PV CLIMATE MODULE

AM-006

Module for Performing Leakage Assessment of Carbon Benefits on Small-scale Agroforestry

Version 1.0

[DD Month YYYY]

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1 Summary

This module for '*Performing Leakage Assessment of Carbon benefits on Small-scale Agroforestry v1.0*' describes the procedures for estimating the project *leakage* for *carbon benefits*. This module is used to determine the project *leakage* as a percentage of the measured value of the *carbon benefits* at a *project level* and specify appropriate *leakage* adjustments. The suitability of the adjustment factor is re-assessed at least every 5 years.

2 Sources

This module supports the following methodology:

- **AM-001** Methodology for Quantifying Carbon Benefits from Small-scale Agroforestry v2.0
- **AR-TOOL04** Tool for testing significance of GHG emissions in A/R CDM project activities v1.0
- **AR-TOOL15** Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity v2.0
- **IPCC 2006** Guidelines for National Greenhouse Gas Inventories. Volume 4 Agriculture, Forestry and Other Land Use
- **PU004** Estimation of GHG emissions from leakage in Plan Vivo projects v1.0

3 Definitions

Definitions used in this module follow the latest version of the Acorn Glossary available on the Acorn website.

4 Applicability Conditions

For this module, the applicability conditions of Methodology **AM-001 v2.0** should be met. The method described in this module is applicable at a *project level*.

5 Procedures

Due to the localized nature of *small-scale agroforestry projects* as well as the minimal impact on broader market dynamics only activity-shifting leakage has to be addressed. Activity-shifting *leakage* can occur if land use or land management activities are displaced from a *project area* as a result of an *Project intervention*.

To address activity-shifting *leakage*, a systematic approach is followed that is built upon comparable approaches from **IPCC 2006**, **CDM AR-TOOL 15** and Plan Vivo's **PU004**. During the *Design Period*, data on potential productivity loss from a sample of project *Participants* is collected.

If insignificance (<5%) can be demonstrated using **AR-TOOL 04** leakage for activity shifting activities may be considered neglectable.

For determining leakage adjustment, a buffer zone extending 5 km around the *project area* is established, as it is found the most likely area for replacement of activities. The application of a 5km buffer is motivated by a number of studies suggesting low mobility of *Smallholder Farmer*s, usually below 2km (Belay, 2020; Alam, 2010; Rapsomanikis, 2015). Within this buffer, land use types are identified. The land use types are identified using data from ESA land cover or alternative land cover inventory data sources, backed by scientific recognition.

During the analysis, the land use type and average *biomass* delta content within the buffer zone are considered, drawing upon guidance from the Intergovernmental Panel on Climate Change (IPCC) and IPCC *ecoregion* definitions. Additionally, a conservative approach is adopted by accounting for 75% of the estimated *biomass* loss. This decision acknowledges the inherent *uncertainty* and variability associated with *leakage* assessments.

Integrating these parameters into an equation allows for quantifying maximum potential *biomass leakage* from the *Project*.

The *leakage* adjustment factor per project is calculated following Equations 1, 2, and 3. Equation 1 must be applied to calculate the potential activity shift area.

$$S_a = P_l \cdot P_a$$

Equation 1

Where:

S_a = Potential activity shift area in ha

P_l = Estimated average % reduction in productivity of crops, livestock, timber, or other products from the *project area*, as a result of the *Project intervention.*

P_a = *Project area* in ha

The activity shift area, Area of disturbance (A_d), only includes areas in which disturbance is expected to cause land use conversion to a land use type with higher average carbon stocks (e.g. forest land, shrubland). Areas where no land conversion is expected or land conversion of land use types with a lower average carbon stock are excluded. Hence, the Area of disturbance (A_d) cannot be larger than the area of land use type with higher average carbon stocks within project areas as calculated using Equation 2.

$$A_d = \min (S_a \cdot L_u)$$

Equation 2

Where:

S_a = Potential activity shift area in ha, derived using Equation 1.

L_u = Area of land use type with higher average carbon stocks within the project area (ha)

The *leakage* adjustment value is the amount of *biomass* stored, on average, on the potential activity shift area and calculated with Equation 3.

$$AdjL = A_d \cdot B_w \cdot CF \cdot 0.75$$

Equation 3

Where:

$AdjL$ = Adjustment for *leakage* (tC)

A_d = Area affected by a potential shifting activity in ha, derived using Equation 2

B_w = Average *biomass* stock of land use type (tonne/ha)

6 Parameters

Data/Parameter	B_w
Units	Tonne/ha
Description	Average *biomass* stock of forest area in t *biomass* per ha
Equations	Equation 3
Source	IPCC 2019 Table 4.7
Value	Number
Justification of choice of data or description of measurement methods and procedures applied	Internationally recognized dataset for *Aboveground Biomass* in natural forests; The value is selected based on the geographical location of the project (continent, global ecological zone, as defined in Global Ecological Zones for FAO, and status of the forest)
Purpose of Data	Input to determine the *leakage* adjustment factor
Comments	N/A

Data/Parameter	CF
Units	No unit
Description	Carbon fraction of *biomass*
Equations	Equation 3
Source	IPCC, 2006
Value	Number
Justification of choice of data or description of	Carbon fraction of *biomass* = 0.47

measurement methods and procedures applied	
Purpose of Data	Widely used conversion
Comments	N/A

Data/Parameter	L_u
Units	ha
Description	Area of Land use type with higher average carbon stocks within the project area.
Equations	Equation 2
Source	ESA
Value	Number
Justification of choice of data or description of measurement methods and procedures applied	Internationally recognized dataset for land cover; utilize the newest available land cover data to determine the land use type on project area. The area of the land use type with higher carbon stocks are is calculated. The land cover is calculated in 5km buffer around the *project area*, counted from the border of the *project*. 5km buffer is motivated by a number of studies suggesting low mobility of *Smallholder Farmer*s, usually below 2km (Belay, 2020; Alam, 2010; Rapsomanikis, 2015).
Purpose of Data	Input to determine the area of disturbance which contributes to calculating *leakage* adjustment factor
Comments	N/A

Data/Parameter	P_a
Units	Hectares (Ha)
Description	*Project area* in ha
Equations	Equation 1
Source	Acorn platform
Value	Number
Justification of choice of data or description of measurement methods and procedures applied	Comparable approach as to IPCC 2006, CDM AR-Tool 15 and Plan Vivo's PU005.
Purpose of Data	Value needed to calculate area of potential disturbance
Comments	N/A

Data/Parameter	P_l
Units	Percentage (%)
Description	Estimated average productivity loss in %
Equations	Equation 1
Source	Collected during Farmer Survey as part of *Project Design Document* and estimates provided by the *Local Partner*
Value	Number
Justification of choice of data or description of measurement methods and procedures applied	Productivity loss data is collected in the Farmer Survey as part of *Project Design Document* during the *Design Period*. The Farmer Survey has to be completed by at least 100 *Participants* at the start of

	Project intervention and every 5 years until the end of the *Crediting Period*.
Purpose of Data	Estimates given to calculate area of potential activity shift area
Comments	N/A

7 References

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