbon removals in forestry, see guidance from WBCSD Forest Solutions Group's Forest Sector Net Zero Roadmap as well SBTi FLAG guidance for more information on target setting for forestry.

Key GHGs to include in agriculture targets

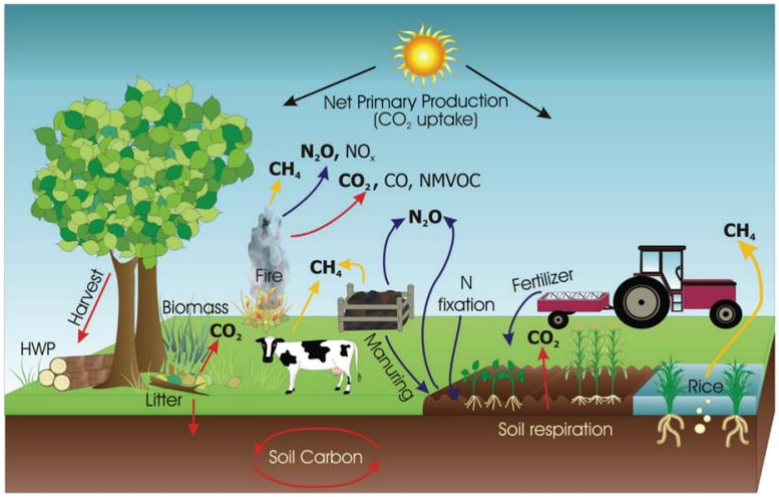
Agriculture's contribution to global GHG emissions is significant, representing the primary source of global methane and nitrous oxide emissions.[13]

- Over half (53%) of global methane (CH_4) emissions originate from agriculture. Methane emissions are particularly pronounced through enteric fermentation and manure management associated with cattle and other livestock.
- More than three quarters (78%) of global nitrous oxide (N_2O) emissions come from agriculture, driven by the use of natural and synthetic fertilizers, as well as waste solids.
- About one fifth (21%) of global carbon dioxide (CO_2) emissions come from agriculture. Sources of carbon dioxide in agriculture include burning for land clearing, decomposition of biomass, and soil respiration.

[12] Based on the GHG Protocol Land Sector and Removals Guidance (Part 1) draft guidance; banks are recommended to look to final guidance once published.

[13] UN-FAO (2021) The share of food systems in total greenhouse gas emissions. Global, regional and country trends, 1990–2019. FAOSTAT Analytical Brief Series No. 31. Rome.

Figure 5: *Farms are a major source of methane, nitrous oxide, and carbon dioxide*



Source: 2006 IPCC Guideline for National Greenhouse Gas Inventories

The impact of these GHGs is significant, especially given the intense warming potential that nitrous oxide and methane emissions have. Methane is believed to be responsible for more than 25% of the warming experienced today and has a global warming potential 27.9 times that of carbon dioxide over a 100-year period. Over that same time period, nitrous oxide has a global warming potential 273 times that of carbon dioxide.[14] Given the clear and present threat to the goal of limiting warming to well below 2, preferably 1.5 degrees Celsius posed by these gases, **banks are recommended to account for significant agricultural methane, nitrous oxide, and carbon dioxide in emissions targets.**

Banks are not expected to set individual targets for each gas and are encouraged to refer to IPCC's Sixth Assessment Report - Mitigation of Climate Change report (AR6) for instruction on conversion of methane and nitrous oxide to carbon dioxide equivalents for target setting.

[14] IPCC.AR6 WGI Report. Chapter 07 Supplementary Material. Table 7.SM.7. Accessed Sept. 2022.

Chapter 2: Framework for selecting scenarios and pathways for agriculture target setting

Key guidance on scenario selection and setting targets:

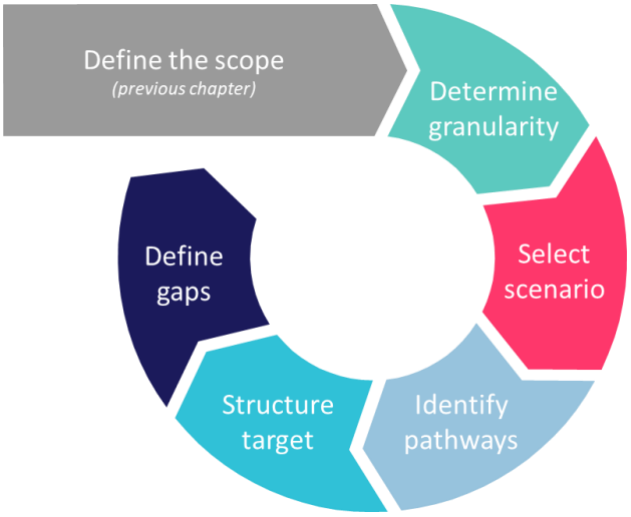
- Banks are recommended to select scenarios that are aligned with NZBA principles (i.e., science-based, 1.5 degrees Celsius-aligned, low-to-no overshoot) and relevant to the agriculture sector.
- Banks are encouraged to include as much geographic and sub-sector granularity as possible in their choice of scenarios, pathways, and targets to the extent that it supports setting and operationalizing those targets.
- NZBA expects 2030 or sooner interim and 2050 long-term sector targets, which can be either absolute or intensity targets. Banks are encouraged to set additional sub-sector targets where relevant and where it supports target setting and operationalizing those targets.
- Banks are recommended to set net or gross targets. If setting net targets, banks are encouraged to be transparent in the role that nature-based removals play in achieving those net targets.
- Banks are recommended to rely on guidance from NZBA and GHG Protocol on the use of removals and carbon credits.

NZBA signatory banks have committed to a target of net zero by 2050, in line with the Paris Agreement, to limit global warming to well below 2, striving for 1.5 degrees Celsius, among other goals. To align their agriculture portfolios to this goal and set agriculture-specific targets, **banks will need to identify an appropriate NZBA-aligned scenario and credible, science-based pathways for their agriculture portfolio that meet NZBA criteria.**

This chapter will provide banks a framework for selecting scenarios and setting targets for agriculture. It includes three sections:

- An approach to selecting appropriate NZBA-aligned scenarios for agriculture
- Recommendations for including detail on sector-level and commodity-specific pathways
- Guidance for setting targets, including use of absolute vs. intensity and net vs. gross targets

Figure 6: *Framework for selecting scenarios, pathways, and targets*

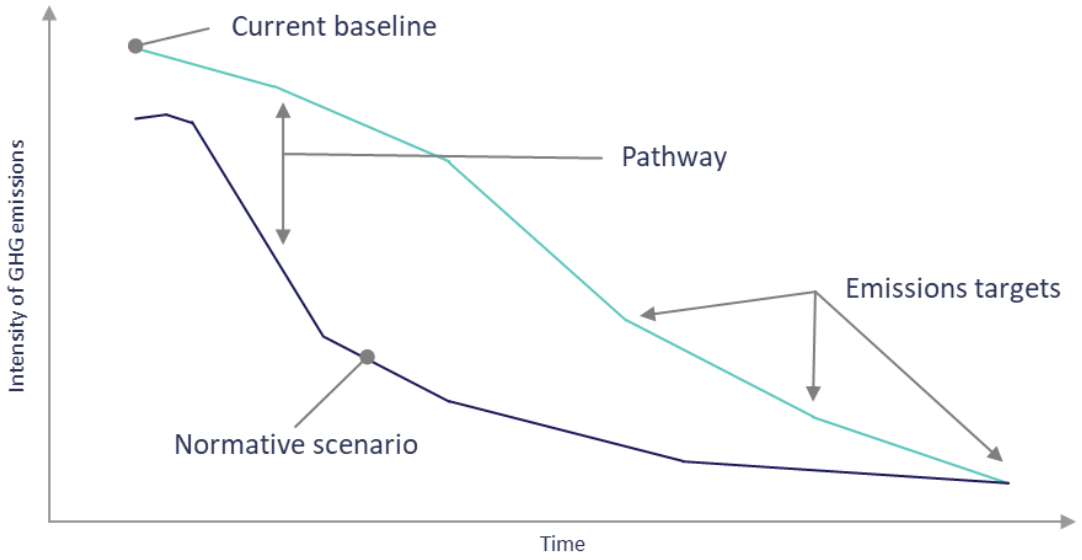


Given the complexities of the target setting process and the unique strategies that different banks might choose to adopt, this report outlines four hypothetical example banks and discusses the decisions points and tradeoffs each bank might consider as they approach target setting in agriculture. These examples were created to represent different types of geographic and agriculture sub-sector concentrations that might exist across banks and highlights implications of different bank-specific factors on target setting. These case studies can be found in Appendix 1.

Approach to selecting appropriate granularity and scenarios for agriculture portfolio emissions targets

A range of analytical tools are available to banks as they consider setting targets for agriculture. Core among them are climate scenarios, many of which are generated by integrated assessment models (IAMs). Academic and intergovernmental institutions have developed IAMs to illustrate what the world might look like under various parameters and assumptions. Many operate by modelling and combining pathways for GHG concentrations and socioeconomic developments, such the Shared Socioeconomic Pathways (SSPs) and Representative Concentration Pathways (RCPs), which are used in the development of IPCC scenarios. For example, IAMs might model warming over time based on current policies or identify what pathways exist that aim to limit warming to 1.5 degrees Celsius by 2050 with various policies and trends. Banks can use these models and climate scenarios to establish trajectories—pathways to transition their portfolios—that meet net zero by 2050 and align their portfolios to those pathways (See Figure 7 below).

Figure 7: *Scenarios serve a key input to determine pathways emission targets*



Scenarios are also used for a range of bank exercises, such as stress-testing and assessing physical and transition climate risks for reporting under the Task Force on Climate-Related Financial Disclosures (TCFD) and other disclosure systems. For example, a bank might conduct stress testing with scenarios where temperature levels reach 2, 3, or 4+ degrees by 2050. Banks might also use "predictive" scenarios based on current or stated policies to understand the current trajectory for risk management (i.e., how the world would look under current assumptions). Risk management is a separate process from target setting and is not in scope for this report.

The focus of this report, however, is on scenarios banks can use to set net zero targets for agriculture. In accordance with NZBA guidance, scenarios used for target setting are expected to align with a limit of 1.5 degrees Celsius warming. Typically, scenarios used for target setting are normative (i.e., anchor to how we desire the world to look) and enable banks to define a pathway to transition their portfolios to strive toward a maximum of 1.5 degrees Celsius warming. Many NZBA-aligned scenarios exist, including the International Energy Agency (IEA) and Network for Greening the Financial System (NGFS) scenarios, which are commonly used by banks for target setting in other sectors. However, some of these scenarios are not suitable for agriculture because they do not account for agriculture-specific assumptions or for certain GHGs relevant to agriculture. Banks might therefore find that different scenarios are needed for agriculture than are used for other sectors.

Because the bank's targets and portfolio alignment pathways will be based on the specific scenario, selecting the right scenario is extremely important. It is the bank's responsibility to choose scenarios that meet the needs of the institution and its portfolio, while also aligning with the goals of the Paris Agreement.

Explainer: Key NZBA Criteria & Supporting Notes[15]

NZBA expects that banks set targets for all, or a substantial majority of, nine identified sectors that cover a "significant majority" of total portfolio emissions. Agriculture is one of the priority sectors identified in NZBA guidance. Within agriculture, "banks may prioritize sub-sectors based on GHG emissions and financial exposure and/or data and methodology availability." This guidance aims to elucidate the data and methodologies available to banks for target setting and encourages banks to set sector-level targets for agriculture if "data and methodologies allow", with sub-sector targets as appropriate. For banks that chose to set agriculture portfolio emissions targets, best practices have been outlined.

NZBA expects scenarios meet the following criteria:

- Science-based, from credible and well-recognized sources. For example, banks may consider scenarios recommended by NZBA or scenarios from models managed by members of the IAM Consortium (IAMC), provided they meet these criteria.
- Aligned with a limit of 1.5 degrees Celsius warming by 2100. Scenarios should have a greater than 50% chance of meeting 1.5 degrees Celsius.
- No- to low- overshoot, meaning that the scenario should not warm beyond 1.5 degrees Celsius at any point, or should only do so for a short time before reverting to 1.5 degrees Celsius or below. Very few 1.5 degrees Celsius scenarios do not include any temperature overshoot, and most rely on some form of negative emissions to ensure temperature goals can be met given constraints such as population growth. As defined by IPCC, banks may consider scenarios that aim to limit warming to below 1.6 degrees Celsius and returning to 1.5 degrees Celsius before 2100 to be "low-overshoot."[16]
- Conservative in regard to negative emissions, such as the use of carbon removal technologies, as well as natural carbon sequestration. As above, most 1.5 degrees Celsius scenarios include the use of negative emissions to some degree to reach net zero—reliance on negative emissions technologies should be conservative. This guidance recognizes that nature-based removals are an important lever for GHG reduction of the agriculture sector.

Many scenarios exist today, but not all are suitable for banks to use to set emissions targets for their agriculture portfolios. It is advised that banks use existing NZBA guidance to identify appropriate scenarios for target setting. In addition, **banks are recommended to consider three additional criteria for choosing scenarios and pathways for agriculture specifically:**

- **Relevance for agriculture and land use.** Scenarios should address agricultural GHG emissions and land use, and include agricultural variables such as crop yields, land use change (e.g., afforestation/reforestation/deforestation), fertilizer use, and other variables that might

[15] UNEP FI (2022) Guidelines for Climate Target Setting for Banks and Supporting Notes

[16] IPCC (2018) Summary for Policymakers. In: *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty.* https://www.ipcc.ch/sr15/chapter/spm/.

impact agricultural GHG emissions. Many banks have already made progress with scenarios for non-AFOLU sectors, particularly Oil & Gas and Power Generation. Many are using the IEA's Net Zero Emissions 2050 (NZE) scenario to set targets and build pathways in these sectors. However, IEA's NZE scenario does not cover agriculture and only covers carbon dioxide, whereas additional GHGs such as methane and nitrous oxide account for a large share of the emissions produced by agricultural practices.

- **Sufficient geographic granularity.** Geographical variance in climate, soil types, and methods of production also means that commodity pathways might differ across regions. Many countries where agriculture forms a significant share of emissions have made specific targets for agriculture that banks might want to consider. Furthermore, IAMs assume different rates of growth for agriculture in different regions, meaning that geographic granularity is crucial to adequately inform targets and pathways for banks with high regional exposure.
- **Sufficient sub-sector granularity.** Agricultural sub-sectors refer to different types of agricultural products (e.g., livestock, cattle, dairy, row crops, or maize might all be considered sub-sectors within agriculture). Agriculture is a heterogeneous sector with significant variation in production practices, emissions, and GHG reduction levers available across farms and products. For example, crop production can emit nitrous oxide through synthetic fertilizer application and affect soil organic carbon, while livestock production is a large emitter of methane through enteric fermentation and manure management. Variation can also be significant between crop commodities and between livestock commodities. For many banks, it will be important that scenarios account for this degree of sub-sector nuance. Banks with material exposure to different agricultural sub-sectors or commodities could consider choosing to set separate targets based on different scenario-derived pathways.

To aid banks in identifying appropriate scenarios, Table 1 compares 1.5 degrees Celsius scenarios that banks might find useful. All scenarios included in Table 1 are either noted by NZBA or are based on credible models managed by IAMC members. This table is not exhaustive and does not include regional scenarios, which banks might consider consulting with national and local governments to access. This table is up to date as of October 2022—as additional updated scenarios continue to be released, banks are encouraged to consider updating their benchmarks.

Table 1: *Summary of commonly used NZBA-aligned climate scenarios*

Not exhaustive – does not include region-specific scenarios or input scenarios (e.g. SSP, RCP)

Org	IAM (Model)	1.5C Scenarios	Orgs endorsed/ aligned	Agri- relevant GHGs?	Covers agri?	Covers land use?	Regional coverage?	Commodity pathways?
PBL Netherlands	IMAGE 3.0	SSP2-2.6	SBTi	✓	✓ High level of detail	✓	✓ 26 (global for FLAG pathways)	SBTi FLAG Pathways
NGFS	REMIND-MagPIE, GCAM, MESSAGE	NZ 2050	NZBA	✓	✓	✓	✓ 11-32	✗
PRI	Builds on IEA NZE	Inevitable Policy Response 1.5 Required Policy	NZBA	✓	✓	✓	✓ 16	✗
Uni Tech Sydney	One Earth Climate	Global OECM 1.5C pathways (SSP1)	NZBA	✗ CO2 and CH4 only	✓	✓	✓ Global, Europe, NA	✓
IEA	WEM, ETP	NZE	NZBA	✗	✗	Limited to bioenergy	✗ Global only	✗
EC-JRC	POLES	GECO		✓	✓	✓	✓ 66	✗
NIES, Japan	AIM/CGE	2.0 SSP1-19, 2.0-SSP2-19		✓	✓	✓	✓ 17	✗

Scenario Assumptions & Scope:
Banks might consider comparing multiple scenarios with differing pathways to net zero to avoid overreliance or sensitivity to any specific assumptions in a given scenario (e.g., carbon pricing, end dates for deforestation). For example, if a bank uses IMAGE 3.0 SSP2-2.6 as a starting point because of the availability of commodity pathways, it should consider that this scenario is based on the IPCC SSP2 "Middle of the Road" narrative, which assumes socioeconomic trends largely follow their historical patterns and countries make development and income growth progress unevenly. Other scenarios such as University of Technology Sydney's OECM are based on the SSP1 "Sustainability – Taking the Green Road" narrative, which assumes more inclusive development and lower consumption and energy intensity. SSP1 scenarios might be considered more optimistic about socioeconomic developments. Banks are recommended to choose assumptions they are comfortable with as an institution. Banks are also encouraged to use scenarios and scenario-derived pathways that align with the scope of agricultural emissions.

Banks that have already used IEA or other scenarios that are incompatible with agriculture for other sectors will inevitably have to "mix and match" scenarios within their portfolio. Banks are encouraged to ensure that the chosen scenario(s) for agriculture is (are) consistent with those for other sectors and their overall portfolio. Most commonly used 1.5 degrees Celsius scenarios rely on analogous carbon budgets and should be compatible, but it is important for banks to confirm alignment if they have chosen to use regional or local scenarios.

Under ideal circumstances, banks are recommended to select one single scenario upon which to base all agriculture targets, to help establish consistency, comparability, and overall compatibility with a 1.5 degrees Celsius limit. All else being equal, banks are recommended to choose a scenario and pathways that enable the appropriate level of geographical and sub-sector granularity as determined based on the bank's portfolio. Selecting a detailed scenario will enable banks to achieve the desired granularity and thus is an important factor in determining what type of target can be set.

However, given the limitations of current scenarios, a bank might be unable to find one scenario that provides suitable levels of granularity to account for all the bank's desired agriculture targets. Banks might instead need to use two or more scenarios within agriculture in order to create geographic or sub-sector pathways that are not available within one scenario. For example, the SBTi FLAG commodity pathways do not cover commodities such as sugar, cocoa, and sheep/lamb. In such cases, banks might consider a few different potential solutions.

One option is for banks to elect to use one scenario, and a general sector-wide or global target to capture sub-sectors or geographies that do not have their own pathways and targets. For most banks, this will be the most straightforward option, particularly when none of the missing sub-sector or geography pathways represent a large share of the portfolio. However, this option requires sacrificing the degree of granularity available in the alternative scenarios—banks are encouraged to consider this tradeoff carefully.

A second option is for banks to combine pathways from multiple scenarios to ensure sufficient granularity. This option might be preferable if, for example, a bank has identified two available

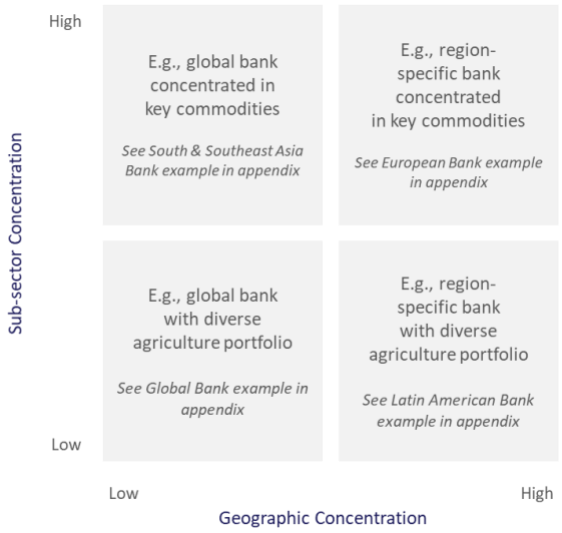
scenarios with the desired granularity for specific geographies that are highly material to the portfolio. This option requires a number of tradeoffs: added complexity, more challenging comparison across targets, and the need to minimize clashing underlying assumptions. Banks using this approach are encouraged to ensure compatibility between scenarios and provide transparent disclosures explaining the methodology and its implications.

Alternatively, banks might consider choosing one scenario but augmenting existing pathways to cover geographies or sub-sectors for which pathways are not included in the scenario. This option is more technically challenging and might require banks to work with a third party to access expertise and help establish external credibility in the pathway. This approach might be considered when a geography or sub-sector is highly material and is not covered by any available scenario. This solution enables internal consistency associated with a single scenario across agriculture targets but sacrifices external comparability with other banks because of the bespoke pathway. See Appendix 1 for Global Bank hypothetical example.

Selecting appropriately granular scenarios & pathways

Banks are encouraged to reach as much detail and granularity as is feasible for material sub-sectors and regions in their choice of scenarios and targets. This will allow banks to avoid a "one size fits all" approach, providing for targets that account for nuances across sub-sectors and geographies. If feasible, banks can evaluate individual commodity and sub-sector decarbonization pathways, consistent with 1.5 degree scenarios, to inform their target setting and execution approach. These pathways can provide insight into the implied production changes needed to achieve targets and support the development of climate transition plans. Granularity ultimately arms banks with the data needed to operationalize their targets and incentivize long-term transformation, aiding client relationship managers and business teams to prioritize and tailor their support for specific clients, regions, and sub-sectors.

Figure 8: *Banks are encouraged to consider geographic and sub-sector granularity as they select scenarios for agriculture targets*



Note: All examples are hypothetical and not representative of real portfolios or decisions of any banks

Banks with strong geographic concentration in their portfolios are recommended to use the greatest regional granularity available in their choice of scenario and pathways. If an IAM-generated scenario such as those listed in Table 1 do not offer sufficient granularity, banks could consider using more regional scenarios when, as per NZBA guidance, they are "demonstrably equivalent to, or more ambitious than" credible global 1.5 degrees Celsius scenarios, as laid out by the UNEP FI Guidelines for Climate Target Setting for Banks Supporting Notes.[17] For example, some banks limited to a single jurisdiction might choose to work with national net zero climate plans, provided they are consistent with credible global scenarios for 1.5 degrees Celsius. See Appendix 1 for European Bank hypothetical example.

On the other hand, where sufficiently granular scenarios do not yet exist, banks might consider using a global scenario to set global targets but differentiate internal regional pathways and client engagement strategies to reach that target. Banks setting global targets are encouraged to consider opportunities to disaggregate them into more granular targets in the future.

Banks with strong sub-sector concentration in their portfolios are encouraged to consider sub-sector breakdown in scenarios. Banks considering sub-sector granularity might want to consider commodity or crop-specific pathways. One available example that banks might want to adapt is the SBTi FLAG commodity pathways (see deep dive below). For banks that prefer not to use commodity or crop-specific pathways, they might choose to use an alternative breakdown available in scenarios, such as by greenhouse gas (carbon dioxide, methane, and nitrous oxide) or a higher-level agricultural product breakdown (e.g., livestock, crops). Doing so equips banks with the data needed to understand intensity and drivers of emissions across their portfolio and make decisions about how to invest and support clients in ways that have the most long-term impact. See Appendix 1 for Latin American Bank hypothetical example.

Deep dive on SBTi FLAG:

As part of its FLAG guidance, SBTi has developed a global agriculture sector pathway, as well as commodity pathways for ten major agricultural commodities (beef, chicken, dairy, leather, maize, palm oil, pork, rice, soy, and wheat), as well as for timber. These are based on the SSP2-2.6 scenario produced by the IMAGE 3.0 model. It should be noted that these pathways are not customized for banks and are not necessarily suitable as given for bank target setting purposes. Rather, banks might find this scenario and the corresponding commodity pathways a useful starting point for exploring and selecting a scenario and setting pathways. In particular, banks that are considering committing to setting Science Based Targets through SBTi might find working with SBTi to apply the FLAG commodity pathways the most straightforward and appropriate approach for their organization. In the future, the development of additional guidance for financial institutions from SBTi FLAG could provide banks more support to apply these pathways.

SBTi released its FLAG guidance in September 2022, including regional commodity pathways, based on 26 regions available in the SSP2-2.6 scenario. This level of regional and commodity granularity is valuable. Development of additional commodity pathways (e.g., cocoa, sugar, sheep) to support banks with high shares of emissions from these products, as well as additional future regional granularity, would be welcome.

[17] UNEP FI (2022) Guidelines for Climate Target Setting for Banks Supporting Notes, p. 11

CASE STUDY: RABOBANK

In February 2022, Rabobank became among the first banks to measure and disclose a baseline of agricultural emissions in the Netherlands, a critical step on the bank's journey to decarbonize its agriculture portfolio as part of its 'Road to Paris' initiative. In establishing a baseline, Rabobank ran into multiple challenges, the solutions to which other banks may learn from.

Assessing farm-level emissions was a particular challenge, and existing tools to engage farmers were not up to the task of collecting the necessary data. Rabobank instead made top-down calculations based on proxy indicators, such as sector-level GDP, emissions, and market share. But even finding consistent and up-to-date sector-level emissions data for specific commodities was a challenge and required creative use of various data sources to begin to address. The bank has found it valuable to invest in talent development given the high degree of technical expertise required for this work.

Despite the nascent data landscape, Rabobank was able to establish an initial baseline that provides a valuable starting point to both improve measurement tools and begin to identify strategies to support farmers in reducing emissions. But as an early mover in agriculture, Rabobank has limited benchmarks with which to compare its emissions. As a result, and despite having established a baseline, it is difficult for Rabobank to determine how its agricultural emissions compare with other banks'.

Looking ahead to target setting for its agricultural emissions, Rabobank will need to continue to navigate an underdeveloped data landscape. For example, agricultural emissions from methane and nitrous oxide are key contributors to climate change but do not currently have universal decarbonization pathways. Establishment of more comprehensive pathways that account for high importance of geographic and commodity-specific granularity in agriculture.

Despite these challenges, Rabobank continues to persist toward its vision for a more sustainable agriculture sector. As it looks to decarbonize its portfolio it will carefully weigh two interconnected dynamics: portfolio optimization, a top-down process involving strategic choices about which assets should be prioritized for a given (sub)portfolio, and client engagement, the bottom-up process through which the bank can encourage its clients to take measures to reduce the GHG emissions.

Rabobank is optimistic about the impact its commitment to net zero can have but is also pragmatic about the limits of its influence on the agriculture sector. Banks can play an important role in signaling to the markets that there is value in improving sustainability. They can also apply strategies to support their clients in taking measures to decarbonize, such as those outlined by GFANZ. Ultimately though, progress toward net zero will be incumbent on complementary efforts from a wide variety of stakeholders including government, industry groups, and other companies in the agriculture value chain all working together toward lower emissions in the agriculture sector.

Guidance for setting targets

There are two key decisions banks must make when setting long-term 2050 and 2030 or sooner interim targets: choice of absolute vs. intensity targets, and choice of net vs gross targets.

The first of these two choices requires banks to choose between absolute targets, wherein banks set a specific level of emissions that they intend to reach by a certain date, or intensity targets, in which banks set a target for the amount of emissions per unit of production, typically fresh weight.

Banks can choose to set either an absolute or an intensity emissions-based target. This optionality aligns with NZBA's current guidance, which sets the expectation for sector-level targets but provides flexibility for absolute or emissions intensity targets. It should also be noted that this deviates from the preliminary version of the GHG Protocol Land Sector and Removals Guidance which is drafted to require absolute targets at a minimum, though the document is not explicitly tailored for financial institutions. In choosing between absolute and intensity targets, banks are encouraged to carefully consider the tradeoffs outlined below.

There are several reasons why banks might consider absolute targets. They are unambiguous, can be easily linked back to the Paris Agreement and can more meaningfully demonstrate an impact on overall global emissions. Absolute targets are often more easily communicated to external stakeholders and can be used to rationalize a bank's need to reduce financed emissions to reach net zero. Furthermore, absolute agriculture targets help to enable alignment and comparability with absolute baseline metrics. Absolute sector-level targets can help ensure that aggregate portfolio-level targets and agriculture sector targets are aligned.

However, some banks note that absolute targets may not effectively represent clients' climate transition efforts and progress, as the need for sufficient food production might limit the feasibility of significant emission reductions in the short term. It is important for banks to be transparent about the impact of increased food production on their portfolio. When working toward their targets, banks are encouraged to prioritize client engagement to facilitate climate transitions as a means to address the emissions impact attributable to the banks' agriculture portfolio.

Intensity targets offer an alternative means of setting targets that show progress toward emissions reduction, even when banking clients' total production—and therefore possibly total emissions—increase. Intensity targets also allow for comparability among banks and clients of different sizes because they are not impacted by the size or composition of a bank's portfolio. However, intensity targets might require a greater degree of data on farm-level productivity than many banks have access to, and the heterogeneity of these targets across product types can make it difficult to aggregate to a meaningful overarching target.[18]

When choosing between absolute and intensity targets, banks are also encouraged to consider the following:

[18] Note that banks are encouraged to physical intensity targets rather than financial intensity where possible as discussed later in this chapter.

- Sub-sector targets are optional but encouraged (see above). These can be either absolute or intensity targets, though intensity pathways are more available at the sub-sector level (e.g., SBTi FLAG commodity pathways).
- Under NZBA, intensity targets are expected to be based on physical metrics (e.g., per kg of product) instead of financial metrics, but could be based on financial metrics if banks can provide a rationale. This report supports NZBA's position in favor of physical metrics.
- Units used for intensity targets are recommended to be weight-based and consistent. Banks are encouraged to use metric tons of fresh weight as a standard measurement to ease comparability across the sector.

To set an absolute target, banks will define a percent reduction implied by the scenario. For physical metric intensity targets, banks can choose from one of two options: 1) convergence target, where the target will align with the scenario's pathway by some year in the future, or 2) rate of reduction target, where the target is the percent reduction implied by the scenario, regardless of whether the bank's portfolio baseline is above or below the scenario pathway. Banks can consult the Portfolio Alignment Team guidance for more technical details.

Banks can choose to set either gross or net long-term 2050 and interim 2030 or sooner agriculture targets. This provides flexibility since there is no specific guidance on this topic currently, such as from NZBA.

It is important that banks are transparent in their disclosures on the role of on-farm nature-based removals in achieving the targets, and the magnitude of their impact on net emissions. This will help to provide greater transparency about the role of removals in reaching net zero and the scale of their impact relevant to overall emissions attributable to a bank's agriculture portfolio. Note that SBTi's FLAG guidance requires net emissions targets, inclusive of removals, though emissions reductions and removals accounting are required to be reported separately for target validation. Though not explicitly tailored for financial institutions, banks can also consider the following from SBTi FLAG and GHG Protocol Land Sector and Removals Guidance on removals:

- Only removals occurring on land owned or operated within a company's supply chain are recommended to be included as negative emissions contributing to net agriculture targets.
- Removals included in net emissions are recommended to have ongoing storage, and be nature-based and aligned with credible guidance. For example, removals could include mitigation through reduced or avoided deforestation, afforestation/reforestation on farm, agroforestry and planting of other woody biomass on farm (e.g., hedgerows), and soil organic carbon sequestration.19
- Bank are recommended to look to the latest guidance (e.g., GHG Protocol Land Sector and Removals) on how to account for removals in GHG inventories, reporting, and target setting. As a next phase of work, B4ICA might consider providing additional guidance for the agriculture sector.

When addressing the emissions attributable to a bank's portfolio, a key differentiator for the agriculture sector is the scope for removals in mitigating climate change. Agriculture is a major source of GHG emissions, but it can also be a major sink—the land sector removes about 30% of annual global carbon dioxide emissions in sinks.[20] As part of the photosynthesis process, carbon is

[19] Note that the science related to soil carbon sequestration is still pending. Please see EDF's Agricultural Soil Carbon Credits report for additional guidance if considering including soil sequestration.
[20] IPCC (2019). Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

removed from the atmosphere and stored in land-based carbon pools, such as biomass above and below ground (e.g., trees, roots, plants) and dead organic matter (e.g., stumps, leaf litter). Carbon stored in biomass and dead organic matter can be transferred to the largest carbon pool, soil.[21] Note that this report is concerned with carbon pools within agricultural land only (e.g., crop fields, agroforestry, fruit trees) —forests (e.g., timber, protected forests) are not in scope for this report, but are also important carbon sinks and are recommended to have targets set against them.

Accounting for removals and storage remains difficult. Current data availability and quality for nature-based removals, such as soil organic carbon sequestration[22], presents a challenge for many banks, especially considering the lack of primary data available from their farming clients. Clear guidance has not yet been published. The GHG Protocol Land Sector and Removals Guidance is in draft consultation and due to be finalized Q1 2023.

Many institutions are understandably concerned about ensuring that bank targets remain conservative, focused on gross emissions reductions within the value chain, and not overly reliant on removals and sequestration. Many banks are also unsure how to differentially reflect removals that occur within the value chain (e.g., afforestation within a financed farm) or outside of it (e.g., afforestation in a project developed for carbon credit generation and not funded by the bank). Therefore, gross targets can be useful to ensure transparent communication regarding emissions reductions within the agricultural portfolio, separately from removals.

NZBA guidance expects that banks restrict the use of carbon credits (also called "offsets") in the achievement of end-state net zero to "removals to balance residual emissions where there are limited technologically or financially viable alternatives to eliminate emissions." For agriculture targets, banks are encouraged to consider existing published guidance, as well as the forthcoming GHG Protocol Land Sector and Removals Guidance (currently available in draft form for public consultation) on accounting for carbon credits.

Banks are also encouraged to share additional targets, which will allow their portfolio transitions to be understood in context. For example, reporting outstanding finance targets alongside gross and net absolute and intensity emissions targets can allow stakeholders to understand whether emissions changes are driven by shifts in the composition of the portfolio, negative emissions, or more efficient production practices. See Appendix 1 for South & Southeast Asia Bank hypothetical example.

Once banks have defined baselines and set targets, they are expected by NZBA to periodically review and revise baselines, targets, and pathways every five years. However, this report deviates from NZBA guidance and encourages more regular reviews for the agriculture sector due to the relatively nascent and quickly evolving nature of methodologies available for this space. **Banks might want to consider an annual stock-take of the data and methodology landscape to understand if there is meaningful opportunity to set more granular targets and pathways or revise baselines and targets to improve accuracy.** Banks are encouraged to consider the following events as triggers for a review and potential revision of baselines, targets, and pathways:

[21] GHG (2022). Land Sector and Removals Guidance.
[22] Banks can review EDF's reports on the science of soil carbon sequestration and carbon credit protocols to learn more about the state of soil carbon sequestration opportunities.

- Availability of new data sources or methodologies that would improve accuracy of baselines. Banks are encouraged to consider revising historical baselines and adjusting targets and pathways accordingly. If historical baselines have been revised downward, banks are recommended to make reasonable efforts to maintain their original ambition level of scenarios and pathways. New baselines are also recommended to be reported publicly with appropriate justification.
- Ability to disaggregate baselines, targets, and pathways into more sub-sector or geographic granularity. If this is a possibility, banks are encouraged to make every effort to disaggregate at the earliest possible date. However, considering the burden of external communications, banks can choose to wait until the NZBA-expected five-year review before disclosing disaggregation externally.
- Availability of new, more suitable scenarios and pathways. If a scenario becomes available that is significantly more appropriate for banks' needs or addresses open challenges with existing options, banks are encouraged to make a concerted effort to transition to the new scenarios and corresponding pathways and targets. All changes are recommended to be disclosed publicly with appropriate justification.

Chapter 3: Data and measurement to assess agricultural emissions

Key guidance on data and measurement for agricultural emissions:

- Farm-level activity data will likely provide the clearest visibility for banks into the drivers of farming clients' emissions.
- Banks need not rely only on farmers for farm-level data; financial disclosures, aggregate data sources, and commercial partnerships could all provide valuable data.
- Disclosures are recommended to include transparent accounting of data sources, analytical tools, and key assumptions used to develop measurements.
- Disclosures are also recommended to specify the nature and impact of changes to analytical methods.

An essential companion to emissions targets in agriculture is a systematic approach to measuring GHGs emitted through agricultural activities. As per NZBA guidance, banks are expected to establish an emissions baseline and annually measure and report the emissions profile of their lending portfolios and investment activities. B4ICA recognizes the difficulty of measuring agricultural emissions from banks' portfolios based on currently available data and methods.

This chapter provides guidance to banks on how to interpret guidance from PCAF and other sources to establish baseline emissions and refresh those measurements over time.

Types and sources of data to support agricultural emissions measurement

While a range of approaches exist to estimate emissions, banks will ultimately require nuanced farm-level activity data to develop the most accurate emissions measurements because decisions about farm-level activities have significant impacts on emissions. Not only does this data provide inputs to inform calculations of farm-level emissions, it also provides banks with a clear view of the emissions drivers at the farm level that banks can use to support their clients' transition to net zero.

When developing sources of farm-level data, banks might consider agricultural data across six categories:

1) **Product data** describing what is produced on the farm (e.g., the number and type of livestock, varietals of crops, acreage of planted crops)
2) **Management practice data** describing the way farmers operate their farms (e.g., tillage practices, irrigation systems, fertilization strategies, and land use)
3) **Input data** including raw materials used on the farm, such as type, volume, and source of feed, type and source of fertilizer, seed stocks, and animal stocks
4) **Energy usage data** including fuels and electricity for farm equipment and facilities
5) **Soil and land data** such as soil type, water table, and land cover, which are likely to be regionally variable

6) **Other parameters** including water usage and biodiversity are also recommended to be captured by banks to support a holistic approach to sustainable portfolio management

Depth of agricultural data and accuracy of emissions measurement are important in principle, but different use cases might require different degrees of data quality. For example, banks might use agricultural data to make decisions at the portfolio level, such as what types of products and services to offer. Basic product data such as number of cattle or acres of row crops might be considered acceptable for these types of portfolio-level decisions. Alternatively, banks might use agricultural data to provide services or products to individual farmer clients to help them invest in new strategies to reduce emissions on their farm. This type of client-level decision-making would likely require more detailed data to capture the nuance of farm-level activities such as methods of fertilizer application, species and age of livestock, or animal health variables.

A note on PCAF data quality scores:

Banks can consider referring to data quality scores from PCAF to assess the degree of certainty provided by different sources. These scores can be helpful as banks consider opportunities to improve data over time, but banks are cautioned against focusing only on improving data quality without considering prioritization and use cases for that data. For example, high-quality and reliable aggregate data sources, which would receive a higher certainty PCAF data quality score, are suitable for setting agriculture targets. PCAF considers direct emissions measurement as the highest certainty type of data for reporting. However, direct emissions measurements generally do not provide the type of practical farm-level data that banks might need to make investment decisions or support their clients to less intensive production means.

Improving data quality across the sector might be labor and cost intensive for both banks and their clients, so careful prioritization is advised when deciding where to invest further resources in data quality. Since banks are looking across a portfolio of clients when setting targets, retaining comparability between counterparties is important and could help banks cut data scoring hierarchies, determine drivers of emissions, and identify opportunities to support their clients. In such cases, data improvements for high-emitting clients or sectors might make the most sense to prioritize.

Farmers are the most direct source of farm-level data to banks, but collecting that data is often a challenge and many are unable or unwilling to share data with banks for legitimate reasons: tracking and sharing data on farm activities can be technically challenging and burdensome; information on yields could influence markets and impact the revenues farmers can generate for their goods; farmers might not have an established relationship with their bank to foster the trust needed for such transactions; and data privacy rules and concerns might limit the extent to which banks can access a farm's data.

Of course, many farmers are eager to reduce emissions on their farms and might be willing to share data in the right scenario. A UK farm practices survey found that 68% of farmers surveyed believed it

to be important to consider GHGs when making agricultural decisions.[23] For these farmers, emissions calculators, typically only tools allowing farmers to enter farm data to calculate total emissions, could be a viable tool for collecting farm-level data. A drawback of these tools is that they often only provide a single emissions figure and do not convey the input data. This limits the usability of the data for banks and makes it difficult to validate the inputs underlying the emissions estimates. Additional guidance on tools and best practices for engaging with and supporting farmers on emissions measurement could be extremely valuable.

In reality, most banks will be able to collect only a narrow set of farm-level agricultural data, and access to data will vary between clients. Banks are not expected to have comprehensive data on every client and are encouraged to prioritize data collection from farms representing the largest share of emissions based on farm size, product type, and known practices.

CASE STUDY: SANTANDER BANK

The agribusiness sector in Brazil is at the heart of Santander's Net Zero plan. The country relies heavily on the agriculture sector as one of its most important economic pillars, representing approximately 27% of the country's GDP in 2020. Greenhouse gas emissions from the agriculture sector also represented 27% of the national total in the same year, excluding emissions from land use change (LUC) associated with the sector.

To start measuring its agricultural emissions, Santander focused on the farm gate considering physical activity data captured at the origination of the loan such as property location, livestock farming by type and number of animals, commodity production by type, crop area financed by commodity in hectares, or quantity produced by commodity, in tons.

The first challenge was to define the most relevant sources of emissions for each agricultural activity, which may vary substantially by activity type. For instance, to estimate emissions from cattle raising, it was established that enteric fermentation, manure handling and pasture management would be considered, as these sources covered the majority of GHG emissions/removals from this activity.

Santander strived to use emission factors that were both robust and unit compatible with the physical activity data available. National Inventory and GHG Protocol Brazil for Agriculture emission factors were the preferred choice, but not always attainable, in which case proxies were used.

Although physical data was sufficient to estimate the key GHG emitting sources, obtaining specific farm-level data as use of inputs, soil or crop management, animal weight and age, or energy consumption is still a challenge. To address this gap, Santander had to establish assumptions based on existing literature and expert advice.

[23] UK Department for Environment Food and Rural Affairs. Agri-Climate report (2021).

Accounting for land use change (LUC) emissions resulting from the conversion of natural vegetation to agricultural or pastureland was also a significant challenge faced in this exercise as it is still unclear how these emissions should be measured or how far back banks should look.

Establishing an emissions baseline highlighted the level of complexity of the agribusiness sector, and there are several lessons to be considered going forward, namely:

- There is a clear need for an integrated view of the property financed in its totality, as opposed to a restricted view of the financed activity on its own, so that an appropriate balance of all property emissions and removals can be considered.
- Before a quantitative emissions target is established, there is an opportunity to work on improvements to existing data already being captured at loan origination.
- There is a need to establish clear parameters for inclusion and measurement of LUC emissions stemming from past conversions from native forest to agricultural activities, especially for emissions that occurred prior to the origination of the loan.
- It is also important to recognize that land use can also be seen as an opportunity to decarbonize a portfolio because of the land's potential to be a source of carbon capture, as better crop and pastureland management techniques are adopted.

Banks are encouraged to explore options for data collection that minimize burdens on the farmer. Most banks already have access to a number of sources that can provide certain data on farms, and there might be opportunities for additional partnerships to enable access to even more farm-level data as outlined below. In some cases, additional data sets can be created or made public by government, industry, and other groups to provide additional farm-level data while limiting the burden on farmers to report that data.

- **Financial disclosures:** In many cases, farms will report some farm-level data (e.g., acres sowed, annual revenues, head of cattle) as a component of the bank transaction. Such data can provide valuable insight into what is happening on the farm that would otherwise be unavailable. However, these data are often unstructured (e.g., in free text format), not digitized, or not connected to ESG systems, making their use for emissions measurement a challenge. Banks could consider developing processes to make data from transactions accessible for emissions measurements but should take care to adhere to relevant laws on the use of transaction data.
- **Aggregate data:** There are a range of industry, academic, and governmental bodies that collect and aggregate agricultural data for public use. Examples include the US's Agriculture Census, the EU's Farm Structure Survey, and the UN FAO's Food and Agriculture Statistics. These sources can provide a valuable starting point for banks and can often be used to inform assumptions about farm-level activities based on location, size, and type of client. All

B4ICA member banks that have begun to establish a baseline of agriculture emission have made use of public and/or industry aggregated data.[24]

- **Commercial partnerships**: There are many companies around the globe that store highly relevant farm-level data through their operations. For example, precision agriculture companies record rich data to help optimize farming practices, animal medicine companies know which farms are using different supplements and medications to impact emissions, and upstream providers of farm inputs know what types of feed and seeds are being used. Banks can consider partnerships with other companies in the agriculture sector to get farm-level or aggregate data, depending on data ownership and sharing practices.

Banks are unlikely to find a one-sized solution to data and should expect to leverage a variety of data types and sources to inform their baseline measurements. Banks and their stakeholders should also be aware that data enhancement will remain a process of continuous improvement over time and as data improves, baseline measurements will evolve.

CASE STUDY: Lloyds Banking Group

Lloyds Banking Group has a diverse portfolio of agriculture clients that it is engaging with on climate transition initiatives. One of the Bank's objectives was to better understand the climate impact of their clients and more accurately measure emissions data. To do so, they partnered with third party data collectors Cool Farm Tool, Agrecalc, and Farm Carbon Toolkit in June 2020, and encouraged customers to baseline their carbon emissions using these tools.

Initial use by their customers showed they were keen for:

- A tool that was straightforward to complete
- An approach which used standard methodologies, and provided standardized results
- Certainty about DEFRA and RPA regulatory requirements for calculators to be completed as part of the Environmental Land Management scheme (ELM)

These findings from the pilot have informed the Bank's next phase of work, helping to shape a proposition which integrates a carbon calculator into a more holistic baselining of farm sustainability looking at soil health, biodiversity, emissions, water quality, animal health and welfare, and social impact. Working in partnership with the Soil Association, the bank is piloting consultancy visits to farms to assist with measurement of baselines, identification of areas for improvement, and development of action plans to implement best practices. These will focus on both environmental and financial sustainability, by demonstrating how environmental changes will also enable the business to make cost savings and improve income.

By offering this consultancy service to Lloyds Banking Group's largest borrowers in the sector, the Bank aims to build up a database of financed emissions across approximately half their lending book, allowing them to extrapolate data across their portfolio. They will also leverage any learnings to develop case studies and best practice for all of their farming clients. This "Measure,

[24] BCG B4ICA Member & Partner Survey analysis (2022). Of the B4ICA members that have reported initiating baselining, all indicated that they had collected agricultural "*Region/Industry Average Activity Data*"

Improve, Reward" theme is being well received by farmers, encouraging them to look at where they are on their sustainability journey.

Analytical approaches to measuring emissions

Establishing a baseline of agricultural emissions requires analytical tools to translate farm-level activity data into an estimate of GHG emissions. Banks have two tools to support this process: emission factors and emission proxies. In other sectors direct emissions measurement is also used to assess real emissions, but direct measurement is not currently viable at scale due to technological and economic constraints.

For most banks, emission factors present the best available method for measuring agricultural emissions. Emission factors are scientifically derived and peer-reviewed values that attempt to relate the quantity of a greenhouse gas released into the atmosphere with an activity.[25] These factors are generally based on the average emissions derived from such activities and are generally assumed to represent long-term averages. PCAF recognizes emission factors based on both physical activities (e.g., emissions per head of cattle) and financial activities (e.g., emissions per revenue) but states a preference for physical activity-based emission factors. B4ICA supports this preference for emission factors based on physical activities because they are grounded in the emitting activities, and are less prone to fluctuation due to changes in prices, exchange rates, and other economic factors.

Degrees of granularity exist across emission factors. Less granular emission factors use a single variable (e.g., number of cattle raised, hectares of wheat planted) and typically do not reflect geographic variability in emissions. Some other emission factors leverage more comprehensive input data and can account for geographic variation and nuanced differences in emissions from different species, farming techniques, and farm inputs. IPCC's Guidelines for National Greenhouse Gas Inventories provide further information on different tiers of emission factors for the agriculture sector. While less granular emission factors offer a lower data burden to use, more detail emission factors will likely be needed for banks to detect changes to emissions from clients over time. The USDA is a helpful source for additional explanation of emission factors and their limitations.

PCAF's Carbon Account Financials database is a helpful resource for banks to identify sources for verified emission factors. Example sources of agriculture-related emission factors include ecoinvent, IPCC, and GEMIS (Global Emissions Model for integrated Systems). B4ICA does not endorse any specific source for emission factors. However, banks are encouraged to use factors that account for the highest level of data granularity as is feasible based on available input data. Where possible, banks are encouraged to use the same source for agriculture emission factors as are used for other sectors within the bank's portfolio.

In cases where emission factors are not available or not practical due to data constraints or other barriers, emission proxies can offer an alternative form of emissions estimates. At present, many banks have extremely limited insight into farm-level factors such as soil quality and activities

[25] Adapted from USDA (2022) Basic Information of Air Emission factors and Quantification.

occurring on farms such as use of agrochemicals and fertilizers**.** In such cases banks could consider making assumptions about emissions based on proxies, such as the size of the farm or location and use aggregate data sources to deduce an estimate of emissions.

As with less granular emission factors, emission proxies pose a challenge for emissions targets because they do not reflect client-level activities that might influence emissions. While emission factors are standardized, there is no industry standard approach for proxy metrics. There is an opportunity within agriculture to standardize proxies used throughout the sector, though banks might retain the flexibility to develop bespoke proxies when needed.

Accordingly, **banks are encouraged to use emission factors when possible, and to use emission proxies only for clients for which emission factors cannot be applied**. Banks are also encouraged to transparently publish methods and assumptions used to develop emission proxies; doing so will be critical to establishing credibility of proxy-based emission estimates.

Approaches to reporting and disclosures

NZBA expects members to publicly disclose their targets and report annually on progress, including a financed emissions profile where targets have been set. NZBA also expects disclosures with respect to 1) the scope, boundary, and coverage of both the asset classes and the sectors included in the baseline, 2) measurement methods, and 3) metrics used at the portfolio, asset class, or sector level. **This report builds on NZBA's guidelines and encourages banks to disclose as much additional detail as possible for the agriculture sector. To that end, additional levels of granularity that banks are recommended to disclose include:**

- Scenario and key underlying assumptions
- Gross and/or net (inclusive of removals) emissions, targets, and pathways
- Absolute and/or intensity targets, pathways, and progress
- Sub-sector and geographic granularity used
- Methodologies used to establish baseline measurement, including source of emission factors, explanation of proxies, and key assumptions

Banks are under significant pressure to begin establishing an agricultural baseline but improving data and analytical tools will likely cause baselines to shift over time. To manage these changes and maintain transparency, **it is essential that banks include an explanation of methodological changes between baselines in their disclosures**. Banks are also encouraged to disclose the impact of those methodological changes on estimated emissions totals, and what share of emission reductions (or increases) are due to methodological changes versus true changes in clients' emissions.

Chapter 4: What's next: how to move forward on net zero in agriculture

As banks set targets for agriculture, they will begin to develop a picture of how they could operationalize their institution's net zero commitments for their agricultural portfolio. They are then faced with the challenge of developing further granularity and tangible action plans to execute on their targets. In this chapter, the report looks to the future of climate transition and improved emissions measurement.

Climate transition opportunities for banks

As banks set targets and pathways to net zero, they will gain critical information about sources of emissions and where they can focus to address the emissions attributable to their portfolios. Each bank will need to develop their own strategy to achieve its emissions targets, including approaches to work with various stakeholders to address sources of carbon dioxide, methane, and nitrous oxide.

B4ICA has identified three areas in which banks can consider taking quick action to begin aligning their agricultural portfolios with emissions targets. This is just a starting point and banks will need to develop a customized approach to address their own portfolios.

- Prioritizing engagement with the highest emitting clients
- Implementing tailored approaches to support farmers in their climate transition
- Partnering with others in the agriculture sector to facilitate change at scale

Prioritizing engagement with the highest emitting clients: Through the process of defining targets, selecting pathways, and establishing a baseline, banks will gain valuable insights into drivers of emissions attributable to their portfolios. Banks can leverage this information to begin prioritizing the highest emitting portfolio segments and clients and have the largest opportunity to address those emissions. Banks can also begin to prioritize specific technologies and tools that might help high-emitting clients make tangible short-term improvements (e.g., funding implementation of precision agriculture tools to make fertilizer application more efficient) and invest in long-term shifts towards sustainable farming (e.g., financing feed additives, new infrastructure, or transition to alternative products). The Environmental Defense Fund's report on opportunities to reduce agricultural emissions in this decade provides additional information on proven strategies that banks can support their clients to adopt.

Implementing tailored client engagement approaches to support farmers: The agriculture sector is unique in the important role that farmers play, and banks will need to effectively engage with farmers and other customers across the agriculture value chain to achieve their emissions targets. In many cases, effective farmer engagement will require new approaches to relationship management to foster strategic collaboration.[26] An important first step is for a bank to be able to clearly articulate

[26] The Cambridge University Institute for Sustainability Leadership (CISL) has outlined a bank client engagement framework which might be useful to banks as they consider ways to work together with farming clients

its emissions targets, what role the bank's clients will play in achieving those goals, and what value the approach can bring to clients. For example, banks can work with their borrowers to understand the financial barriers to low-emitting practices and technologies (e.g., multi-year transition processes, high upfront costs, yield risks) and adapt their offerings to allow farmers to successfully overcome those barriers. The Farmers Business Network and Environmental Defense Fund outline one such example of innovative financing in response to customer demand through their Regenerative Agriculture Finance Fund initiative.

Partnering with others in the agriculture sector to facilitate change at scale: The banking sector is part of a broader network supporting agriculture: government, industry, academia, and civil society each have important roles to play to create an enabling environment that supports farmers to reduce emissions from agriculture. Banks can look outside the traditional bank-client relationship to facilitate access to a broader ecosystem of actors and resources for farmers, including by:

- Facilitating access to grants, subsidies, and government-provided support
- Connecting farmers with agronomic advice or peer farmer networks
- Providing access to preferential rates for inputs and machinery
- Connecting farmers to downstream commodity purchasers willing to pay premiums for sustainable practices
- Developing of advisory services to support farmers in navigating various certification or environmental market opportunities

Sector-level next steps

B4ICA identifies topics where additional guidance and innovation would help to support banks and their farming clients on the journey to net zero:

Opportunity 1: **Improving the selection and quality of scenarios and pathways** to facilitate target setting can help to address a major barrier for banks, which cite inadequate granularity and applicability to national political and regulatory contexts as key barriers:

- Expanded geographical and sub-sector granularity within existing scenarios, and a wider selection of pathways to facilitate target setting that considers individual decarbonization pathways and the changes those pathways imply
- Further development of regional and national climate plans, scenarios, and pathways to provide banks with clear guidance and mobilize the farming sector
- Additional transparency into how emissions and removals are incorporated into climate scenarios (e.g., models can be more transparent about assumptions on permanence when including nature-based land removals into scenarios)

Opportunity 2: Better strategies and approaches to access agricultural **data and establish baselines**

- Increased public access to existing data sets and development of additional data sources to support target setting and climate transition in agriculture
- New solutions to collect data from farmers that reduce the burden while ensuring a clear value proposition for farmers

- Development of more granular emissions factors that better account for nuances across geographies and productions methods
- Standardization for key assumptions and emission proxies to make baselines more efficient and help improve comparability across banks

Opportunity 3: **Additional guidance** to support banks as they work with other actors across the agriculture sector and related sectors toward net zero

- Guidance on net zero target setting for forests and specific commodities
- Guidance on how financial institutions can assess, transform, and disclose climate and nature risks relating to agriculture and forestry
- Supplemental guidance on setting and operationalizing sub-sector targets by evaluating individual decarbonization pathways and the related transformations they imply
- Supplemental guidance on different approaches to target setting focused on other upstream and downstream actors in the agriculture value chain
- Approaches to mobilize upstream and downstream agribusiness players to shape the supply chain in support of low-emissions products
- Strategies to bring together banks, government, industry, and others to support farmers transitioning to low-emissions farming techniques
- Additional clarity on the role that nature-based removals and carbon credits should play in the agriculture sector

B4ICA next steps

Recognizing the work to be done in this space to equip banks to set and meet emissions targets for their agriculture portfolios, B4ICA will consider taking up the following topics in future phases of work it develops to support banks in this space, and welcomes partnership from other organizations to do so:

1) **Development of risk management frameworks and tools to inform decision making:** To effectively implement targets and develop actionable transition plans, banks will need tools to help them gain a comprehensive understanding of the risks associated with their agriculture portfolios. B4ICA will consider evaluating existing risk management tools, such as the TCFD Reference Scenarios tool for Agriculture, to understand the applicability for banks and identify gaps where additional tools and frameworks are needed. B4ICA might also consider developing standardized risk assessment frameworks or guidance on key considerations for banks that could provide valuable insight to inform decision making or client engagement. There might also be an opportunity to develop a similar TCFD Reference Scenarios tool, specifically for the forestry sector.
2) **Standardization of data collection and measurement methodologies, and creation of additional analytical tools where needed to improve data quality and accessibility:** To enable comparability, B4ICA might consider establishing industry-standard parameters on emission measurement methodologies, such as the selection and use of emission proxies or more granular data sources. To address the current data gaps and complexities that exist in the agriculture sector, B4ICA might also consider creating resources to improve the

accessibility and quality of emissions data banks have access to, by evaluating existing sources of farm-level data collected by governmental organizations, other value chain players, and third-party data aggregators.

3) **Development of supplemental guidance to provide further granularity on key topics:** Additional topic-based guidance can be developed to address unique regional and commodity-specific considerations, and activities that extend beyond the agriculture farm gate. This could include guidance on evaluating sub-sector decarbonization pathways as an input to target setting and execution, approaches for measuring emissions across the end-to-end agriculture value chain (including downstream emissions), or target setting for the forestry sector.

Appendix 1: Hypothetical bank target setting decisions

The following examples have been created to help banks gain a better understanding of how they might make target setting decisions based on their sub-sector and geographic concentration. These examples are hypothetical and not representative of the actual portfolios or decisions of any banks.

Hypothetical Example 1: "Global Bank"

- Large and highly diversified with an agriculture client portfolio spread across several continents and a wide range of crops and livestock.
- Agriculture portfolio primarily comprises smaller SMEs
- Has very limited data on agriculture clients and their activities

Decision points	Decision Logic
1. What does our agricultural portfolio look like?	• Global agriculture portfolio including clients across North America (25%), South and Central America (20%), Europe (25%), APAC (20%), and Africa (10%). • North American portfolio is Crops (50%), livestock (25%), and mixed/unknown (25%). Sub-sector granularity in other regions is not available
2. What levels of granularity might be incorporated into targets?	• Priority 1: Sufficient sub-sector granularity to differentiate between crops & livestock and enable decision-making to operationalize targets for crop and livestock clients • Priority 2: Sufficient regional pathways to cover the bank's portfolio spread globally
3. How should we select a scenario to set targets?	• Scenarios should allow for crop and livestock granularity and regional granularity reflecting the portfolio • OECM scenario selected because it is an NZBA-endorsed SSP1 scenario • SSP1 scenario assumptions best align with the bank's internal assumptions about socio-economic development in the future • The bank is comfortable with OECM's underlying assumptions, such as a 2035 phase-out of forest and peat loss and its view on the role of land-based removals • OECM disaggregates by sub-sector. However, the bank is only able to disaggregate into Global, North American and European regions, which is not as granular as it would have liked • Bank will also need to recognize that OECM does not account for nitrous oxide emissions, which is not optimal
4. What type of pathway do we choose?	• Uses Global, European, and North American regional pathways • APAC, South and Central America, and Africa are covered by the Global pathway, but may be disaggregated in the next 3-5 years • Crop pathway and a Livestock pathway used for clients where sub-sector differentiation is known

Decision points	Decision Logic
	• General agriculture pathway used for clients where sub-sector disaggregation is not known
5. How do we set targets?	• Intensity: Based on the limited production data they have on their farming clients and their practices; they are only able to set a physical intensity metric using proxy fresh weight metrics. They disclose this goal clearly to external stakeholders, along with a plan to work with farmers, governments, and industry groups to increase farm-level data and to annually review the possibility of revising their targets • Gross: Because Global Bank does not have visibility into farming practices, removals are not factored into their targets or progress updates
6. Where are there gaps?	• More regional granularity needed to improve ability to operationalize targets. To that end, they aim to work on gaining more region-specific data, including working with farming clients to gain primary data. They aim develop a method to augment the existing pathways into country-specific pathways, perhaps using national climate scenarios as reference points • The bank plans for more commodity granularity so it can prioritize key industries and launch campaigns with those industries to support their decarbonization • They then plan to annually review the feasibility of disaggregating geographic and sub-sector pathways further.

Hypothetical Example 2: "European Bank"

- Small regional bank with a focus on agriculture and a client portfolio with concentration in Western Europe and in livestock, dairy, and horticulture
- Has not yet set any targets due to a lack of guidance specific to agriculture in the region
- Climate change is a high priority for the business and stakeholders, driving the bank to act quickly

Decision points	Decision Logic
1. What does our agricultural portfolio look like?	• European Bank is relatively small, with 80% of its agricultural portfolio based in the European Union. 20% of its portfolio are spread globally (Australia, N America, S America, Asia, and Europe) • Share of lending: dairy (30%), fruits and vegetables (30%), flowers (20%), pork (10%), Other (10%) • Share of emissions: dairy (30%), fruits and vegetables (30%), Pork (20%), flowers (20%), Other (<1%)
2. What levels of granularity might be incorporated into targets?	• Priority 1: Country-specific pathways. Global or European-level scenarios would not capture the state of agriculture in each country, especially considering environmental progress already made by some countries' farmers • Priority 2: Additional country-specific pathways to cover the 20% of its client base outside of the EU
3. How should we select a scenario to set targets?	• European Bank considered using IMAGE 3.0 SSP2-2.6 given the availability of commodity pathways provided by SBTi FLAG but did not feel that the regional granularity (Western Europe) was sufficient. Furthermore, the commodity pathways did not cover fruits and vegetables, key sub-sectors for European Bank • Without country-specific IAM scenarios readily available, European Bank considered using national climate targets, but found that they were inconsistent across countries and decided that using different country-level scenarios would add too much complexity to their overarching target • Ultimately, European Bank opts to use IMAGE 3.0 SSP2-2.6 and its Western European pathway because the regional granularity provides adequate, though less than ideal, granularity for the largest share of its portfolio
4. What type of pathway do we choose?	• Used SBTi FLAG pathways for dairy and pork, and agriculture sector-level pathways for the remainder of its portfolio for which SBTi does not have defined pathways • Also used Western Europe regional granularity for the share of its portfolio in Western Europe, and global pathways for the rest of its portfolio due to the high level of differentiation outside Western Europe
5. How do we set targets?	• Sets targets for dairy, pork, and other agriculture in Western Europe and globally

Decision points	Decision Logic
	• Absolute: They do not have sufficiently accurate data on production to be able to convert to intensity targets, so choose to set absolute targets instead. They are careful to avoid assumptions that they will divest from higher-emitting sectors or geographies so they can instead focus on decarbonization within their current customer base • Gross: Because SBTi requires that banks establishing net targets also establish gross, European Bank decides only to set gross targets. They are also wary about making assumptions about the role that removals will play because guidance is still evolving
6. Where are there gaps?	• SBTi does not provide commodity pathways for fruits and vegetables or for flowers, both of which represent material shares of European Bank's portfolio. • More universal and consistent national level plans could help to provide European Bank with clearer and more relevant pathways in geographies where it is most heavily represented.

Hypothetical Example 3: "Latin American Bank"

- Large, diversified bank with a substantial agricultural portfolio
- Already has targets for oil/gas and power (IEA NZE 2050) and uses NGFS scenarios for TCFD and risk analysis
- Has not yet set an agriculture target because of concerns that IEA and NGFS do not meet Latin American Bank's needs for the sector

Decision points	Decision Logic
1. What does our agricultural portfolio look like?	• Operations are split between Brazil (~50%) and other Latin American countries (~50%) • Clients are spread throughout Latin America, with very different climates and farming practices • Share of lending: beef (20%), soy (15%), poultry (5%), pork (5%), coffee (10%), sugarcane (10%), wheat (5%), rice (5%), oranges (5%) cotton (5%), maize (5%), cacao (5%), other (5%) • Share of emissions: beef (30%), soy (25%), poultry (10%), pork (10%), coffee (2%), sugarcane (2%), wheat (5%), rice (5%), oranges (1%), cotton (2%), maize (3%), cacao (4%), other (1%)
2. What levels of granularity might be incorporated into targets?	• Priority 1: Brazil-specific and other Latin America. Breakdown within Brazil (to inform client engagement strategies) would be ideal. • Priority 2: Commodity breakdown. Latin American Bank decides to ensure granularity for all commodities at or above 10% of emissions as highly material. For any <10%, goal to include granularity where possible, though lower priority. • Latin American Bank decides on generic sector pathway for long-tail "Other" (<1% of total share of emissions, so considered below threshold for differentiation).
3. How should we select a scenario to set targets?	• Latin American Bank wants to avoid "mixing and matching" scenarios and was inclined to use NGFS, but it does not have sufficient commodity breakdown. IEA does not cover agriculture • SBTi FLAG pathways and the IMAGE 3.0 SSP2-2.6 scenarios are an appealing starting point, as they have commodity pathways already established for seven of the bank's major commodities. The pathways are also disaggregated into Brazil vs Other Latin America • OECM model is also considered, however less granularity is available for regions in the OECM model • Due to local context, Latin American Bank wants to make sure that assumptions in the scenario on land use change, especially deforestation, are realistic, as it does not want its pathway to diverge from real emissions based on deforestation. OECM assumes a full phaseout of deforestation by 2035, while IMAGE 3.0 assumes zero deforestation achieved by 2030 • However, because the regional and commodity pathways are important to Latin American Bank and it has limited resources to

Decision points	Decision Logic
	design bespoke pathways, they decide on using SBTi FLAG as a basis, with assumption that pathways could be adjusted in future if new SBTi guidance emerges
4. What type of pathway do we choose?	• Due to choice of SBTi FLAG pathways, Latin American Bank applies a general sector pathway, as well as commodity pathways for beef, soy, pork, poultry, maize, rice, wheat. Latin American Bank is aware that forestry is included in the scope of SBTi FLAG targets, so adapts the pathways accordingly to exclude forestry
5. How do we set targets?	• Chose to set and disclose targets for sector and commodity pathways. While this invited more public scrutiny, Latin American Bank felt confident the transparency would be welcomed • Both absolute and intensity: Latin American Bank wants to achieve two goals: ensure targets are easy to communicate and easy to understand (absolute) while ensuring they can support relationship managers in conversations with farmers and track progress (intensity). • Latin American Bank chose to set net targets as the SBTi FLAG pathways are already net. It also made it a lot easier for Latin American Bank to track progress made through increasingly popular sequestration measures in Brazil, such as agroforestry. • Latin American Bank developed gross targets, as well, and chose to disclose them for transparency. To avoid concerns that Latin American Bank was overly reliant on removals, it included justification of the role of nature-based removals, referring to SBTi's methodology and assumptions
6. Where are there gaps?	• Latin American Bank aims to review data to see if baseline must be reviewed. • Latin American Bank would like to use pathways for sugar, cacao, coffee, and orange, so will discuss with the SBTi and/or the IMAGE 3.0 team and adopt those pathways if they become available • Additionally, Latin American Bank would like to differentiate pathways among Latin American sub-regions, to reflect different practices and climates.

Hypothetical Example 4: "South & Southeast Asia Bank"

- Mid-sized bank with a strong presence across South & Southeast Asia
- Has a substantial agricultural portfolio, which is spread across a wide variety of commodities due to its geographical spread
- Does not have any targets yet. It wants to ensure that its targets allow for food security in the developing world

Decision points	Decision Logic
1. What does our agricultural portfolio look like?	• South & Southeast Asia Bank's portfolio is spread across Southeast Asia, with a large presence in Indonesia and India. • Its portfolio is 40% oil palm, 30% sugar, 20% cocoa, and 10% mixed agriculture.
2. What levels of granularity might be incorporated into targets?	• South & Southeast Asia Bank's portfolio is spread across Southeast Asia, with a large presence in Indonesia and India • Its portfolio is 40% oil palm, 30% sugar, 20% cocoa, and 10% mixed agriculture
3. How should we select a scenario to set targets?	• Priority 1: Commodity pathways. South & Southeast Asia Bank has a strong portfolio of large palm oil clients for whom it has a lot of farm-level data. It has poor quality data on its sugar, cocoa, and mixed agriculture clients, who are typically smaller in size • Priority 2: Regional pathways. Palm Bank wants to make sure that it supports its farmers in a tailored way that recognizes local contexts to the best ability
4. What type of pathway do we choose?	• South & Southeast Asia Bank considers creating individual country-specific scenarios based on national climate plans. However, it determines that several of the country plans it is considering do not meet NZBA criteria, so it decides to use an available IAM scenario • South & Southeast Asia Bank considers other scenarios with high levels of regional granularity, such as PRI's Inevitable Policy Response scenario, but is not aligned with the scenario's assumptions about deforestation (end to global deforestation by 2025) and food demands • The IMAGE 3.0 SBTi FLAG pathways disaggregate into Southeast Asia, Indonesia region, India and Rest of South Asia. However, it only includes pathways for palm oil, – not sugar and cocoa.
5. How do we set targets?	• Because of limited data and lack of pathways for sugar, cocoa, and mixed agriculture, South & Southeast Asia Bank decides to disaggregate its pathways and targets into palm oil and general agriculture only. This is meant to be a short-term approach only • It disaggregates its pathways and targets into Southeast Asia, Indonesia region, India and Rest of South Asia

Decision points	Decision Logic
6. Where are there gaps?	• Intensity: South & Southeast Asia Bank is forecasting a growing agriculture market and wants to make sure it can accommodate for increased food production, so decides to set intensity targets rather than absolute targets • Net and gross: South & Southeast Asia Bank knows that it will work with its clients on land use change, such as reforestation of deforested areas. It already has partnerships with NGOs through its industry leadership work that it can leverage to support this transition. Therefore, net targets and pathways will be necessary to account for carbon sequestration

Appendix 2: Relevant guidance for banks setting emissions targets for agriculture

This Appendix outlines some key sources for guidance on GHG emissions target setting that might be relevant to banks as they set targets for the agriculture sector. This is intended to provide banks with a starting point to access additional information. This list does not constitute an endorsement of any guidance by B4ICA, nor is this list exhaustive. For additional detail on sources used to develop this report, please see the References section.

General

UNEP FI Guidelines for Climate Target Setting for Banks and Supporting Notes are the core publications of guidance for NZBA. Banks can consult these documents to understand the expectations for banks under NZBA on Scope 3 emissions, scenarios, targets, and reporting.

Sustainable Markets Initiative A Practitioner's Guide for Banks: Considerations for banks in setting a net zero strategy offers useful practical guidance on target setting for banks across different sectors, including additional discussion on concepts such as baselines, scenarios, absolute vs. intensity targets, and disclosures. It is helpful in elaborating on the steps banks need to take to set targets.

Data & Accounting

PCAF Global GHG Accounting and Reporting Standard for the Financial Industry is the industry standard for banks accounting and reporting their GHG emissions. It also provides helpful guidance on data quality and offers PCAF scores to allow banks to benchmark their data against the standard. Banks are recommended to rely on PCAF guidance when assessing their portfolio's financed emissions and thinking about building a baseline for target setting.

GHG Protocol Land Sector and Removals Guidance: Part 1: Accounting and Reporting Requirement and Guidance and Part 2: Calculation Guidance. This draft guidance was released in September 2022, and is currently in public consultation. Therefore, B4ICA has not taken a position on this document and encourages banks to consider it carefully and provide feedback to GHG Protocol. Where SBTi FLAG guidance is aimed at target setting, GHG Protocol is focused on accounting, and should be read in tandem with PCAF. Particularly relevant for banks using this document is the guidance on accounting for land-based removals and carbon credits/offsets in their GHG inventory and toward targets.

Target Setting

Portfolio Alignment Team Measuring Portfolio Alignment: Technical Considerations includes technical guidance for setting targets and aligning portfolios across different sectors. It is useful, for example, as banks decide whether to set absolute or intensity targets and determine how to technically put them in place.

SBTi Forest, Land, and Agriculture (FLAG) Science-based Target Setting Guidance was released in final form in September 2022. It provides the SBTi approach to target setting for agriculture, and also provides a tool for companies to set 10 agricultural commodity pathways and targets for 26 different regions. The tool will also aggregate pathways and targets into sector and global targets. SBTi FLAG was not created specifically for financial institutions, so interested banks are encouraged to discuss

this tool with SBTi directly. It has been released alongside the draft GHG Protocol Land Sector and Removals Guidance, which the World Resources Institute (WRI) was also involved in drafting.

Decarbonization Planning

GFANZ Recommendations and Guidance on Financial Institution Net zero Transition Plans is a publication from the Glasgow Financial Alliance for Net Zero outlining how financial institutions can operationalize their net zero commitments. Banks can consult this document for guidance on creating decarbonization plans for agriculture, as outlined in Chapter 4, as well as suggested disclosure.

Glossary of terms

1.5 degrees Celsius Pathway	A pathway of emissions of greenhouse gases and other climate forcers that provides an approximately one-in-two to two-in-three chance, given current knowledge of the climate response, of global warming either remaining below 1.5 degrees Celsius or returning to 1.5 degrees Celsius by around 2100 following an overshoot
absolute emissions	Greenhouse gas emissions attributed to a financial institution's lending and investing activity, expressed in metric tons of CO_2 equivalent (tCO2e)
afforestation	Planting of new forests on lands which, historically, have not contained forests
agriculture	The practice of farming, including cultivation of the soil for the growing of crops and the rearing of animals to provide food, wool, and other products. For the purposes of this guidance, forestry (timber/wood/paper/pulp) products are not included.
agricultural products	Any raw or processed product/commodity that is marketed for human or livestock consumption (excluding water, salt, and additives). This includes livestock, crops, dairy, and other miscellaneous products.
alley cropping	The planting of rows of trees and/or shrubs to create alleys within which agricultural or horticultural crops are produced
carbon dioxide (CO2) equivalent	A way to place emissions of various radiative forcing agents on a common footing by accounting for their effect on climate. It describes, for a given mixture and amount of greenhouse gases, the amount of CO_2 that would have the same global warming ability, when measured over a specified time period.
emissions intensity	The amount of emissions of carbon dioxide equivalents released per unit of another variable such as physical output (e.g., energy production or vehicle kilometers driven) or a monetary unit (e.g., loan and investment volume)
emissions intensity metrics	Emissions per a specific unit, for example: tCO2e/€M invested, tCO2e/MWh, tCO2e/ton product produced, tCO2e/MWh, tCO2e/ton product produced, tCO2e/€M company revenue.
farm-gate	The boundary of the farm within the value chain. Includes physical and economic activities occurring on the farm, but excluding activities occurring upstream or downstream within the value chain
forest farming	The cultivation of high-value crops under the protection of a managed tree canopy. Sometimes also referred to as multi-story farming

forestry	The management of forests for the provision of goods and services such as forest products, carbon storage, and other ecosystems services
fresh weight	Weight of product recorded immediately at point of harvest, inclusive of water content present in the product
Global Warming Potential (GWP)	Potential to contribute to global warming through the greenhouse effect. Different greenhouse gases have different GWPs; CO_2 is the reference gas against which other GHGs are measured and therefore has a global warming potential (GWP) of 1
greenhouse gas (GHG)	Greenhouse gases are those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of terrestrial radiation emitted by the Earth's surface, the atmosphere itself, and by clouds. This property causes the greenhouse effect. Water vapor (H_2O), carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4) and ozone (O_3) are the primary GHGs in the Earth's atmosphere. Moreover, there are a number of entirely human-made GHGs in the atmosphere, such as the halocarbons and other chlorine-and bromine-containing substances, dealt with under the Montreal Protocol. Beside CO_2, N_2O and CH_4, the Kyoto Protocol deals with the GHGs sulfur hexafluoride (SF_6), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs). See also Carbon dioxide (CO_2), Methane (CH_4), Nitrous oxide (N_2O) and Ozone (O_3)
gross emissions	The amount of greenhouse gases released into the atmosphere, not inclusive of removals
Integrated Assessment Models (IAMs)	Models that seek to combine knowledge from multiple disciplines in the form of equations and/or algorithms in order to explore complex environmental problems. As such, they describe the full chain of climate change, from production of greenhouse gases to atmospheric responses. This necessarily includes relevant links and feedbacks between socio-economic and biophysical processes
land use change (LUC)	A transition from one land use category to another, such as from forest to grassland or cropland.
net emissions	The sum of positive emissions and removals (negative emissions) representing a total of greenhouse gas emissions over a defined period of time (e.g., annually)
net zero	Net zero emissions are achieved when anthropogenic emissions of greenhouse gases to the atmosphere are balanced by anthropogenic removals over a specified period. Where multiple greenhouse gases are involved, the quantification of net zero emissions depends on the climate

	metric chosen to compare emissions of different gases (e.g., global warming potential, global temperature change potential, and others, as well as the chosen time horizon)
Paris Agreement	The Paris Agreement, adopted within the United Nations Framework Convention on Climate Change (UNFCCC) in December 2015, commits all participating countries to limit global temperature rise to well-below 2 degrees Celsius above preindustrial levels and pursue efforts to limit warming to well below 2, preferably to 1.5 degrees Celsius, to adapt to changes already occurring, and to regularly increase efforts over time
reforestation	Establishment of forest on land that had recent tree cover
removal	Anthropogenic activities removing CO_2 from the atmosphere and durably storing it in geological, terrestrial, or ocean reservoirs, or in products. It includes existing and potential anthropogenic enhancement of biological or geochemical sinks and direct air capture and storage but excludes natural CO_2 uptake not directly caused by human activities. Removals within a biological sink are considered 'nature-based'.
Representative Concentration Pathways (RCPs)	Pathways that illustrate different emissions trajectories or concentrations that may occur in the future, leading to a range of temperature warming levels
scenario	A description of how the future may unfold based on 'if-then' propositions. Scenarios typically include an initial socio-economic situation and a description of the key driving forces and future changes in emissions, temperature, or other climate change-related variables.[27]
sequestration or removal	Refers to atmospheric CO_2 emissions that are captured and stored in solid or liquid form, thereby removing their harmful global warming effect.
scope 1 emissions	Direct emissions from operations that are owned or controlled by the reporting company
scope 2 emissions	Indirect GHG emissions from consumption of purchased electricity, heat, or steam
scope 3 emissions	Indirect emissions not covered in Scope 2 that occur in the value chain of the reporting company, including both upstream and downstream emissions. Scope 3 emissions could include the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled by the reporting entity, electricity-related activities (e.g.,

[27] SBTi FLAG guidance

	transmission and distribution losses), outsourced activities, and waste disposal[28]
Shared Socio-economic Pathways (SSPs)	Pathways that illustrate possible socio-economic conditions, technological developments, and other human-caused climate drivers that may influence GHG emissions and concentrations in the future
silvopasture	The deliberate integration of trees and grazing livestock operations on the same land

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About WBCSD

World Business Council for Sustainable Development (WBCSD) is the premier global, CEO-led company of over 200 leading businesses working collectively to accelerate the system transformations needed for a net zero, nature positive, and more equitable future.

We do this by engaging executives and sustainability leaders from business and elsewhere to share practical insights on the obstacles and opportunities we currently face in tackling the integrated climate, nature and inequality sustainability challenge; by co-developing "how-to" CEO-guides from these insights; by providing science-based target guidance including standards and protocols; and by developing tools and platforms to help leading businesses drive integrated actions to tackle climate, nature and inequality challenges across sectors and geographical regions.

Our member companies come from all business sectors and all major economies, representing a combined revenue of more than $8.5 trillion and 19 million employees. Our global network of almost 70 national business councils gives our members unparalleled reach across the globe. Since 1995, WBCSD has been uniquely positioned to work with member companies along and across value chains to deliver impactful business solutions to the most challenging sustainability issues.

Together, we are the leading voice of business for sustainability, united by our vision of creating a world in which 9+ billion people are living well, within planetary boundaries, by mid-century.

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