



National Action Plan for Agriculture GHG Inventory Improvement

Belize 2022



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National Action Plan for Agriculture GHG Inventory Improvement

Belize 2022

Prepared by:

Greenhouse Gas Management Institute in collaboration with the
Caribbean Agricultural Research and Development Institute (CARDI)

(Belize's Agriculture GHG Inventory Institute
under the IICA GCF CARICOM AgREADY Project

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Editorial coordination: Kelly Witkowski, Chaney St. Martin, and Shanna Prevost

Proofreader: Catalina Ann Saraceno

Layout: Kathryn Duncan

Cover design: Kathryn Duncan

Stevens, Luanne
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Castries, Saint Lucia
2023

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Acronyms

BAHA	Belize Plant Health Authority
BAIMS	Belize Agricultural Information System
BAU	Business as Usual
BPA	Belize Poultry Association
BPLA	Belize Livestock Producers Association
BSI	Belize Sugar Industries Limited
BUR	Biennial Update Report
CARDI	Caribbean Agricultural Research and Development Institute
GHG	Greenhouse Gas
IICA	Inter-American Institute for Cooperation on Agriculture
MAFFESDI	Ministry of Agriculture, Fisheries, Forestry, the Environment, Sustainable Development, and Immigration
MOU	Memorandum of Understanding
NAP	National Action Plan
NC	National Communication
NCCO	National Climate Change Office
NDC	Nationally Determined Contribution
NIR	National (GHG) Inventory Report
NMS	National Meteorological Service
QA	Quality Assurance
QC	Quality Control
SIMIS	Sugar Industry Management Information System
SIRDI	Sugar Industry Research and Development Institute
TACCC	Transparency, Accuracy, Completeness, Comparability, and Consistency

1. Introduction

The GCF-Readiness Project titled “Strengthening the foundation for a climate responsive agricultural sector in the Caribbean” (GCF CARICOM AgREADY, in short) is funded through a Grant Agreement with the Green Climate Fund (GCF) with The Ministry of Environment and Housing, The Bahamas as the lead National Designated Authority (NDA) and the Inter-American Institute of Cooperation on Agriculture (IICA) as the delivery partner.

The AgREADY project seeks to raise the profile of the agricultural sector in GCF’s climate financing prioritisation processes by positing an evidence-based and inter-sectoral argument that seats Caribbean agriculture as “low-emissions” and part of the solution for addressing climate change. The project logic is premised on a vision of developing “a climate responsive agricultural sector in the Caribbean that supports food security, livelihoods and uses natural resources sustainably” by addressing barriers of ineffective mechanisms and engagement with agricultural experts and stakeholders in GCF climate programming processes, policy gaps, and limited or fragmented data/information to inform climate risks planning, programming, and action in the sector.

The IICA-GCF Readiness Project targets nine countries (The Bahamas, Belize, Dominica, Haiti, St. Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, and Trinidad and Tobago) in the CARICOM sub-region, with specific activities related to the following objectives:

- To improve the enabling conditions to design, implement and evaluate options for enhanced climate action in the agricultural sector by strengthening policies, capacities, frameworks, methods, and institutional arrangements for collecting, monitoring, measuring, reporting, verifying (MRV), and analysing agricultural and associated activity data from the sector.
- To increase the number of projects identified for development and investment in a pipeline of evidenced-based and bankable projects aligned with regional and national priorities as informed by climate risk assessments of the agriculture sector.
- To disseminate best practices for institutional capacity building, coordination, and pipeline development of more robust proposals for building climate-resilience along prioritised agricultural value chains, with a focus on cultivating the innovative capacity of the region’s youth.

2. Context

Through the assessment of Belize's Fourth National Greenhouse Gas Inventory, submitted in 2020, Belize continues to be a net carbon sink. Notwithstanding this, there was a general increase in GHG emissions across almost all subsectors over the inventory period. The dominant emissions are from fuel combustion in the electricity generation and transport subsectors. Following this, emissions from the agricultural sector, the main emissions accounted for in this GHG inventory were those from enteric fermentation and manure management¹. As reported in its NIR, Agriculture remains one of the pillars of the Belizean economy. The vast majority of the rural population and the livelihood of the rural communities are also dependent on the environment through farming and forestry activities.

Since its submission of its first BUR, Belize has undergone an exercise to update its Nationally Determined Contributions (NDCs) in the years 2021-2022, in which the agriculture sector is prioritised, for example with its reference to avoiding emissions of at least 4.5 ktCO₂e related to agriculturally driven land use change by 2025 with a focus on upscaling sustainable agriculture and land management; reductions in livestock emissions by 10% in comparison to BAU, as well as references are made to the National Adaptation Strategy to Address Climate Change in the agricultural sector regarding the mobilisation of climate-smart agriculture investments and research into reducing post-harvest losses and increasing sector resilience at large².

¹ The Government of Belize, 2020.

² The Government of Belize, 2022.

3. Objectives and Methodology

The objectives of this project are to develop a National Action Plan (NAP) to improve the agriculture GHG inventory by:

- a) Assessing the status of the national agriculture GHG inventory
- b) Identifying areas for improvement
- c) Developing actions for taking the improvement plan forward
- d) Prioritising the actions

A review of Belize's latest available agriculture GHG inventory was completed to identify current institutional arrangements, data sources, data collection procedures, quality control and verification procedures, and tools utilised for inventory compilation. Any improvement plans suggested in the inventory reports or BURs and NCs were extracted and assessed. This information was used as a basis for discussions with national experts to determine what improvements are required to ameliorate the agriculture GHG inventory compilation process in each country and improve agriculture emission estimates in the future. The synthesis of the results was framed in accordance with current situations and opportunities to improve institutional arrangements, data sources, collection, quality control and verification procedures, MRV and archiving.

4. Assessment of Current Status and Opportunities for Improvement

4.1 Institutional arrangements

4.4.1 Current situation

Belize has been building national capacity through participation in the previous two national communications and greenhouse gas inventories, and it was expected that the third National Communication (NC) and first Biennial Update Report (BUR) would further that process as it sought to institutionalise the greenhouse inventory process (data collection, analysis, and report preparation) within the Government of Belize Departments. Previous GHG inventories and National Communications were prepared and submitted under the lead of the National Meteorological Service (NMS).

The Ministry of Sustainable Development, Climate Change, and Disaster Risk Management through the National Climate Change Office (NCCO) is entrusted with the role of leading the country's national and international agenda on climate change. Belize has been a party to the UNFCCC since 1992. The NCCO, in its capacity as Focal Point to the UNFCCC, is also the coordinating body for all reporting obligations to the Secretariat, including National Communications, Biennial Update Reports, and National Greenhouse Gas Inventory Reports.

Belize's national GHG inventory team is comprised of an Inventory Coordinator who synchronises all sector and crosscutting activities/reports and ensures the functionality of the GHG inventory management system; sector leads who take the executive roles in coordinating data collection, estimating, and reporting GHG emissions and sinks for their sectors, and crosscutting roles such as quality assurance/quality control; and uncertainty management leads who facilitate report quality indicators.

The GHG inventory exercise is now executed by an inventory team lead by the Ministry of Agriculture, Fisheries, Forestry, the Environment, Sustainable Development and Immigration (MAFFESDI). This structure was designed and intended to encourage buy-in to the process and eventual assumption of ownership by the relevant government authorities.

The involvement of the government officers was achieved through their preliminary work to obtain/access and share source data, via participation in data validation sessions, in the review of draft reports produced by the consultants, as well as through participation in the validation of the reports. Occasionally these government officers were themselves the sources of data and information³.

The sector lead for the agriculture sector is the country representative from the Caribbean Agricultural Research and Development Institute (CARDI).

4.4.2 Opportunities for improvement

The NCCO has created an inventory management structure that enables the coordination of key stakeholders' participation, such as various government departments and other institutions. The structure establishes the roles and responsibilities of these stakeholders through a system of sector leads with support groups for data collection and management⁴. This structure is currently operating on a mostly voluntary basis, except for a recurring MOU between the NCCO and CARDI for agriculture sector management, however, the country would benefit from similar agreements between the NCCO, and other sector leads for GHG inventory management.

³ The Government of Belize, 2020.

⁴ The Government of Belize, 2020.

Table 1 below shows the identified actions to improve the institutional arrangements for the agriculture GHG inventory compilation process.

Table 1: Potential actions to improve the institutional arrangements for the agriculture GHG inventory compilation process.

Goal	Actions
Expand capacity at the government level in national agriculture GHG inventories	Establish working groups to coordinate data available and sharing data and seek guidance from within the government on best approaches to integrate the Ministry of Agriculture and other data support providers (BAHA, BLPA, BPA, BSI) in the inventory process.
	Draft the standard operating procedure from the reporting identifying the key staff (positions) person from the ministry who should be responsible and encourage them to be trained to participate in the national agriculture GHG inventory process, and in what capacity (as support to the compiler, primary data collector, QA QC, etc.).
	Identify training opportunities to capacitate the staff person in their role
	Provide the inventory compiler with sufficient time to attend these training sessions and a clear list of expected outputs.
	Engage with the University of Belize Central Farm Campus to include GHG inventory basics and compilation as a credited course to the Bachelor' in its Climate Smart Agriculture program.
Formalised institutional arrangements for data collection	Identify key data providers of agricultural GHG inventory data (see section 1.2).
	Draft a set of data requirements from the various identified organisations (including details on what, how often, what format, etc.).
	Draft MoUs or data agreements, attach the data requirements and templates for data reporting, and formalise the data collection process with each data provider.

4.2 Data sources and data collection procedures

4.2.1 Current situation

For Belize, the GHG national inventory coordinator from the NCCO, was responsible for the identification and sourcing of all datasets at the national level, in collaboration with the sector lead institution for each sector, who identified all the national experts and/or institutions where the data would be sourced. The involvement of the government officers and/or sector leads was achieved through their preliminary work to obtain/access and share source data, and through participation in data validation sessions.

Data was prioritised from national sources, particularly for livestock where some data was collected from Belize Livestock Producers Association, Belize Poultry Association, and directly from the Department of Agriculture for soil enhancers.

The priority emission sub-categories, in order, for Belize are (a) enteric fermentation, (b) direct N₂O from managed soil, and (c) biomass burning.

Table 2: Data sources for Belize agriculture GHG Inventory activity data

Activity data	Data source
Livestock population numbers	
Cattle	Belize Livestock Producers Association
Buffalo	Belize Livestock Producers Association
Sheep/Goats	Ministry of Agriculture Sheep project, Livestock Department
Swine	Ministry of Agriculture, Belize Pig Council
Horses/mules/asses	FAOSTAT
Poultry	Ministry of Agriculture, Belize Poultry Association
Manure management data	Expert Judgement
Lime consumption	Ministry of Agriculture
Urea consumption	Belize Plant Health Authority (BAHA) (Fertilizer importation data)
N fertilizer consumption	Belize Plant Health Authority (BAHA) (Fertilizer importation data)
Crop residue data	Sugarcane Data (Cane Farmers Association), SIRD, SIMIS
Rice cultivation area and data	Ministry of Agriculture

Table 3: Categories included in the Belize agriculture GHG inventory and the tier-level approach

Category	E/NE/NO	Tier 1/Tier 2
3A1 Enteric fermentation	E	Tier 1
3A2 Manure management CH ₄	E	Tier 1
3A2 Manure management N ₂ O	E	Tier 1
3C1 Biomass burning	E	Tier 2 ⁵
3C3 Lime application (CO ₂)	E	Tier 1
3C3 Urea application (CO ₂)	E	Tier 1
3C4 Direct N ₂ O from managed soils	E	Tier 1
3C5 Indirect N ₂ O from managed soils	E	Tier 1
3C6 Indirect N ₂ O from manure management	E	Tier 1
3C7 Rice cultivation	E	Tier 1

E = Estimated; NE = Not estimated; NO = Not occurring

4.2.2 Opportunities for improvement

The major opportunity would be to standardise the data collection and ensure that more reliable information be collected for the sector. This would allow for a more realistic figure of the emissions, as for this exercise, some data still needs verification.

A focus on improving the frequency of data collection through extension officers and electronic surveys to populate the Belize Agricultural Information System (BAIMS) on a regular basis would greatly improve data quality and availability.

Table 4 shows the identified actions to improve the data and data collection process for the agriculture GHG inventory compilation.

Table 4: Potential actions to improve the data collection and data collection process for the agriculture GHG inventory compilation process.

⁵ Country-specific data was used for the emission factors for the burning of crop residues of sugarcane from the 2006 study by Booker/Tate Consultant Mr. David Eastwood "Sugarcane crop residue contribution to Nitrous oxide".

Goal	Actions
Enhanced data collection system (BAIMS)	Review digital data collection survey used for an annual agricultural survey as part of the Belize Agricultural Information System (BAIMS) and map gaps in GHG data indicators, (such as manure management system information, and synthetic and organic fertiliser use). Please note that this data is collected by BAHA and NOT the Ministry of Agriculture.
	Engage with the Policy and Data Unit to discuss the questions included in the agriculture data source for the inventory and survey.
	Identify critical questions relevant to the verification of agriculture GHG inventory data that could be added to the agricultural census data collection template.
	Assess the country coverage for extension officers to undergo data collection in a comprehensive and cost-effective way.
	Hold yearly stakeholder workshops (3 to 5) to identify the best way to collect the additional data and sensitised on the value of data collection, i.e., what can be collected through BAIMS, extension officers, the Department of Statistics, or other methods.
	Utilise the training material ⁶ from the IICA-GCF project to set up training courses at extension officer training centres to teach farmers/extension officers about climate change and GHG inventory data requirements.
	Pilot the provided data collection templates ⁷ or their modification into existing surveys at a few sites to understand the issues on the ground and to adapt the templates for local purposes (focusing on what key data can be collected such as crop management, livestock, manure management, and fertiliser use).
	Adapt the data collection templates to collect the country-specific data and produce the appropriate mechanism/integration into existing data collection processes for collecting this data.
Perform scoping study for financing from national activities/projects and/or regional projects to finance additional data collection efforts, system integration and administration.	
Collection of annual nitrogen fertiliser consumption data	Establish an MoU with the Belize Agricultural Health Association (BAHA), customs/imports section, to provide annual fertiliser data.

4.3 Quality control and verification procedures

4.3.1 Current situation

In the inventory cycle, the NCCO and its team of sector leads are responsible for reviewing the status of existing methods, data sources, and emissions factors, and play a vital role in emissions estimation, and ultimately report writing. This part of the inventory process requires various quality inputs such as uncertainty analysis, key category analysis and QA/QC checks to ensure that country estimations are reported according to IPCC Good Practice Guidelines and follow the TACCC Principles (Transparency, Accuracy, Completeness, Comparability, and Consistency). At the final stages of the process, where the draft NIR is reviewed to produce the final NIR, publication and dissemination to policymakers as well as the wider public ensure that transparency efforts are covered, and that informed national decisions and policy mainstreaming are facilitated.

Further to this, independent reviews of the inventory are conducted by experts who have previously done peer reviews, whose names are indicated in the NIR.

4.3.2 Opportunities for improvements

There is an opportunity to improve quality control and quality assurance by institutionalising specific roles for support members to the inventory compiler, who is charged with most of the quality control procedures as noted in the country's latest NIR.

⁶ See Appendix A on training material pamphlet from train the trainer training.

⁷ See Appendix B on example data collection template.

Table 5 shows the identified actions to improve the quality assurance and quality control procedures for the agriculture GHG inventory compilation.

Table 5: Potential actions to improve the quality assurance and quality control for the agriculture GHG inventory compilation process.

Goal	Actions
Institutionalisation of quality control and quality assurance procedures	Develop a list of specific QA/QC checks for the agriculture sector inventory (both for the calculation file and the report).
	Identify a quality controller for the agriculture GHG inventory (this may be the compiler for another sector, if resources are limited).
	Identify training opportunities to capacitate the inventory quality controller.
	Provide the inventory quality controller with sufficient time to attend these training sessions.
Improved QA of agriculture inventory	Develop a bilateral agreement with another Caribbean country so that the agriculture compiler from that country can review Belize's agriculture inventory and vice versa.

4.4 MRV and archiving

4.4.1 Current situation

The NCCO has initiated the development of a database in which all the data and information collected is being archived, currently on the NCCO internal drive, and the government file storage cloud. This builds on work that began with the third National GHG Inventory. All data are documented and stored as per archiving and documentation procedures, with the main custodian being the NCCO, in its database for archiving and retrieval.

The archived database contains; (a) all inputs datasets and datasheets; (b) country-specific excel calculation tool, including GHG emission and removal estimates from the AFOLU sectors from 1994-2017, (c) manuals and protocols, (f) literature reviewed, (g) completed QA/QC templates and protocols, and (h) all reports and documentation.⁸

4.4.2 Opportunities for improvements

The country could enhance its archiving infrastructure and management to ensure that inventory files are preserved cycle by cycle. This function is not currently institutionalised, although active efforts are being made to ensure data preservation is maintained.

⁸ *The Government of Belize, 2020.*

5. Overall action plan for improving Belize's agriculture sector GHG inventory

Goal	Task	Responsibility	Priority (L/M/H) #	Timeline (S/M/L) *
Expand capacity at the government level in national agriculture GHG inventories	Establish a working group to ask questions on available data and seek guidance from within the government on the best approaches to integrate the Ministry of Agriculture in the inventory process.	National Climate Change Office/ Ministry of Agriculture	H	M
	Identify a staff person from the ministry who would participate in the national agriculture GHG inventory process, and in what capacity (as support to the compiler, primary data collector, QA QC, etc).	Ministry of Agriculture	M	M
	Identify training opportunities to capacitate the staff person in their role.	National Climate Change Office/ CARDI	M	S
	Provide the inventory compiler with sufficient time to attend these training sessions.	National Climate Change Office/ CARDI	H	S
	Engage with the University of Belize Central Farm Campus to include GHG inventory basics and compilation as a credited course to the Bachelor in Climate Smart Agriculture program.	National Climate Change Office/ CARDI	M	M-L
Formalised institutional arrangements for data collection	Identify key data providers of agricultural GHG inventory data.	CARDI/National Climate Change Office	H	S
	Draft a set of data requirements from the various identified organizations (including details on what, how often, what format, etc).	CARDI/National Climate Change Office	H	M
	Draft MoUs or data agreements, attach the data requirements, and templates for data reporting, and formalise the data collection process with each data provider.	CARDI/National Climate Change Office	H	L
Enhanced data collection system (BAIMS)	Review digital data collection survey used for the annual agricultural survey as part of the Belize Agricultural Information System (BAIMS) and map gaps in GHG data indicators, (such as manure management system information, synthetic and organic fertiliser use).	National Climate Change Office/ CARDI/ Min. of Agriculture	H	M-L
	Engage with the Policy and Data Unit to discuss the questions included in the agriculture survey.	National Climate Change Office/ CARDI	H	M
	Identify a few critical questions relevant to the verification of agriculture GHG inventory data that could be added to the agricultural census data collection template.	CARDI	H	M
	Assess the country coverage for extension officers to cover data collection in a comprehensive and cost-effective way.	Ministry of Agriculture	H	M
	Hold a stakeholder workshop to identify the best way to collect the additional data, i.e., what can be collected through BAIMS, extension officers, the Department of Statistics or other methods.	National Climate Change Office/ CARDI/ Ministry of Agriculture	H	M-L
	Utilise the training material ⁹ from the IICA-GCF project to set up training courses at extension officer training centres to teach farmers/extension officers about climate change and GHG inventory data requirements.	National Climate Change Office/ CARDI/ Ministry of Agriculture	H	M-L
	Pilot the provided data collection templates ¹⁰ or their modification into existing surveys at a few sites to understand the issues on the ground and to adapt the templates for local purposes (focusing on what key data can be collected such as crop management, livestock, manure management, and fertiliser use).	National Climate Change Office/ CARDI/ Ministry of Agriculture	H	M-L
	Adapt the data collection templates to collect the country-specific data and produce the appropriate mechanism/integration into existing data collection processes for collecting this data.	National Climate Change Office/ CARDI	H	M-L
	Perform scoping study for financing from national activities/projects and/or regional projects to finance additional data collection efforts, system integration and administration.	National Climate Change Office	H	L
	Inclusion of a digital national agriculture platform for data submission and collection to encourage reporting on the sector.	National Climate Change Office/ CARDI	H	L

⁹ See Appendix A on training material pamphlet from train the trainer training.

¹⁰ See Appendix B on example data collection template,

Collection of annual nitrogen fertiliser consumption data	Establish a MOU with the Belize Agricultural Health Association (BAHA), customs / imports section, to provide annual fertiliser data.	National Climate Change Office	H	M-L
Institutionalisation of quality control and quality assurance procedures	Develop a list of specific QA/QC checks for the agriculture sector inventory (both for the calculation file and the report).	National Climate Change Office / CARDI	H	M
	Identify a quality controller for the agriculture GHG inventory (this may be the compiler for another sector, if resources are limited).	National Climate Change Office / CARDI	H	L
	Identify training opportunities to capacitate the inventory quality controller.	National Climate Change Office / CARDI	H	L
	Provide the inventory quality controller with sufficient time to attend these training sessions.	National Climate Change Office / CARDI	H	L
Improved QA of agriculture inventory	Develop a bilateral agreement with another Caribbean country so that the agriculture compiler from that country can review Belize's agriculture inventory and vice versa.	National Climate Change Office / CARDI	M	L

[#]L = Low, M = Medium, H = High

^{*}S = Short term (within 1 year), M = Medium term (completed within 2 years), L = Long term (completed within 4 years)

6. References

The Government of Belize. 2022. *Draft Belize NDC Implementation Plan*.

The Government of Belize. 2020. *Belize's National Inventory Report*.

Appendix A: 1-Page Handouts on Data Collection Training



DATA COLLECTION ON LIVESTOCK FARMS FOR GREENHOUSE GAS EMISSION MONITORING





How do livestock impact greenhouse gas emissions?



Livestock release greenhouse gases into the atmosphere through the digestive process and through manure management.

Why do we need to collect livestock data?

Livestock and manure management data can be used to determine the amount of greenhouse gases produced. Detailed and more frequent data collection means more accurate emission estimates. This information assists farmers and the government to identify relevant actions that can be taken to reduce these emissions. Implementing these actions will in turn reduce the negative impacts of climate change. Frequent monitoring can also be used to determine whether the implemented action is having the desired effect.

$$\text{GHG emissions} = \text{Livestock} \times \text{Emission per head}$$

What type of data is required?



Population data



Livestock categories (gender/type)



Animal weight



Feed intake









Manure management by livestock type

What are the benefits to understanding and reducing livestock emissions?

Benefits to farm businesses from improving their emissions performance may include:

- Decreasing costs and increasing productivity. Belched methane represents energy lost from the production system that might otherwise be converted to the milk, meat or fibre that generates income.
- Increasing market opportunities as supply chains and consumers become more aware of increasing demand for food and fibre produced with lower emissions.
- Improved animal health and husbandry.
- Reduction in inorganic fertiliser costs. Reducing nitrogen losses from manure means a higher concentration of nitrogen in manure being applied to soils and therefore a reduction in the requirement for inorganic nitrogen fertilisers.



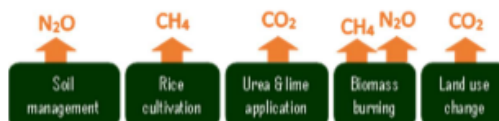


DATA COLLECTION ON CROP FARMS FOR GREENHOUSE GAS EMISSION MONITORING



How does crop farming impact greenhouse gas emissions?

Crop farming leads to the release of greenhouse gases through the application of fertilisers and lime, crop residue burning, tillage and other management practices, saturated soils (such as rice paddies) and the conversion of forest land to cropland.



Croplands can also lead to the removal of CO_2 from the atmosphere (*carbon sequestration*) through woody crop/tree growth, increased crop cover, mulching, no tillage and reduced land conversions.

Why do we need to collect crop data?

Crop areas, harvest areas and crop management data (*activity data*) can be used to determine the amount of greenhouse gases produced. Frequent and detailed data collection means more accurate emission estimates. This information assists farmers and the government to identify relevant actions that can be taken to reduce emissions. Implementing these actions will in turn reduce the negative impacts of climate

$$\text{GHG emissions} = \text{Activity data} \times \text{Emission factor}$$

change. Monitoring can be used to determine whether the implemented action is having the desired effect.

What type of data is required?



What are the benefits to reducing cropland emissions and increasing carbon storage?

Benefits to farm businesses from improving their emissions performance may include:

- Improved soil fertility and sustainability through improved soil management.
- Improved productivity and increased income.
- Increasing market opportunities as supply chains and consumers become more aware of increasing demand for food and fibre produced with lower emissions.
- Reduced time, labour inputs and fuel costs due to more efficient farming.
- Improved nutritional quality of food and food security.
- Increased resilience to climate change for farmers and communities.



Appendix B: Example of Data Collection Template



LIVESTOCK DATA Dairy cattle



YEAR	
DATE	

CATEGORY SPECIFIC DEFINITIONS	
High producing cows	Cows in commercial operations that have calved at least once and are used principally for milk production
Low producing cows	Cows managed with traditional methods that have calved at least once and are used principally for milk production
NOTE	Low producing, multi-purpose cows are considered under "Other cattle" as "Mature cows" and not as "Dairy cattle".

NOTES:

Livestock type	Livestock sub-category		Average annual population	Typical average animal mass (TAM)	Daily feed intake	Average milk production	Milk fat content	Manure management						
			(Head)	(kg)	(kg dry matter/head/day)	(kg milk/head/year)	(%)	(% of total manure produced by each livestock going to each manure management practice)						
Dairy cattle	TOTAL	Avg												
		High												
		Low												
	High producing cows	Avg												
		High												
		Low												
	Low producing cows	Avg												
		High												
		Low												

YEAR	
DATE	

NOTES:

Data collection template for dairy cows

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Inter-American Institute for Cooperation on Agriculture

Headquarters. P.O. Box 55-2200
San Jose, Vazquez de Coronado, San Isidro
11101 - Costa Rica
Phone: (+506) 2216 0222 / Fax: (+506) 2216 0233
e-mail: iicahq@iica.int
www.iica.int

