Operación CO_2

Obelisco

Analyzing the carbon potential of
Zone B and Zone C

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Carbon activities in the project

Zone A:

1. Carbon activities focusing on improved forest/land management:
- More productive forests (LtHP)
- Longer harvesting cycle (ERA)
- Reforestation, revegetation (ARR)
- Avoid forest conversion (AUDD/APDD)
- Improve SOC pasture land (grazing management)

2. Carbon activity focusing on substitution of fossil fuels by biomass in thermal applications:
- Substitution of gasoil (emissions)
- Substitution of fossil coal (emissions)

Zone B & C:

Carbon fixation through Agro-forestry practices.
- Very different methodology

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Adoption of Sustainable Agricultural Land Management (SALM)

SALM Activity Purpose:

Increase carbon stock on the land as a result of adopting sustainable agricultural practices.

Applicability conditions:

- Land is either cropland or grassland at the start of the project;
- The project does not occur on wetlands;
- The land is degraded and will continue to degrade;
- The area of land under cultivation in the region is constant or increasing
- Forest land in the region is constant or decreasing over time;
- There must be studies that demonstrate that the Roth-C model is applicable.

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Calculation steps

Carbon benefits = Project Scenario - Baseline Scenario

Baseline Scenario

1. Demonstrate additionality

Would carbon stock have increased without the project?

=> Proof! (Soil samples, productivity accounts, stats, etc)

2. Estimate carbon pools and emission sources:

- Above ground and below ground biomass
- Soil organic content
- Use of fertilizers (N_2O)
- Use of N-fixing species (N_2O)
- Burning of biomass (CH_4 and N_2O) NO
- Burning of fossil fuels (CO_2; N_2O; CH_4)

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Above and below ground biomass

Same methodology used for ARR in zone A:

- Annual crops not included (only perennial trees/bushes)

Baseline scenario

IPCC (2006) default figures

Standing volume above ground:	0,10 m3/ha (meseta)
BCEF:	1,70
Root to shoot ratio:	0,32
Estimated total biomass meseta:	0,25 ton/ha
Estimated total biomass monte (2ha):	12 ton/ha
Estimated weighed average biomass:	1,2 ton/ha
Estimated current biomass for 25 ha:	30 ton

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Above and below ground biomass

Project scenario

IPCC (2006) default figures – conservative estimations

Standing volume pine plantation:	90,0 m3/ha
BCEF:	0,6
Total biomass above ground:	54,0 ton/ha
Root to shoot ratio:	0,28
Total biomass above/below:	69,12 ton/ha (end of cycle)

⇒ Biomass increase on plantation land = 1,0 ton/ha per year

Agroforestry system with 50% perennials and half of monte removed:

Net biomass gain after 5 years on 25 ha (project – baseline):

5 x 12,5 – 30 = 32,5 ton

Net CO_2 gain on 25 ha: 32,5 x 0,5 (carbon %) x 44/12 = 59,5 ton CO_2

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Soil Organic Content

Source: University of Essex (2001)

Conservation tillage systems + green manure and cover crops + Intercropping help increase soil carbon:

Humid temperate: 0,5-1,0 ton C/ha per year
Humid tropics: 0,2-0,5 ton C/ha per year
Dry tropical (lowest): 0,1-0,2 ton C/ha per year

Assumed average CO_2 gains per year (25 ha):
25 x 0,2 ton C x 44/12 = 18,33 ton CO_2 per year

Net gains for 25 ha after 5 years : 91,65 ton CO_2

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Use of fertilizers

Source: Biograce standard values

Emission coefficients:

- N fertilizer: 5,88 kg CO_2-eq/kg
- P_2O_5 fertilizer: 1,01 kg CO_2-eq/kg
- K_2O fertilizer: 0,58 kg CO_2-eq/kg
- CaO fertilizer: 0,13 kg CO_2-eq/kg
- Pesticides: 10,97 kg CO_2-eq/kg

Assumptions: (N content: 0,5%; crop production 1 ton/ha)
N-fertilizer: Weighed average (50% crop) over 25 ha => 25 kg/ha
=> 25 kg x 25 ha = 2500 kg N-fertilizer per year

=> 14,7 ton CO_2 per year for 25 ha = 73,5 ton CO_2 after 5 years.

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Burning fossil fuels

Soil breaking up (cultivator): 14,10 liter/ha (once only?)

Yearly basis for crop land:
Herbicides application: 0,50 liter/ha
Sowing: 5,00 liter/ha
Fertilizing (assumed): 5,00 liter/ha
Harvesting (assumed): 5,00 liter/ha (also for perennials)

Assumed weighed fuel use per year (25 ha): 250 liter

Energetic value: 250 x 36,55 (MJ/liter) = 9137,5 MJ
Emission coefficient: 83,8 gCO_2/MJ => 0,766 ton CO_2 per year
=> **Estimated emissions for 25 ha after 5 years: 3,83 ton CO_2**

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Summary

Factor	Ton CO_2/ Year	Ton CO_2 project
Biomass accumulation	11,9	59,5
Soil Organic Content	18,33	91,65
Fertilizer	-/- 14,7	-/- 73,5
Fossil fuel use	-/- 0,77	-/- 3,83
Total savings by project	14,76	73,82

Conclusions:

- Minimize cultivation and other soil disturbances
- Maximize soil building capacity (legumes, cover crops, intercropping, rotation)
- Minimize fertilizer and herbicides/pesticides

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