

CLIMATE BENEFITS MITIGATION

Hito 5

1. CO₂ EMISSIONS REDUCTIONS

The project supported management of 175,96 hectares of agroforestry plots as well as 190.5 hectares of surrounding natural forest. In addition, the project supported the improved management of 2.554 hectares of wild cacao groves as well as 7,990 hectares of jatata forest management, including both the area currently being harvested and the area under conservation. The essential oil producers also contributed to forest management, however this area is considered included in the jatata management area. As can be seen in the table below, the project supported the forest management of a total of 10.734,5 hectares.

Reduction in carbon emissions is calculated using the impact of both actions. The biomass accumulation in developing and recovering agroforestry plots during 8 years of growth and forest loss prevention in comparison to the average annual deforestation rates in the region.

A biomass estimate of **381,68 tCO₂^e/ha** was used for mature 8-year-old coffee agroforestry stands, or an equivalent annual accumulation of **47,71 tCO₂^e/ha**.

From the fourth year to the 20th year we include preventing forest loss in the **10.734,5 hectares** under improved management by jatata, essential oil, cacao and coffee producers, using the average rate of annual forest loss of 0.3% and an average biomass of **660.6 CO₂^e**. As can be seen in the table below, this also includes 190,5 hectares of forest managed for conservation by the APCERL coffee producers

ORGANIZATION	PRODUCTION	Ha of forest under management	Ha of agroforestry
CARMEN DE EMERO	Cacao silvestre	2554	
APAI - RQ	Jatata (harvesting)	3781	
APAI -RQ	Jatata (conservation)	4209	
SHAN	Essential oils	(included in the area with jatata production)	
APCERL	Coffee	190,5	175,96
TOTALS		10.734,5	175,96

These calculations are detailed below and result in a reduction in direct emissions of **426.415 CO₂^e** over the maximum technical lifetime of the project twenty years. Indirect impacts are calculated from the fourth year, considering an additional 44 hectares of agroforestry plots, a further 40 in year 5 and another 8 in year 6. These calculations lead to **35,115 CO₂^et** of indirect emissions over 10 years.

2. CARBON SINKS

Direct Impacts:

From Yr. 1 we begin to take into account the initial 108 hectares of agroforestry plots and 20 additional hectares established calculating an annual biomass accumulation of 47.7 CO₂e t/yr for

8 years (Yr. 1; $128 \times 47.71 = 6,107$). In Yr. 2 we add an additional 44 hectares of new agroforestry plots for a total of 172 hectares. In Yr 3 we adjusted this calculation using more detailed georeferencing to 175.96 hectares. For years 8, 9 and 10 we only consider the 59,2 hectares still in the growth stage in 2019.

Indirect impacts:

From Yr 4 we consider an additional 44 hectares of agroforestry plots ($44 \times 47.71 = 2,099$) and then a further 40 in years 5 and another 8 in year 6.

CARBON SINKS - DIRECT IMPACTS CALCULATION

Direct impacts = achieved directly due to the planned NCF project				
	Investment	Carbon revenue/value		
Year	EUR/a	CO _{2e} reductions, t/a (equation)	EUR/t	Revenue, EUR
<i>Discount rate</i>		5%		5%
1	108.183	6.107	9	54.962
2	108.183	8.206	9	73.855
3	54.092	8.395	9	75.555
4		8.395	9	75.555
5		8.395	9	75.555
6		8.395	9	75.555
7		8.395	9	75.555
8		2.825	9	25.424
9		2.825	9	25.424
10		2825	9	25.424
NPV:	247.883	64.763		465.242
Value of emission reductions, %	188%			

CARBON SINKS - INDIRECT IMPACTS CALCULATION

Indirect impacts = likely to be achieved due to the planned NCF project with additional investments (over max 10 years)				
	Investment*	Carbon revenue/value		
Year	EUR/a	CO _{2e} reductions, t/a (equation)	EUR/t	Revenue, EUR
<i>Discount rate</i>		5%		5%
1			9	0
2			9	0
3			9	0
4	6.010	2.099	9	18893,16
5	6.010	4.008	9	36068,76
6	6.010	4.389	9	39503,88
7	6.010	4.389	9	39503,88
8	6.010	4.389	9	39503,88
9	6.010	4.389	9	39503,88
10	6.010	4.389	9	39503,88
11	6.010	4.389	9	39503,88
12	6.010	2.290	9	20610,72
13	6.010	382	9	3435,12
	46.405		35.115*	214.207*
Value of emission reductions, %		462%		

* These are the exact sums when considering the fractions, see the Carbon Sinks excel template.

TOTAL CARBON SINKS: 64.763 + 35.115 = 99.878 CO_{2e} reductions, t/a (equation).

3. AVOIDED DEFORESTATION:

From the fourth year to the 20th year we include preventing forest loss in the 10.734,5 hectares under improved management by jatata, essential oil, coffee and cacao producers, using the average rate of annual forest loss of 0.3% and an average biomass of 660,6 CO_{2e}. This includes the 190,5 hectares of forest managed for conservation by the APCERL coffee producers.

In total per year: 10.734,5 x 0,3% x 660,6 = 21.274 CO_{2e} reductions, t/a (equation).

TOTAL AVOIDED DEFORESTATION: 21.274 X 17 = 361.652 CO_{2e} reductions, t/a (equation), see table below.

AVOIDED DEFORESTATION - DIRECT IMPACTS CALCULATION

Direct impacts = achieved directly due to the planned NCF project				
	Investment	Carbon revenue/value		
Year	EUR/a	CO _{2e} reductions, t/a (equation)	EUR/t	Revenue, EUR
<i>Discount rate</i>	5%		5%	
1	108.183		9	0
2	108.183		9	0
3	54.092		9	0
4		21.274	9	191.463
5		21.274	9	191.463
6		21.274	9	191.463
7		21.274	9	191.463
8		21.274	9	191.463
9		21.274	9	191.463
10		21.274	9	191.463
11		21.274	9	191.463
12		21.274	9	191.463
13		21.274	9	191.463
14		21.274	9	191.463
15		21.274	9	191.463
16		21.274	9	191.463
17		21.274	9	191.463
18		21.274	9	191.463
19		21.274	9	191.463
20		21.274	9	191.463
NPV:	247.883	361.652*		1.864.648*
Value of emission reductions, %	752%			

* These are the exact sums when considering the fractions, see the *Avoided Deforestation excel template*.