Carbon Footprint Management

Export Cocoa Value Chain of the San Martin Region - Peru

ALIANZA CACAO PERÚ

USAID DEL PUEBLO DE LOS ESTADOS UNIDOS DE AMERICA

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Calle Uno Oeste N° 50, piso 14, urb. Córpac,
San Isidro, Lima - Perú
Phone: (51-1) 616-7300
www.promperu.gob.pe

Produced by:
PROMPERÚ, Department of Sustainable Trade and Communications Office

Peru - USAID Cacao Alliance
José Iturrios, José Gamarra

Green initiative
Luciana Visnevski, Mayte Velaochaga

Proofreading: Juan Carlos Bondy

Translation: Oriental Experience EIRL

Design and layout: Realidades SAC

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1.

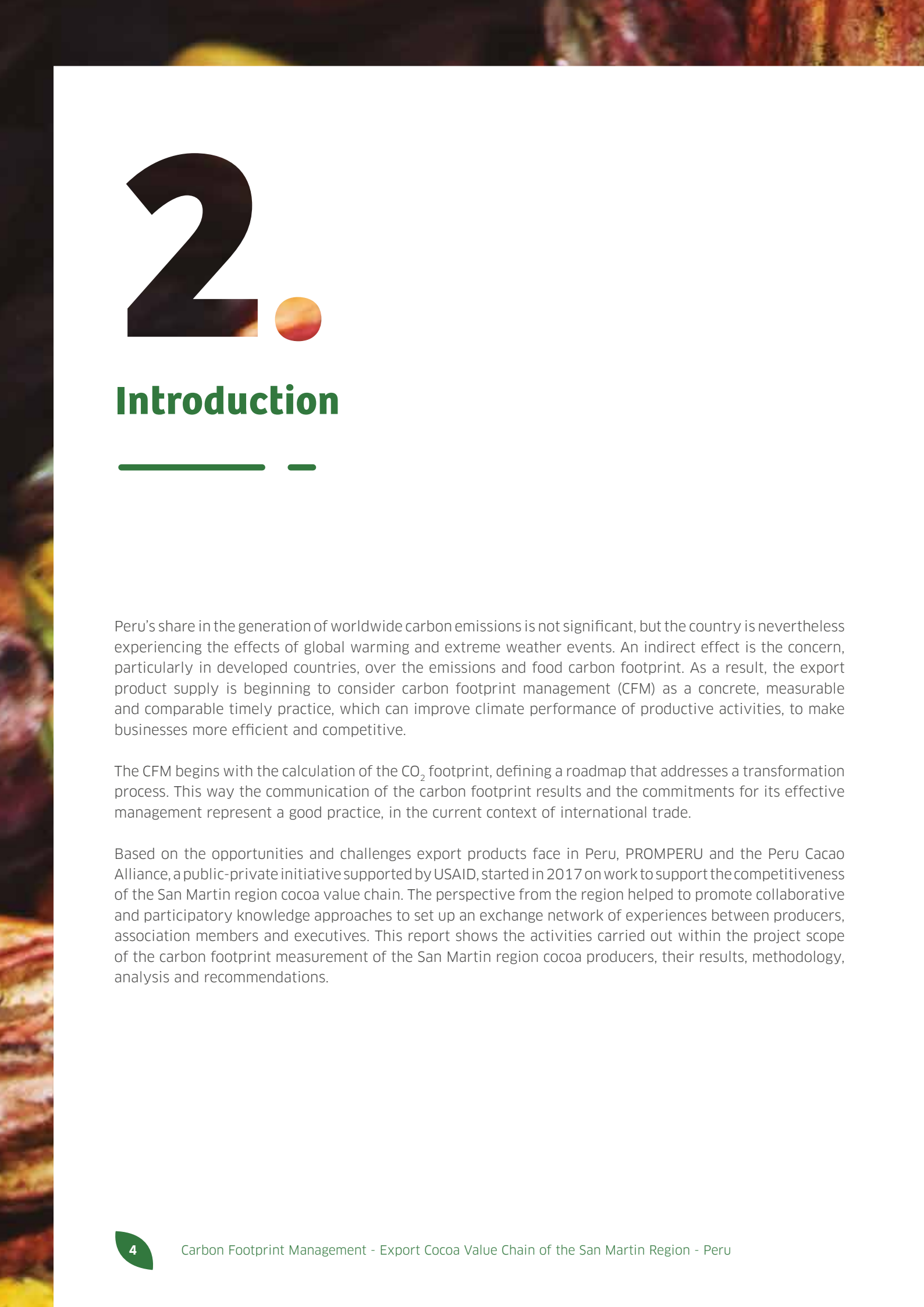
Presentation

Combating climate change is the greatest environmental challenge of the 21st century. Governments, businesses, institutions and groups are joining efforts to curb this global phenomenon through innovation and management of their production and consumption processes.

To contribute to this global objective, PROMPERU has conducted research and established programs for Peruvian companies related to the conservation and optimization of resources, as well as the continuous improvement of environmental, social and economic processes based on the pillars of sustainability.

Within the programs of the Department of Sustainable Trade ("Departamento de Comercio Sostenible"), carbon footprint measuring and management allows us to implement strategies to reduce this footprint and as a result move to a green economy.

This publication is the result of a joint effort between PROMPERU and the Peru Cacao Alliance ("Alianza Cacao Perú")—a public-private initiative supported by USAID (United States Agency for International Development)—to analyze the current situation of San Martin region cocoa cooperatives and to develop and implement greenhouse gas emission mitigation plans to reduce its value chain carbon footprint.



2.

Introduction

Peru's share in the generation of worldwide carbon emissions is not significant, but the country is nevertheless experiencing the effects of global warming and extreme weather events. An indirect effect is the concern, particularly in developed countries, over the emissions and food carbon footprint. As a result, the export product supply is beginning to consider carbon footprint management (CFM) as a concrete, measurable and comparable timely practice, which can improve climate performance of productive activities, to make businesses more efficient and competitive.

The CFM begins with the calculation of the CO_2 footprint, defining a roadmap that addresses a transformation process. This way the communication of the carbon footprint results and the commitments for its effective management represent a good practice, in the current context of international trade.

Based on the opportunities and challenges export products face in Peru, PROMPERU and the Peru Cacao Alliance, a public-private initiative supported by USAID, started in 2017 on work to support the competitiveness of the San Martin region cocoa value chain. The perspective from the region helped to promote collaborative and participatory knowledge approaches to set up an exchange network of experiences between producers, association members and executives. This report shows the activities carried out within the project scope of the carbon footprint measurement of the San Martin region cocoa producers, their results, methodology, analysis and recommendations.

3.

Context and situation analysis

The New York Declaration

This is one of the major global milestones on the transformation of agroforestry business value chains, and it aims to recover forest and farmland areas to reduce carbon emissions between 4,500 and 8,800 million tons a year. It also seeks to reward countries that reduce their forest emissions, in return for a payment increase for these actions. This way it tries to directly influence the global commodity market, like the cocoa market. The New York Declaration, signed by Peru and the Regional Government of San Martin, indicates that by 2030 the deforestation levels of natural forests should be zero.

The Paris Agreement

Among the decisions of the Paris Agreement concerning the forest sector, stands out the importance of financial resources as incentives to reduce emissions from deforestation and forest degradation, as well as the promotion of conservation, the sustainable management of forests and the enhancement of forest carbon stocks. This resolution is important for Peru, since the first stage for climate finance is to know the carbon footprint, and the second stage should see the development of mitigation actions that could be financed by agencies such as the Green Climate Fund (GFC). For this reason, this report allows the State to meet the Framework Convention agreements on Climate Change and to position Peru on the world stage as protagonist of the environmental restoration segment and sustainable production in various value chains, such as cocoa.

International trade and climate change

The opening of international trade has three possible effects on climate change: of scale (on GHG emissions), composition (how price changes affect the production structure and its emissions) and technology (improvement of production methods to reduce the emissions). Trade policy is directly related to carbon emissions of production methods and the climate change mitigation measures. One of the central challenges of the relationship between international trade and economic growth is to ensure that the carbon emissions do not keep pace with the economic growth rate.

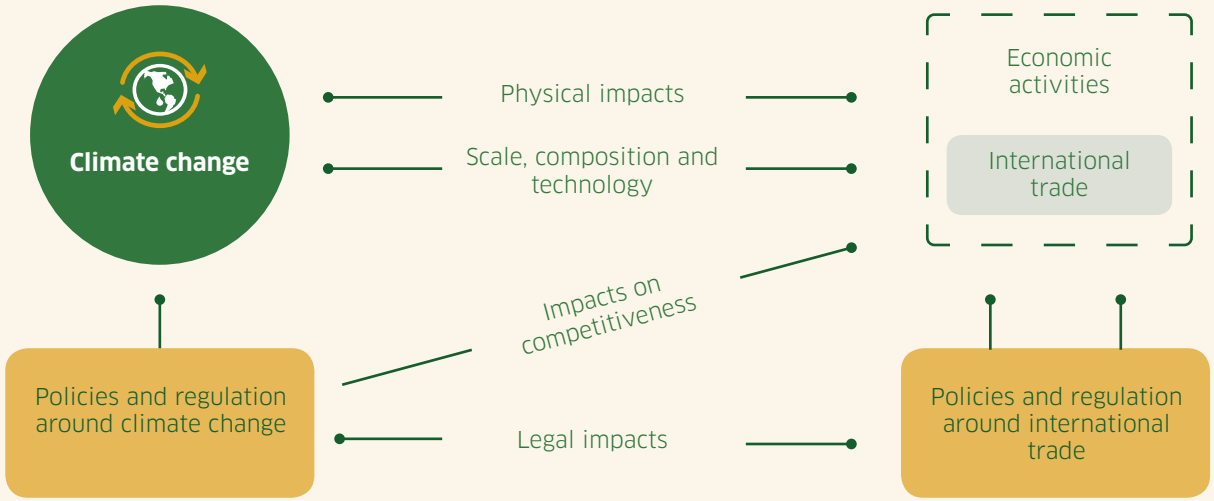
Climate change and its effects on international food trade

In recent years there have been several carbon footprint pilot measurements of agricultural products in Latin America, to find out its emission source and act on the matter. The impact of climate change on trade happens in two ways:

a. In countries where **commercial comparative** advantage is linked to its climate or geographical location.

b. Influencing **infrastructure, transport** routes and trade logistics.

Links between climate change, international trade and their respective policies



Source: Aaron Cosbey (2007), "Trade and Climate Change Linkages: A scoping paper produced for the Trade Ministers´ Dialogue on Climate Change Issues, International Institute for Sustainable Development, Geneva

Why calculate the carbon footprint? (Cocoa industry's perspective)

a. The CFM helps with the mitigation and delay of climate change effects, to longer maintain the conditions that allow for crop growth in certain localities. The strategic actions in cocoa producing regions would not be possible without climate variability analysis and without calculating the carbon footprint, the mitigation and the monitoring of the State, the producers and the industry.

b. The calculation allows for the identification of aspects related to production efficiency that can be improved.

c. The calculation of carbon footprint and a supply that generates less emissions become a comparative advantage in international markets, which should be communicated.

d. The green economy principles and CFM practice help to identify innovation opportunities.

Why calculate the carbon footprint? (Demand-side perspective)

a. Some signatory countries of international agreements seek to differentiate their suppliers by carbon emission load, as an element of competitiveness or to the extent that the recommendations of buyers become mandatory. However, the sensitivity to the carbon footprint of products varies, since people are not always willing to pay more for them.

b. Cocoa producing countries that can reconcile an agenda of increasing productivity with environmentally and biodiversity friendly good practices can develop a good reputation.

4.

Methodology

- The study scope comprises the accounting of emissions, from cocoa farming to the delivery of the final product, packaged and dry, at the port of origin (Peruvian port).

- The study baseline considers estimated figures on the possible landscape conversion that occurred at some point prior to the sowing in the study region, based on cocoa farming.

- The method used for obtaining primary data consisted of the application of a data collection and calculation tool for producers and designed to address key cocoa value chain issues. After having obtained the dataset per cooperative, a data analysis and consolidation, whose values are expressed in annual CO_2eq (carbon dioxide equivalent) emissions per pound (lbs), were carried out. The greenhouse gas (GHG) emission factors for the specific sources were obtained according to international protocols, along with databases of the Intergovernmental Panel on Climate Change (IPCC) and World Resources Institute (WRI). To determine the emission factors of the different elements of the cocoa value chain, methodology PAS 2050:2011, that evaluates the life cycle of goods and services, was used as a base and facilitates the quantification of the resulting carbon footprint from the production process.

- Work was done in conjunction with the following cooperatives: Cooperativa Agraria Cacaotera Acopagro, Cooperativa Agroindustrial Paraiso Ltda., Cooperativa Agroindustrial Cordillera Azul Nuevo Progreso Ltda., Cooperativa Agroindustrial Tocache Ltda., Cooperativa Agraria Allima Cacao Ltda., Cooperativa Agraria del Valle del Mishollo Ltda., Cooperativa Agroindustrial CP Cacao, Cooperativa Agraria Cafetalera y de Servicios Oro Verde Ltda., Cooperativa Agroindustrial AsprocNbt Ltda. and Cooperativa Agraria Apahui Ltda.

- The collection was done with the participation of technicians from 10 participating associations. The carbon footprint calculation complied with the value chain analytical logic and incorporated key elements of the production stage (harvest and post-harvest) to export (Peruvian port).

- Information was also gathered from secondary sources, such as scientific databases and indexed publications on GHG emission factors, expressed in tons of CO_2 per year. Databases of Peruvian government agencies and international socio-environmental research institutions were also reviewed.

- A user guide was prepared for the proper application of the calculation tool, and it was used during the training of users or focal points. Also the use of the calculation tool and its continuity in each organization was explained.

- The final result led to a detailed baseline illustrating the reality of a significant segment of San Martin region cooperatives. Whereas the reality of practices applied by other cooperatives does not substantially differ from the one of the participating cooperatives in the study, it is possible to estimate the carbon footprint of cocoa production activities in the region as a whole.

5.

Technical details

Project name

Measurement and analysis of the San Martin region value chain carbon footprint.

Objective

Measuring the CO_2eq footprint of San Martin region cocoa producers, installing a continuous measurement process, with recommendations to reduce the footprint and, if desired, supporting them financially, in search for a carbon neutral production.

Specific objectives

- Identify the critical CO_2eq emission points and the reduction opportunities during the concerned activities.
- Identify opportunities to apply the mitigation hierarchy: avoid, reduce, restore, compensate and, where possible, achieve a positive contribution.
- Identify a baseline that allows for concrete and measurable commitments with impact on its performance.
- Integrate CO_2 emissions management and decision making in the San Martin region cocoa value chain.
- Strengthen relationships with buyers who are looking to reduce their carbon footprint to have greener value chains.
- Show the environmental responsibility of the producers to improve the supply negotiation capacity of prices and terms.
- Neutralize negative information on the cocoa production in San Martin and Peru by promoting a positive image, among others.

Relative cocoa cultivated area in Peru (2017)

147 304 ha

Cocoa cultivated area in San Martin (2017):

54 159 ha

Covered area by the project:

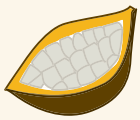
9301 ha

(6% of the total acreage in Peru)

Relative deforestation

Total deforested area between 2001 and 2017:

415 136 ha



Potentially deforested in the area covered by the project:

1774 ha

GHG emissions associated with the deforestation in the area covered by the project:

422 566 ton CO_2eq

Study coverage

Number of cacao producing cooperatives that participate in the study:

10

Productivity

Average cocoa yield in the study area:

1028,87 kg / ha / year

Number of beneficiary associated producers:

4,809

Annual cocoa production of the 10 cooperatives:

9,569 tons

6.

Global results

Results	CO_2eq Activity Emission Ranking within the production process
1º. Waste management emissions (cocoa shells): **40,203.1 ton CO_2eq/year** (92.70%)	2º. Composting and pest control emissions: **2141.8 ton CO_2eq/year** (4.94%)
3º. Cocoa fermentation emissions: **683.3 ton CO_2eq/year** (1.58%)	
4º. Packaging process emissions: **177.4 ton CO_2eq/year** (0.41%)	5º. Transport process emissions: **160.8 ton CO_2eq/year** (0.37%)
6º. Drying process emissions: **0 ton CO_2eq/year** (0%)	

Total emissions: **43,366 ton CO_2eq/year**

CO_2eq compensation – via cocoa crop photosynthesis. **29,663.95 ton CO_2eq/year**

Key emission indicators

Net emissions **13,702.50 ton CO_2eq/year**

Emissions per kilo of produced cacao: **1,43 kg CO_2eq /kg.**

a. Study area description

San Martin is the most deforested region of Peru, due to the replacement of its natural forest for agricultural crops, such as cocoa, as well as irregular land occupation.

GEOGRAPHIC COORDINATES

UTM 18 M X: 301242 Y:9203750

TOTAL AREA

OF 5 154 561 HA

49%

Commitment of the Regional Government of San Martin to preserve

2 525 735 ha

of forests (49% of the region's total area)

This is the most degraded region of the entire Peruvian territory, with approximately

415 136 ha

DEFORESTED

between 2001 and 2017.
(Source: Ministry of Environment of Peru - MINAM)

Map of the San Martin region with a degradation projection of the landscape until 2030, in case the current processes persist, without public policies to mitigate the problem of the use and irregular occupation of the land in the region.

(**Source:** Ministry of Environment of Peru - MINAM 2015)

TOTAL AREA OF **THE STUDY SCOPE**

9301 ha

OF CACAO ACREAGE

ENCOMPASSING

10

COOPERATIVES

PRODUCTIVITY

1028 kg / ha / year

4809

ASSOCIATE **PRODUCERS**

MEAN **ACREAGE**

4.94 acres

PER FARMER

The project scope acreage corresponds to approximately:

6%

of the total acreage in Peru as a whole

14%

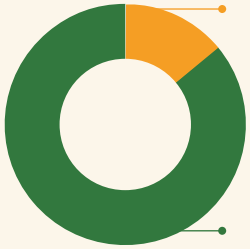
of the crops of San Martin

b. Emissions due to land use change

The San Martin region has nationwide the highest conversion rate of natural landscapes (forests) to agricultural production areas (change in land use). In addition, about 20% of productive areas included in the project probably also went through an initial process of deforestation.

Within the entire value chain of the San Martin region, land use change is the main factor of GHG emissions.

ACREAGE (ACRES AND PERCENTUAL)



- SAN MARTÍN
- PROJECT

9301 ha - 17% represents the total farming area in the San Martín region in 2017

54 158 ha represents the total of cacao farming in the San Martin region in 2017

Baseline emissions based on landscape conversion

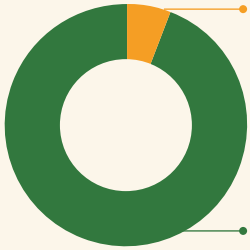
Conversion rate of natural landscapes to agricultural production areas in San Martin:

23 271 ha/year

Acreage expansion for cacao farming in the region:

39% (54 158 ha) of the total national acreage **(147 304 ha)**

ACREAGE (ACRES AND PERCENTUAL)



- PERÚ
- PROJECT

9301 ha represents 6% of the farming area nationwide

147 304 ha is the total area of cacao farming in Peru in 2017

According to the provided information by cooperatives, the degraded areas at the start of the cacao farming activities totaled approximately

1800 ha

(20% of the total acreage), as follows:

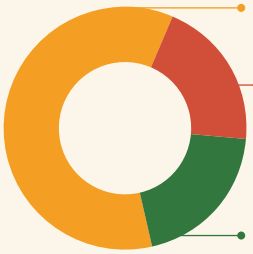
ACREAGE (ACRES AND PERCENTUAL)

- PERÚ
- PROJECT

54 158 ha is the cacao farming area in San Martín and represents 39% of the cacao farming area in Peru

147 304 ha is the total area of cacao farming in Peru in 2017

INITIAL STATE OF PRODUCTIVE AREAS



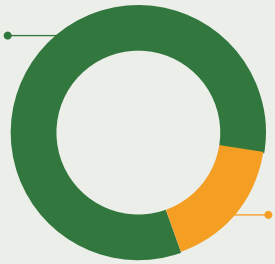
- Degraded area
- Traditional area
- New area

5753 ha - 62%

1774 ha -19%

1774 ha - 19%

PRODUCTION SYSTEM USED IN THE STUDY AREA



- Agroforestry
- Conventional

7744,30 ha - 83%

1556,20 ha - 17%

GHG EMISSIONS: LANDSCAPE CONVERSION ASSOCIATED WITH DEGRADED AREAS

Ton CO_2eq

422 566,8

c. Emissions related to the production process

6.1.
GHG emissions associated with the organic solid waste management process

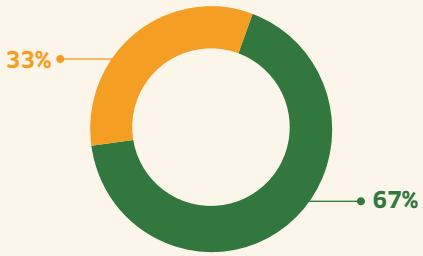
Within the production process, the organic solid waste (cocoa shell or pod) of the cacao production contributes 92.70% of the total CO_2 footprint.

GHG emissions
Organic solid waste

Tons of CO_2 per year	Total percentage
40 203,1	92.70

This percentage is because the harvest of cocoa beans includes the breakage process of the shells (pods). 67% of this organic solid waste is disposed directly on the farm soil without any type of pretreatment. This practice creates an anaerobic decomposition that generate substantial amount of methane (CH4), a gas with a Global Warming Potential (GWP) 23 times greater than CO_2.

Waste management (relative percentage)



6.2.
Composting and pest control GHG emissions

GHG emissions occur mainly because of the fertilizers in the nitrogenated compounds and also upon producing these fertilizers.

GHG emissions
Composting and pest control

Tons of CO_2 per year	Total percentage
2141,8	4,94

6.3.
GHG emissions associated with the seed fermentation process

Representing 1.58% of total emissions. This is because during the process there are GHG associated emissions based on bacterial action that raise the temperature of the seeds and contribute to the volatilization of various gases.

GHG emissions
Cacao fermentation

Kg (cacao)	Tons of CO_2 per year	Total percentage
9 569 017	683,3	1,58

6.4.
GHG emissions associated with the packing process after the postharvest process

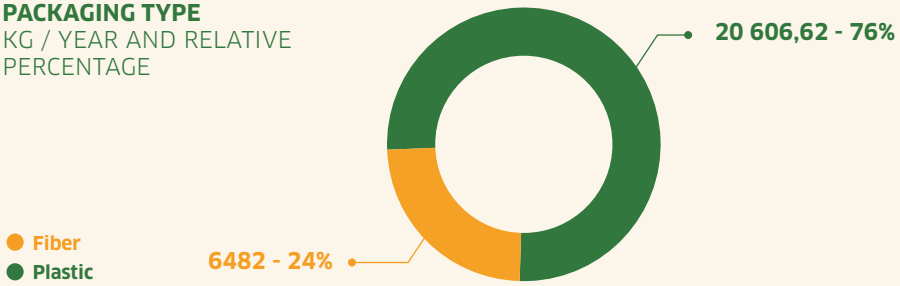
Representing 0.41% of total emissions. This is because when plastic bags are used, GHG emissions occur in their fabrication, recycling or final disposal. Meanwhile, the use of natural fiber bags (jute) does not generate those emissions.

The 10 cooperatives use approximately 20 606 kg of plastic bags in total, which corresponds to 76% of the total packaging.

GHG emissions
Packaging

Tons of CO_2 per year	Total percentage
177,4	0,41

PACKAGING TYPE
KG / YEAR AND RELATIVE PERCENTAGE



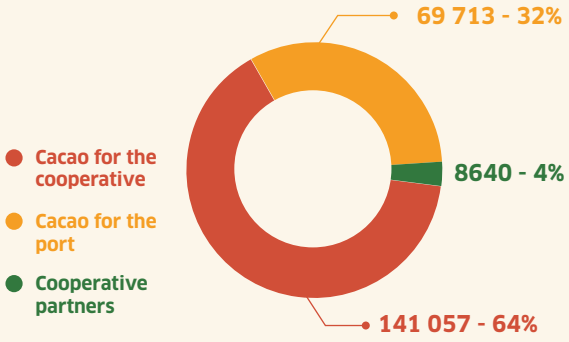
6.5.
GHG emissions associated with the transport process

The transport process from the farmland to the cooperatives and from there to the departure port involves approximately 136,335 miles/year of traveling via rural roads and highways.

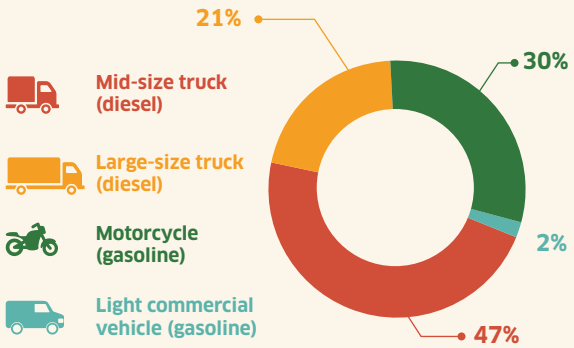
GHG emissions Transport

Tons of CO_2 per year	Total percentage
160,8	0,37

TRANSPORT
(KM / YEAR AND RELATIVE PERCENTAGE)



TRANSPORT
(KM / YEAR AND RELATIVE PERCENTAGE)



Therefore, after the emissions and capturing of CO_2, it is concluded that a kilogram of produced cacao in the study area presents a CO_2 footprint equivalent to 1,43 kg of CO_2/year.

Emissions associated with the production

Tons of CO_2 per year	Emissions of Kg CO_2 / Kg of cocoa/year
43 366,5	4,53

CO_2 secuestration
(from cocoa plantations and the agroforestry system in which they are cultivated)

Tons of CO_2 per year	Sequestration Kg CO_2 / Kg of cocoa/year
29 664	3,10

Net GHG emissions
(emissions associated with the production and CO_2 sequestration)

Tons of CO_2 per year	Sequestration Kg CO_2 / Kg of cocoa/year
13 702,5	1,43

This result indicates that although the cocoa production is capable of sequestering atmospheric CO_2, the emissions associated with the production still exceed the capturing capacity and generate net GHG emissions, which contributes to the process of global warming. This also considers the impact of deforestation and the loss of biodiversity and ecosystem services.

7.

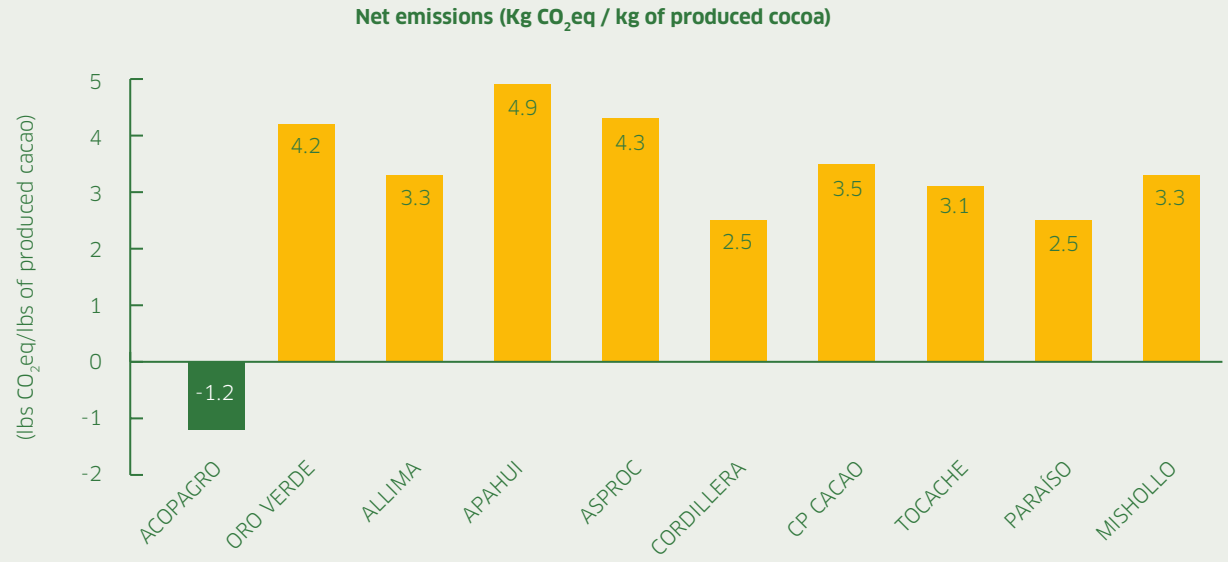
Detailed results per cooperatives

Organizations according to net emissions of Kg of CO_2 / Kg of produced cocoa

Organization	Cultivated area (ha)	Number of partners	CO_2 Waste Management emissions	Net emissions		Recommendations	
				Ton of CO_2 / year	Kg. of CO_2 / Kg of cocoa	Reduction	Compensation
Cooperativa Agraria Cacaotera Acopagro	5000	2200	83%	-5305,56	-1,17	-	-
Cooperativa Agroindustrial Paraíso Ltda.	340	121	94%	865,23	2,47	70% composting and manure produced	30% plantation or purchase of carbon credits
Cooperativa Agroindustrial Cordillera Azul Nuevo Progreso Ltda.	268	120	94%	565,85	2,52	70% composting and manure produced	30% plantation or purchase of carbon credits
Cooperativa Agroindustrial Tocache Ltda.	640	205	95%	2612,2	3,1	70% composting and manure produced	30% plantation or purchase of carbon credits
Cooperativa Agraria Allima Cacao Ltda.	427	120	82%	271,18	3,31	70% composting and manure produced + plantation densification	30% plantation or purchase of carbon credits

Organization	Cultivated area (ha)	Number of partners	CO_2 Waste Management emissions	Net emissions		Recommendations	
				Ton of CO_2 / year	Kg. of CO_2 / Kg of cocoa	Reduction	Compensation
Cooperativa Agraria del Valle del Mishollo	327	109	91%	869,16	3,32	70% composting and manure produced	30% plantation or purchase of carbon credits
Cooperativa Agroindustrial CP Cacao	327	109	88%	1389,49	3,54	70% composting and manure produced	30% plantation or purchase of carbon credits
Cooperativa Agraria Cafetalera y de Servicios Oro Verde Ltda.	887	1350	97%	7115,33	4,22	70% composting and manure produced	30% plantation or purchase of carbon credits
Cooperativa Agroindustrial ASPROC NBT Ltda.	925	355	96%	4542,41	4,27	70% composting and manure produced	30% plantation or purchase of carbon credits
Cooperativa Agraria Apahui Ltda.	160	120	96%	623,32	4,95	70% composting and manure produced + plantation densification	30% plantation or purchase of carbon credits

Percentage of net emissions per organization



8.

Key considerations
(to understand the results)

The quality concept of cocoa goes beyond good genetics, flavor and aroma. There are very significant ethical, social and environmental elements in the price and quality definition of the supply in the international market.	Waste management represents an opportunity to mitigate emissions (GHG) and must be a priority.	It is also important to communicate the achievements in identifying and mitigating the CO_2 footprint to the cocoa organizations.
From the environmental point of view, the GHC is a key factor to distance the cocoa production from a widely recognized problem in the world and something we try to avoid, namely climate change. Cacao produced with low carbon emissions is increasingly recognized as an environmentally friendly cacao.	Net emissions are 32% of the total emissions. GHG emission results versus the capture of CO_2 by cocoa trees and the agroforestry system they form part of.	It is necessary to generate content and to inform buyers, experts and other stakeholders about the good practices adopted and results achieved, allowing for a better value proposal.
The main factor of CO_2 emissions within the entire San Martin region cocoa value chain is land use change; in other words, the deforestation associated to the cacao production. The total amount of emissions associated with deforestation is estimated to be 422,566 ton CO_2eq/ year, which is approximately 10 times more than the total of direct emissions from the cacao production process.	The low cost actions and that diversify the economic income of farmers, such as agroforestry and the renewal of plantations, can expand the compensation capacity of productive areas and achieve net levels close to zero (carbon neutral) and even carbon positive.	
If the processes are followed, the organic solid waste (cacao shell or pod) of the cocoa production contributes over 90% of the total CO_2 footprint. Managing their emissions is an achievable and low cost challenge compared to other process stages, such as transport.	After analyzing the CO_2 footprint and identifying the main critical points that generate GHG emissions, emission mitigation plans should be developed in an articulated and participative manner with the entire value chain.	

9.

Recommendations

For producers	For cooperatives	For the regional government	For the Peru Cacao Alliance	For PROMPERU
The cocoa production system in the region must be in line with the emission mitigation hierarchy: avoid, reduce, restore and compensate.	**Disclose** the calculation results to the buyers.	Opt for CFM as environmental and trade strategy for the region.	**Support the disclosure** of measurement results to buyers.	**Support the disclosure of measurement** results and the commitments of the cooperatives to international buyers.
Waste management: the lack of treatment produces anaerobic decomposition that emits methane (CH4), a gas with a Global Warming Potential (GWP) 23 times greater than CO_2. Aerobic composting is recommended, which could reduce the total GHG emissions by 80%, from 1,43 to 0,28 kg CO2eq/kg of cocoa per year.	Develop and implement low cost and high **impact mitigation action plans.**	Support producers in their **mitigation action plans.**	**Support** the development and **implementation of GHG** emission mitigation plans.	Support **monitoring of positive** measurement impacts on sales and new markets.
The production of this organic fertilizer from the composting of organic cocoa waste facilitates **composting and pest control**, which is the second most CO_2 emission-intensive process (4.94%).	Seek alliances, **credits and support** to mitigate and compensate.	**Cover 90%** of the regional production in partnership with PROMPERU and the Peru Cacao Alliance to obtain the **designation of origin of "carbon neutral cacao".**	Support **monitoring of positive** measurement impacts on sales and new markets.	Seek alliances to boost the CO_2 calculation practice in San Martin to cover 90% of its production and to contribute to the **designation of origin of "carbon neutral cocoa".**
Packaging: their emissions could be offset by stop using plastic bags in favor of only natural fiber bags (jute).	Seek **regional dialogue** to obtain the designation of origin of **"carbon neutral cacao" in San Martin.**	**Integrate** the practice of **carbon footprint calculation** to the support activities for cacao producers.	**Support** that **90% of the regional** production obtains the designation of origin of **"carbon neutral cocoa".**	**Boost** the practice in other **regions and other chains** with export potential.

For producers	For cooperatives	For the regional government	For the Peru Cacao Alliance	For PROMPERU
Compensation: by installing forest plantations in partnership with local governments, private institutions and NGOs.	Monitor **positive measurement** impacts on **sales and new markets.**	**Disclose** the experience at a regional, national and international level to promote regional leadership and innovation.	**Integrate** the practice of **carbon footprint** calculation to the support activities for cocoa producers. **Disclose** the experience at a regional, national and international level to promote regional leadership and innovation.	**Disclose** the experience at a regional, national and international level to promote regional leadership and innovation.

Final general recommendations

- Develop more research on previous dynamics concerning land use and occupation in the study region. Emissions associated with deforestation processes in the study area (422,566.8 tons of CO_2) can be compensated in degraded areas by making production areas denser with an agroforestry system or by conserving stocks with REDD (Reducing Emissions from Deforestation and Degradation) systems.

- Promote a greater productivity with a higher plantation density, as well as the gradual transition of conventional farmland areas to agroforestry system crops, to capture more CO_2.

- Reducing the waste treatment emissions from cocoa shells through composting and manure, because that is the determining factor in reducing emissions in the group studied. More than 60% of waste is left untreated on the soil, which can reduce emissions associated with the cacao production in the group studies by 70%. The best performance belongs to the Acopagro cooperative, because it composts 100% of its process.

- A compensation is suggested for purchasing carbon credits. Another viable alternative could be that the same associations install forest plantations and generate their own carbon credits, which they can sell directly to companies that are interested in offsetting their emissions.

10.

Glossary

Carbon credits	These are certified reductions of Greenhouse gas emissions. The carbon bonds are an international decontamination mechanism to reduce polluting emissions to the environment. It is one of 3 proposed mechanisms in the Kyoto Protocol for reducing emissions that cause global warming or the greenhouse effect.
Global warming	The gradual increase of Earth's atmosphere and ocean temperatures.
Climate change	A change in the statistical distribution of weather patterns over an extended period, which can range from decades to millions of years.
Carbon neutral	The balance between emission quantification and the reduction and removal/ compensation actions of greenhouse gases.
Carbon dioxide equivalent (CO_2eq)	A universal measurement in tons used to indicate the possibility of global warming of each greenhouse gas.
Greenhouse effect	The rise of temperature of the atmosphere as a result of the atmospheric concentration of certain gases, mainly CO_2.
Greenhouse Gases (GHG)	Gases whose presence in the atmosphere contributes to the greenhouse effect. These gases are water vapor (H_2O), carbon dioxide (CO_2), methane (CH_4), nitrogen oxides (NO_x), ozone (O_3) and chlorofluorocarbons.
Carbon Footprint Management (CFM)	A concrete, measurable and comparable practice over time that improves the climate performance of the productive activities system, seeking to disconnect economic growth from CO_2 emissions.
Carbon footprint	The total of greenhouse gases emitted by direct or indirect effect an individual, organization, event or product.
Agroforestry system	All systems and practices of use of the land, where trees or evergreen woody shrubs are deliberately planted in the same land management unit with agricultural crops and animals, both in spatial mixing and in temporal sequence.

Calle 21 N° 713, San Isidro
Lima – Perú

(01) 604-5601 / (01) 719-2999 / (01) 207-1530
(01) 616-7400 (Department of Sustainable Trade)

www.promperu.gob.pe
sae@promperu.gob.pe