



Indicative simplified baseline and monitoring methodologies
for selected small-scale CDM project activity categories

TYPE III - OTHER PROJECT ACTIVITIES

Project participants shall apply the general guidelines to SSC CDM methodologies and information on additionality (attachment A to Appendix B) provided at <http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html> *mutatis mutandis*.

III.T. Plant oil production and use for transport applications

Technology/measure

1. This methodology covers project activities involving the cultivation of oilseeds, the production of plant oil¹ and the use of plant oil for transportation applications. Plant oil in contrast to bio-diesel is not trans-esterified but only pressed and filtered from oilseeds.
2. This methodology is only applicable to plant oil that:
 - (a) Is used in blends of up to 10% by volume of plant oil in unconverted vehicles,² or
 - (b) Is used as pure or in blends above 10% by volume of plant oil.³
3. This methodology is applicable under the following conditions:
 - (a) In the baseline situation the vehicles use diesel;
 - (b) Plant oil must comply with national quality regulations or in absence of the latter with the quality standards stipulated in Table III.T.1;
 - (c) The retailers, final users and the producer of the plant oil or its blend are bound by a contract that states that the retailers and final consumers shall not claim emission reductions resulting from its consumption. The contract also enables the producer to monitor the consumption of plant oil or its blend. Only the producer of the plant oil can claim emission reductions under this methodology;
 - (d) Under this methodology only the CO₂ emissions from diesel displaced by plant oil is considered;⁴
 - (e) In accordance with the approved “General guidance on leakage in biomass project activities” for small scale projects, the project participants should demonstrate that the area where the biomass is grown is not a forest (as per DNA forest definition) and has not been deforested, according to the forest definition by the national

¹ Plant oil, or vegetable oil, is oil of plant origin composing of triglycerides. Although many different parts of the plants may yield oil, most often oil is extracted from the seeds or fruits of the plant. Examples of plant oil are sunflower oil, rapeseed oil and jatropha oil.

² The term ‘vehicles’ used throughout this document also includes other transportation applications such as domestic water borne transport. Domestic water borne transport as defined by IPCC 2006, vol.2, chapter 3 can be considered as eligible.

³ Conversion measures include adaptations of fuel supply, fuel injection and combustion.

⁴ Project participants are encouraged to submit procedures to calculate upstream emissions related to the production and use of fossil fuel in the baseline for consideration and approval by the CDM Executive Board.



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DNA, during the last 10 years prior to the implementation of the project activity. In the absence of forest definition from the DNA, definitions provided by relevant international organizations (e.g. FAO) shall be used. The plantations established on peatlands are not eligible under this methodology;

- (f) The export of the plant oil produced to Annex I countries is not allowed under this methodology.

Table III.T.1: Proposed Quality Control Parameters for Plant Oil

Properties	Unit	Proposed Limiting Value		Possible Testing Method
		Min.	Max.	
Acid Value	mg KOH/g	-	2.0	DIN EN ISO 660
Oxidation Stability (110°C)	h	5.0	-	ISO 6886
Ash Content	Mass-%	-	0.01	DIN EN ISO 6245
Contamination	mg/kg	-	25	DIN EN 12662
Phosphorus Content	mg/kg	-	15	ASTM D3231-99
Water Content	Mass-%	-	0.075	Pr EN ISO 12937
Kinematic Viscosity (40°C)	mm ² /s	-	Variable	DIN EN ISO 3104

4. Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO₂ equivalent annually.

Boundary

5. The project boundary is the geographical area of the cultivation, production and processing of oil-seeds and the areas where plant oil is blended and sold to the final users. The vehicles of the final users where the plant oil or blend is consumed are also included in the project boundary.

Baseline

6. Baseline emissions are calculated based on the amount of plant oil consumed by the project. For this purpose the amount of diesel fuel that would have been consumed in absence of using plant oil is calculated. Calculations are based on the relative net calorific values of the fuels used.

$$FC_{D,y} = \sum_{k=1..n} \frac{NCV_k}{NCV_D} \times FC_{k,y} \quad (1)$$

Where:

$FC_{D,y}$ Diesel fuel which would have been consumed in the absence of the project activity in the year y (tons)



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NCV_k	Net calorific value of plant oil k (GJ/m ³)
NCV_D	Net calorific value of diesel (GJ/m ³)
$FC_{k,y}$	Plant oil type k consumed in the year y (tons)
k	Types of plant oil used (dependent on oil-seed source)

Under the condition of:

$$FC_{k,y} \leq FP_{k,y} \quad (2)$$

Where:

$FP_{k,y}$	Plant oil type k produced in the year y (tons)
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7. The net calorific values (in GJ/m³) of diesel and of plant oil used are determined based on direct measurements of a representative sample.

8. Only plant oil which is consumed in non-annex 1 countries by captive fleets and which is sold to the end users at filling stations and recorded by calibrated metering systems is included. Captive fleets, retailers and final consumers are bound by a contract that allows the producer to monitor the consumption of plant oil and states that the captive fleet, the retailer or end user shall not claim emission reductions resulting from its consumption.

9. Total baseline emissions are determined as follows:

$$BE_y = FC_{D,y} \times NCV_D \times EF_{CO_2,D} \times f_{PD,y} \quad (3)$$

Where:

BE_y	Baseline emissions in year y (tCO ₂ e)
NCV_D	Net calorific value of diesel (GJ/ton)
$EF_{CO_2,D}$	CO ₂ emission factor diesel (tCO ₂ e/GJ)
$f_{PD,y}$	1.0 if pure petrodiesel is used for blending otherwise use the fraction of petrodiesel in the fuel used for blending ⁵ (blending fraction based on volume basis)

⁵ It is expected that plant oil is blended with pure petrodiesel, however where the project proponent has no access to pure petrodiesel (e.g. due to local regulations requiring sale of blended petrodiesel in the region/country) blended fuel may be used.



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Project Activity Emissions

10. Project activity emissions are the emissions related to the cultivation of oil seeds and production of plant oil (“field-to-wheel” emissions). These emissions will be attributed to the plant oil produced, and not shared over the different co-products.⁶

11. Project emissions from the cultivation of oil crops and production of oil seeds, shall be calculated in accordance with the “General guidance on leakage in biomass project activities” for small scale CDM project. Specific details are provided in this methodology for N₂O emissions resulting from fertilizer application and/or from nitrogen in crop residues (above-ground and below-ground).

12. In addition to the emission sources included in paragraph 11 the following sources shall be considered:

- (a) Emissions from energy use for processing (e.g. pressing and filtering) of plant oil;
- (b) Where applicable methane emissions due to stockpiling, land filling, waste water generated in the plant oil production facility.

13. For each oilseed/plant oil type k the project emissions shall be calculated separately.

$$PE_y = \sum_k PE_{PO,k,y} \times FP_{k,y} \quad (4)$$

Where:

PE_y Total project emissions from plant oil production (tCO₂e) in year y

$PE_{PO,k,y}$ Project emissions from plant oil production of crop k (tCO₂e/ton plant oil k produced) in year y

$$PE_{PO,k,y} = \frac{PE_{FA,k,y} + PE_{OFP,k,y} + PE_{CH4,k,y}}{H_{k,y} \times OY_{k,y}} \quad (5)$$

Where:

$PE_{FA,k,y}$ Project emissions of N₂O in cultivation of crop k in year y (tCO₂e)

$PE_{OFP,k,y}$ Project emissions from energy use for oil-seed processing (e.g. pressing and filtering) of crop k in year y (tCO₂)

$PE_{CH4,k,y}$ Project emissions of CH₄ from solid waste and/or waste water treatment associated with crop k in year y (tCO₂)

$H_{k,y}$ Harvest of crop k in year y (ton crop)

⁶ Project proponents are encouraged to submit procedures to allocate emissions associated with the cultivation of oil seeds and production of plant oil among by-products for consideration and approval by the Board.

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$OY_{k,y}$ Oil yield of crop k in year y (ton oil/t crop)

14. The project emissions of N_2O from oil crop cultivation ($PE_{FA,k,y}$) are determined as per the following options:

Option 1: Use of default emission factor

$$PE_{FA,k,y} = \sum_k A_{k,y} * EF_{k,y} \tag{6}$$

Where:

$A_{k,y}$ Area in which oil seed type k is cultivated for use in the project plant in year y (ha)

$EF_{k,y}$ Project emissions of N_2O from land management at the plantation where the oil seed type k is cultivated in year y (tCO₂e/ha)

Table III.T.2: Default factors for the N_2O emissions (tCO₂e/ ha) associated with the cultivation of oil seeds⁷

Crop	Climate Zone	EF k,y (tCO ₂ e/ha)
Palm	Tropical Moist	0.53
Palm	Tropical Wet	0.53
Jatropha	Tropical Moist	0.60
Jatropha	Tropical Dry	0.9

Option 2: Calculation as per the equation below:

$$PE_{FA,k,y} = \left[(F_{ON,k,y} + F_{SN,k,y} + F_{CR,k,y}) \times EF_{N2O_direct} \right] \times \frac{44}{28} \times GWP_{N2O} \tag{7}$$

Where:

$F_{ON,k,y}$ Amount of organic fertilizer nitrogen applied in crop k in year y (ton N)

$F_{SN,k,y}$ Amount of synthetic fertilizer nitrogen applied in crop k in year y (ton N)

$F_{CR,k,y}$ Amount of N in residues of crop k in year y (ton N). For N-fixing crops like soybean F_{CR} shall be taken into account. For other types of crops F_{CR} can be ignored. F_{CR} shall be calculated in accordance with 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Vol 4, chapter 11

⁷ The default emission factor accounts for N_2O emissions from land management, however the project emissions from fossil fuel consumption for agriculture operations and upstream emissions related to the production of synthetic fertilizers used at plantation are neglected in this simplified SSC CDM methodology.



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EF_{N20_direct} N₂O emission factor for emissions from N inputs (ton N₂O-N/ton N input). A default value of 0.01 can be taken in accordance with 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Vol 4, Table 11.1 p.11

GWP_{N2O} Global warming potential of N₂O (tCO₂e/tN₂O) (value of 310)

15. Project emissions from energy use for processing (e.g. pressing and filtering) of plant oil ($PE_{OFP,k,y}$) are determined as follows:

$$PE_{OFP,k,y} = EC_{OFP,k,y} \times EF_{CO2,ELEC} + \sum_i (FC_{OFP,i,k,y} \times NCV_i \times EF_{CO2,i}) \quad (8)$$

Where:

$EC_{OFP,k,y}$ Electricity consumption in processing (e.g. pressing and filtering) for crop k in year y (MWh)

$EF_{CO2,ELEC}$ Emissions factor for grid electricity supplied to the project plant using the calculation methods of AMS-I.D (tCO₂e/MWh)

$FC_{OFP,i,k,y}$ Consumption of fossil fuel i for filtering and pressing for crop k in year y (tons)

NCV_i Net calorific value of fossil fuel i (GJ/ton)

$EF_{CO2,i}$ Emissions factor of fossil fuel i (tCO₂/GJ fuel)

16. Project emission of CH₄ from solid waste disposal and/or waste water treatment ($PE_{CH4,k,y}$) are calculated as per provisions in AMS-III.G (landfill); AMS-III.F (composting), AMS-III.H (waste water treatment).

17. Project emissions from transportation of oil seeds to the oil production plant have to be accounted following the procedures in AMS-III.AK if the transportation distance is of more than 200 km, otherwise they can be neglected.

Leakage

18. Leakage emissions due to a shift of pre-project activities shall be accounted for as per the approved “General guidance on leakage in biomass project activities” for small-scale project activities.

19. In case oil seeds are cultivated in the baseline situation in the area of land where oil seeds are cultivated in the project situation, the guidance on competing uses for biomass in the “General guidance on leakage in biomass project activities” for small-scale projects shall be taken into account. Leakage shall be estimated accordingly and deducted from the emission reductions.



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Emission Reduction

20. The emission reduction achieved by the project activity shall be calculated as the difference between the baseline emissions and the sum of the project emissions and leakage.

$$ER_y = BE_y - PE_y - LE_y \quad (9)$$

Where:

ER_y Emission reductions in the year y (tCO₂e)

LE_y Leakage in year y (tCO₂e)

Monitoring

21. The following parameters shall be monitored as per the Table III.T.3 below. The applicable requirements specified in the “General Guidelines to SSC Methodologies” (e.g. calibration requirements, sampling requirements) are also an integral part of the monitoring guidelines specified below and therefore shall be referred by the project participants.

**Table III.T.3: The following parameters shall be monitored
and recorded during the crediting period**

No	Parameter	Description	Unit	Monitoring/ recording Frequency	Measurement Methods and Procedures
1.	$H_{k,y}$	Harvest of crop k in year y	Tonnes	Annually	Measurements are undertaken using calibrated meters
2.	$OY_{k,y}$	Oil yield of crop k in year y	tonnes oil/ t crop	Annually	Measured and calculated value. The plant oil extraction data shall be cross-checked with the amount of plant oil consumed by end-users
3.	$A_{k,y}$	Area in which oil seed type k is cultivated for use in the project plant in year y	ha	Annually	Metered and calculated plantation area (e.g. using maps). Measurements results shall be consistent with yield of the plantation
4.		Oil content of oil seeds	%	Annually	Laboratory analysis to be carried out. The value is to be established on representative samples

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No	Parameter	Description	Unit	Monitoring/ recording Frequency	Measurement Methods and Procedures
5.	EF _{CO₂,ELEC}	CO ₂ emission factor for grid electricity supplied to the project plant in year <i>y</i>	tCO ₂ e/kWh	Annually	Grid emission factor shall be determined as per AMS-I.D
6.	EF _{CO₂,i}	CO ₂ emission factor of fossil fuel type <i>i</i>	tCO ₂ e/GJ	Annually	As per the “Tool to calculate project or leakage CO ₂ emissions from fossil fuel combustion“
7.	EC _{OPF,k,y}	Quantity of electricity consumption in processing (e.g. pressing and filtering) for crop <i>k</i> in year <i>y</i>	MWh	As per the “Tool to calculate baseline, project and/or leakage emissions from electricity consumption”	As per the “Tool to calculate baseline, project and/or leakage emissions from electricity consumption”
8.	NCV _i	Net calorific value of fossil fuel type <i>i</i>	GJ/mass or volume unit	Annually	As per the “Tool to calculate project or leakage CO ₂ emissions from fossil fuel combustion“
9.	FC _{OPF,i,k,y}	Quantity of fossil fuel consumption <i>i</i> for filtering and pressing for crop <i>k</i> in year <i>y</i>	Mass or volume unit	As per the “Tool to calculate project or leakage CO ₂ emissions from fossil fuel combustion”	As per the “Tool to calculate project or leakage CO ₂ emissions from fossil fuel combustion”
10.	F _{ON,k,y} ; F _{SN,k,y}	Amount of organic fertilizer nitrogen applied in crop <i>k</i> in year <i>y</i> Amount of synthetic fertilizer nitrogen applied in crop <i>k</i> in year <i>y</i>	Tonnes	Continuously or in batches	Measurements are undertaken using calibrated meters. Measurements results shall be cross-checked with records for purchased amount (e.g. invoices/receipts)
11.	NCV _k	Net calorific value of plant oil <i>k</i>	GJ/m ³	Annually	Measured according to relevant national/international standards. Analysis has to be carried out by accredited laboratory



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No	Parameter	Description	Unit	Monitoring/ recording Frequency	Measurement Methods and Procedures
12.	NCV_D	Net calorific value of petrodiesel	GJ/m ³	Annually	Measured according to relevant national/international standards. Analysis has to be carried out by accredited laboratory
13.	$FP_{k,y}$	Plant oil type k produced in the year y	Tonnes/m ³	Continuously or in batches	Measurement through direct weighting or volume and density
14.	$FC_{k,y}$	Plant oil type k consumed in the year y	Tonnes/m ³	Continuously or in batches	Measurements of the amount of plant oil sold to retailers and filled into vehicles of the final end users and captive fleets are undertaken using calibrated meters for volume and multiplied by the density which is determined through sampling. Measurements results shall be cross-checked with production and consumption data
15.	$FB_{PO,y}$	Amount of plant oil bought in case the plant oil is sold and/or used as blend	Tonnes/m ³	Continuously or in batches	Measurements of the amount of plant oil bought by the retailers and owners of captive fleets are undertaken using calibrated meters. Measurements results shall be cross-checked with sales records
16.	$FB_{D,y}$	Amount of diesel bought in the case the plant oil is sold and/or used as blend	Tonnes/m ³	Continuously or in batches	Measurements of the amount of diesel bought by the retailers and owners of captive fleets are undertaken using calibrated meters. Measurements results shall be cross checked with sales records



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No	Parameter	Description	Unit	Monitoring/ recording Frequency	Measurement Methods and Procedures
17.	$FC_{PO,y}$	Amount of blended plant oil used	Tonnes/m ³	Continuously or in batches	Measurements of the amount of blended plant oil sold final end users and captive fleets are undertaken using calibrated meters. Measurements results shall be cross checked with production and consumption data
18.	$f_{PD,y}$	Fraction of petrodiesel in the fuel used for blending	%	Continuously or in batches	Data from the supplier of the fuel used for blending

22. The occurrence of shift of pre-project activities and the competing uses of biomass shall be monitored and verified.

23. The compliance of pure plant oil and plant oil blends with national regulations or in absence of latter compliance with the parameters identified in Table III.T.1 shall be ensured through monitoring.

24. All the parameters for determination of the methane project emissions are to be estimated as per paragraph 16 and the procedures of the relevant methodologies.

25. If paragraph 2 (b) is applicable, the engine conversion of the vehicles shall be monitored and verified by sampling.

26. It shall be monitored and verified that no plant oil is exported to Annex I countries.

Project activity under a programme of activities

27. As currently constructed this methodology does not apply to a programme of activities. In order for this methodology to be used under a programme of activities further analyses are required, for instance further analysis concerning issues related to the shift of the pre-project activities in the lands where the oil crops are grown and the competing use of biomass is required. Project proponents are encouraged to submit procedures to address these issues as revisions to make this methodology applicable to a programme of activities for approval by the Board.



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III.T. Plant oil production and use for transport applications (cont)

History of the document

Version	Date	Nature of revision
02	EB 55, Annex 33 30 July 2010	To include default factors for project emissions associated with the oil seed cultivation and procedures for accounting methane project emissions.
01	EB 36, Annex 22, 30 November 2007	Initial adoption.
Decision Class: Regulatory Document Type: Standard Business Function: Methodology		