



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 oil<sup>1</sup> 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;<sup>2</sup> or
  - (b) Is used as pure or in blends above 10% by volume of plant oil. In case pure plant oil is used it shall be used as a fuel only in converted vehicles.<sup>3</sup> The use of pure plant oil in vehicles where engine conversions have not been carried out is not covered under this methodology.
3. This methodology is applicable under the following conditions:
  - (i) In the baseline situation the vehicles use diesel;
  - (ii) In case of blending, plant oil is blended with pure diesel and not with bio-diesel or bio-diesel blends.
  - (iii) Plant oil must comply with national quality regulations or in absence of the latter with the quality standards stipulated in Table III.T.1;
  - (iv) 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;

<sup>1</sup> 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.

<sup>2</sup> 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.

<sup>3</sup> Conversion measures include adaptations of fuel supply, fuel injection and combustion.



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

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

- (v) Under this methodology only the CO<sub>2</sub> emissions from diesel displaced by plant oil is considered;<sup>4</sup>
- (vi) 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 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;**
- (vii) **No biomass and/or wastes generated/used in the cultivation and processing of the oilseeds will be stockpiled, disposed or treated in such a way as to allow anaerobic decay that result in methane emissions;**
- (viii) **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 <sup>2</sup> /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 CO<sub>2</sub> 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.

<sup>4</sup> 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.



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

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

**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)

$NCV_k$  Net calorific value of plant oil  $k$  (GJ/m<sup>3</sup>)

$NCV_D$  Net calorific value of diesel (GJ/m<sup>3</sup>)

$FC_{k,y}$  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)

7. The net calorific values (in GJ/m<sup>3</sup>) 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<sub>2</sub>e)

$NCV_D$  Net calorific value of diesel (GJ/ton)



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

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

$EF_{CO_2,D}$  CO<sub>2</sub> emission factor diesel (tCO<sub>2</sub>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<sup>5</sup> (blending fraction based on volume basis)

**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.<sup>6</sup>

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, are: Specific details are provided in this methodology for N<sub>2</sub>O 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) N<sub>2</sub>O emissions resulting from either from fertilizer application and/or from nitrogen in crop residues (above ground and below ground);
- (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 (tCO<sub>2</sub>e/ton plant oil produced) in year  $y$

$PE_{PO,k,y}$  Project emissions from plant oil production of crop  $k$  (tCO<sub>2</sub>e/ton plant oil  $k$  produced) in year  $y$

<sup>5</sup> 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.

<sup>6</sup> 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.

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

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

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

Where:

$PE_{FA,k,y}$  Project emissions of N<sub>2</sub>O in cultivation of crop *k* in year *y* (tCO<sub>2</sub>e)

$PE_{OFP,k,y}$  Project emissions from energy use for oil-seed processing (e.g. pressing and filtering) of crop *k* in year *y* (tCO<sub>2</sub>)

$PE_{CH4,k,y}$  Project emissions of CH<sub>4</sub> from solid waste and/or waste water treatment associated with crop *k* in year *y* (tCO<sub>2</sub>)

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

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

14. The project emissions of N<sub>2</sub>O from oil crop cultivation ( $PE_{FA,k,y}$ ) are determined as per the following options:

**Option 1: Use of default emission factor**

$$PE_{FA,k,y} = \sum_k A_{k,y} * PE_{N2Osoil,k,y} \quad (6)$$

Where:

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

$PE_{N2Osoil,k,y}$  Project emissions of N<sub>2</sub>O from land management at the plantation where the oil seed type *k* is cultivated in year *y* (tCO<sub>2</sub>e/ha)

**Table III.T.2: Default factors for the N<sub>2</sub>O emissions associated with the cultivation of oil seeds<sup>7</sup>**

[tCO <sub>2</sub> e/ ha]	Fresh palm fruit bunches		Jatropha nuts	
	Tropical Moist	Tropical Wet	Tropical Moist	Tropical Dry
$PE_{N2O,soil,k,y}$	0.53	0.53	0.60	0.90

**Option 2: Calculation as per equation below:**

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

<sup>7</sup> The default emission factor accounts for N<sub>2</sub>O emissions from land management, 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.

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

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

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
$EF_{N2O\_direct}$	$N_2O$ emission factor for emissions from $N$ inputs (ton $N_2O$ -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 $N_2O$ ( $tCO_2e/tN_2O$ ) (value of 310)

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

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

Where:

$EC_{OFFP,k,y}$	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 ( $tCO_2e/MWh$ )
$FC_{OFFP,i,k,y}$	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 $i$ ( $tCO_2/GJ$ fuel)

16. Project emissions from clearance of lands are addressed by the applicability conditions of the methodology.

16. Project emission of  $CH_4$  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 SSC-III.AK if the transportation distance is of more than 200 km, otherwise they can be neglected.



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

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

#### Leakage

17. If equipment is transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered.

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 plant oil is produced—oil seeds are cultivated in the baseline situation in the area of land where plant oil is cultivated—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.

#### 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  $y$  (tCO<sub>2</sub>e)

$LE_y$  Leakage in year  $y$  (tCO<sub>2</sub>e)

#### 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.

- (i) The crop harvest, oil content of the oil seeds and amount of plant oil produced per crop source per production location. The extent of the area where plant oil is produced should be consistent with the yield of the cultivation, the plant oil extraction and with the amount of plant oil consumed by end users.
- (ii) The energy use (electricity and fossil fuel) for the production of plant oil and the amount of fertilizer applied for the cultivation of plant oil per crop source per production location.
- (iii) The occurrence of shift of pre-project activities and the competing uses of biomass shall be monitored and verified.
- (iv) The NCV of plant oils are determined based on direct measurements of a representative sample.



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

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

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- (v) 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.
- (vi) The amount and type of plant oil sold to retailers and filled into the vehicles of the final end users and captive fleets must be recorded by a calibrated metering system. Records of these vehicles and the plant oil (blends) consumed by these vehicles shall be provided.
- (vii) In case the plant oil is sold and/or used as blend then the following shall be recorded by the retailer or by the owner of the captive fleet:
- (viii) The amount of plant oil bought ( $FB_{PO}$ );
- (ix) The amount of diesel bought ( $FB_D$ );
- (x) The amount of blended plant oil used ( $FC_{PO}$ ) by the captive fleet or sold to final clients.
- (xi) In case of blending, the maximum blending ratio of 10% shall be controlled at the sites that sell the plant oil blends.  $FB_{PO}$  can be maximally 10% of  $FB_D$ . In addition the procedure for blending shall ensure that the blending ratio is maximally 10% by volume.
- (xii) In case of use of pure plant oil it shall be monitored and verified by random sampling that the vehicles have carried out engine conversions.
- (xiii) The contracts between the producer of plant oil and the final users and retailers specifying that only the producer of plant oil can claim CERs, the obligation for engine conversions in case of pure plant oil use shall be verified by random sampling.
- (xiv) It shall be monitored and verified that no plant oil is exported to annex 1 countries.



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

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

**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
5.	$EF_{CO_2,ELEC}$	CO <sub>2</sub> emission factor for grid electricity supplied to the project plant in year $y$	tCO <sub>2</sub> e/kWh	Annually	Grid emission factor shall be determined as per AMS-I.D
6.	$EF_{CO_2,i}$	CO <sub>2</sub> emission factor of fossil fuel type $i$	tCO <sub>2</sub> e/GJ	Annually	As per the “Tool to calculate project or leakage CO <sub>2</sub> emissions from fossil fuel combustion“
7.	$EC_{OP,k,y}$	Quantity of electricity consumption in processing (e.g. pressing and filtering) for crop $k$ in year $y$	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“

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

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

No	Parameter	Description	Unit	Monitoring/ recording Frequency	Measurement Methods and Procedures
8.	NCV <sub>i</sub>	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 <sub>2</sub> emissions from fossil fuel combustion“
9.	FC <sub>OFF,i,k,y</sub>	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 <sub>2</sub> emissions from fossil fuel combustion”	As per the “Tool to calculate project or leakage CO <sub>2</sub> emissions from fossil fuel combustion”
10.	F <sub>ON,k,y</sub> F <sub>SN,k,y</sub>	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 <sub>k</sub>	Net calorific value of plant oil <i>k</i>	GJ/m <sup>3</sup>	Annually	Measured according to relevant national/international standards. Analysis has to be carried out by accredited laboratory
12.	NCV <sub>D</sub>	Net calorific value of petrodiesel	GJ/m <sup>3</sup>	Annually	Measured according to relevant national/international standards. Analysis has to be carried out by accredited laboratory
13.	FP <sub>k,y</sub>	Plant oil type <i>k</i> produced in the year <i>y</i>	Tonnes/m <sup>3</sup>	Continuously or in batches	Measurement through direct weighting or volume and density

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

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

No	Parameter	Description	Unit	Monitoring/ recording Frequency	Measurement Methods and Procedures
14.	$FC_{k,y}$	Plant oil type $k$ consumed in the year $y$	Tonnes/m <sup>3</sup>	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 <sup>3</sup>	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 <sup>3</sup>	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
17.	$FC_{PO,y}$	Amount of blended plant oil used	Tonnes/m <sup>3</sup>	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



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

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

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 random sampling that the vehicles have carried out engine conversion.

26. The contracts between the producer of plant oil and the final users and retailers specifying that only the producer of plant oil can claim CERs, the obligation for engine conversions in cases as per paragraph 3,iv) shall be verified by random 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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**History of the document**

Version	Date	Nature of revision
02	EB 55, Annex # 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.
<b>Decision Class:</b> Regulatory <b>Document Type:</b> Standard <b>Business Function:</b> Methodology		