

**CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006**

CONTENTS

- A. General description of the small scale project activity
- B. Application of a baseline and monitoring methodology
- C. Duration of the project activity / crediting period
- D. Environmental impacts
- E. Stakeholders' comments

Annexes

Annex 1: Contact information on participants in the proposed small scale project activity

Annex 2: Information regarding public funding

Annex 3: Baseline information

Annex 4: Monitoring Information

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Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	<ul style="list-style-type: none">• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document.• As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at http://cdm.unfccc.int/Reference/Documents.
03	22 December 2006	<ul style="list-style-type: none">• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

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SECTION A. General description of small-scale project activity
A.1 Title of the small-scale project activity:

Inoculant distribution in Brazil
Version 01 – May 9, 2007

A.2. Description of the small-scale project activity:

The project participant (Becker Underwood) is implementing a program that involves the distribution of inoculant by selling the inoculant at a reduced price to soybean farmers in Brazil that have in the three most recent years not used inoculant (but urea) in the regions of the South of Brazil, namely Paraná, Santa Catarina and Rio Grande do Sul. In these regions, use of inoculant in soybean cropping is not common practice. Yearly, Becker Underwood will distribute inoculant before the planting season (which starts around October¹).

Becker Underwood will distribute the inoculant in the form of Rhizo-Stick® (a peat-based inoculant carrier) to selected seed distributors in the programme area. The distributors will apply the inoculant to the seeds they will sell to the farmers that are eligible to participate in the programme. For this purpose, Becker Underwood has made an agreement with a number of seed wholesalers and retailers in the South of Brazil that will assist Becker Underwood in implementing the project activity in accordance with the monitoring plan for the project activity.

Becker Underwood will enter into an agreement with the farmers to which the inoculant is distributed under the project activity that specifies that:

- The farmers will not claim CERs for using inoculant on their land
- CERs generated by the project activity are owned by Becker Underwood
- The distributor will make sure that inoculant is applied according to the recommended application rate of 1,200,000 rhizobia bacteria per ha taking into account common seeding rates (seeds/ha).

The inoculant that will be distributed under the project activity comes from the existing production facility of Becker Underwood in Brazil.

The project activity will reduce urea use by soybean farmers that have in the three most recent years applied this kind of fertilization method. GHG emissions reduced will be due to:

- Reduced N₂O emission from the soil from the urea that would have been applied
- Reduced production of urea that causes CO₂ and N₂O emissions

The project activity contributes to sustainable development because it:

- Reduces the amount of weeds on the plantation area (weeds grow better when Urea is applied than when inoculant is applied) and therefore leads to less application of chemical weed control
- Reduces the pollution of local water supply by leaching of nitrate nitrogen (NO₃-) from Urea into the groundwater or rivers
- Avoids local emissions due to fuel combustion around the urea production plant
- Leads to a less rapid depletion of natural gas resources (most common feedstock to produce urea from)

¹ In the following, when we speak about year y we refer to the period of one year which starts at the beginning of the growing season in one calendar year and ends before the start of the growing season in the subsequent calendar year.

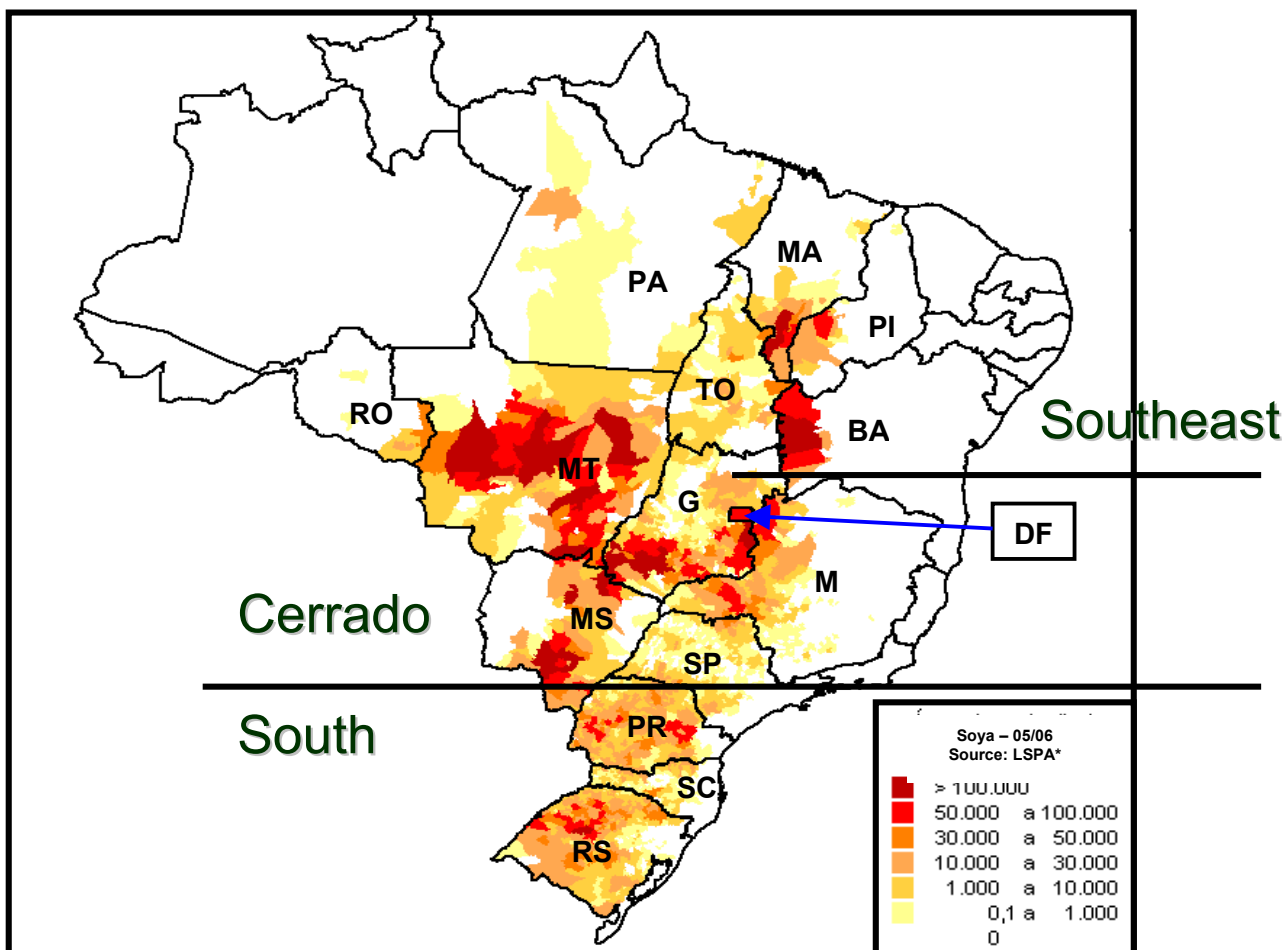
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A.3. Project participants:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Brazil (host)	Nitral Urbana (private)	No

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:



Source: Kleffmann Group (2006)

The project activity is located in in the regions of the South of Brazil, namely Paraná (PR), Santa Catarina (SC) and Rio Grande do Sul (RS).

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A.4.1.1. Host Party(ies):

Brazil.

A.4.1.2. Region/State/Province etc.:

Paraná (PR), Santa Catarina (SC) and Rio Grande do Sul (RS)

A.4.1.3. City/Town/Community etc:

Not applicable.

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):

Not applicable.

A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

The methodology is applicable to Scope 15 (“Agriculture”) project activities for non-SSC projects. This scope falls into small-scale type III – other project types.

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

Years	Annual estimation of emission reductions in tonnes of CO ₂ e
2007	9.387
2008	37.548
2009	37.548
2010	37.548
2011	37.548
2012	37.548
2013	37.548
2014	37.548
2015	37.548
2016	37.548
2017	28.161
Total estimated reductions (tonnes of CO ₂ e)	375.478
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO ₂ e)	37.548

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A.4.4. Public funding of the small-scale project activity:

No public funding involved.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

The proposed small-scale project activity is not a debundled component of a large project activity as there is no registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

- With the same project participants;
- In the same project category and technology/measure; and
- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

SECTION B. Application of a baseline and monitoring methodology**B.1. Title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity:**

The proposed new small-scale baseline methodology “III.A. Urea offset programmes for inoculant application” that has been submitted with this PDD is applied to the project activity.

B.2 Justification of the choice of the project category:

It can be seen in section B.6.3. that the annual emission reductions from the project activity are below 60,000 t CO₂e per year in any year of the crediting period.

B.3. Description of the project boundary:

The project boundary encompasses a) the physical, geographical location of each measure (area of agricultural land where inoculant is applied) and b) the production facility where the inoculant originates from.

	Source	Gas	Included?	Justification / Explanation
Baseline	Urea application to soil	N ₂ O	Yes	Major GHG emissions source (direct N ₂ O emissions from the soil)
	Fuel combustion and power consumption for urea production	CO ₂	Yes	Major GHG emissions source

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	Fuel combustion and power consumption urea production	CH ₄	No	Negligible
Project Activity	Fuel combustion and power consumption for inoculant production	CO ₂	Yes	Major GHG emissions source
		CH ₄	No.	Negligible
		N ₂ O	No	Negligible

B.4. Description of baseline and its development:

In the regions of Paraná (PR), Santa Catarina (SC) and Rio Grande do Sul (RS) Becker Underwood has identified 100 soybean farmers that have used urea in the three most recent years and have not used any inoculant. Those farmers have been identified with the assistance of a seed distributor that also sold urea to the farmers.

Alternatives for fertilization for those farmers may include, inter alia

- The farmer not using any fertilization option and relying on the BNF effectiveness of the soil
- Application of organic fertilizer (e.g. animal manure or other organic fertilizer)
- Continued application of urea
- The project activity not implemented as a CDM project

The following alternatives exist for the soybean farmers identified:

1) The farmers not using any fertilization option and relying on the indigenous BNF effectiveness of the soil

This is no realistic scenario as the farmers will not be able to achieve the required yields per ha in order remain competitive in the market. It is therefore excluded from the further analysis.

2) Application of organic fertilizer (e.g. animal manure or other organic fertilizer)

In Brazilian soybean cropping use of organic fertilizer is generally negligible. The main reason is that soybean farmers usually plant large areas and those farmers are usually specialised on crop production (typical rotation is soybean-corn or soybean-soybean-corn). It follows that due to the large areas concerned and almost no animal livestock at the farm, the contribution of animal manure is negligible. The same is true for other organic fertilizer. Application of organic fertilizer is therefore excluded from the further analysis.

3) Continued application of urea

As the farmers have applied urea, at least for the recent three years, this is a credible and realistic project alternative.

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4) The project activity not implemented as a CDM project

This means that the soybean farmers would purchase the inoculant, if Becker Underwood were not selling it for a reduced price. This scenario cannot be ruled out and therefore is a credible and realistic project alternative.

None of the above identified credible and realistic project alternatives is prevented by legal and regulatory requirements.

The proposed project activity is inhibited by the existing agricultural practice. The farmers identified due to their existing agricultural practice will not stop using urea. The farmers identified have certain distinct characteristics that are also shared by numerous other farmers in the South of Brazil that do not use inoculant. Those common characteristics are for example:

- Relatively small farming area
- Relatively high age of farmer
- No agricultural training of the farmer
- Farmers do not read agricultural magazines and do not have internet access
- Farmers purchase seeds and urea from cooperatives

This data is available in market research and will be made available in the final PDD.

The above identified barriers do not prevent the farmers from using urea as they have continuously done so in the most three recent years.

As urea application is the only alternative that is not prevented by any barrier, this alternative is the most plausible baseline scenario.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered <u>small-scale</u> CDM project activity:

Without the project activity being registered as a CDM project activity, Becker Underwood would be facing a barrier to investment. This is in the following proposed by NPV calculation.

Becker Underwood sales the inoculant for 1.00 € per “dose”. A “dose” is the amount of rhizobia bacteria required to fertilize 1 ha of soybean (50.4×10^8 rhizobia bacteria). Becker Underwood therefore does have an economic revenue from the project activity other than CERs. NPV calculation is applied for calculation of the profit of the project activity were it not implemented as a CDM project activity.

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total
CERs	37.690	37.690	37.690	37.690	37.690	37.690	37.690	37.690	37.690	37.690	376.900
Ha treated	198.413	198.413	198.413	198.413	198.413	198.413	198.413	198.413	198.413	198.413	1.984.127
Doses sold	198.413	198.413	198.413	198.413	198.413	198.413	198.413	198.413	198.413	198.413	1.984.127
Total costs (€)	-595.238	-595.238	-595.238	-595.238	595.238	-595.238	-595.238	-595.238	-595.238	-595.238	-5.952.381
Discounted total costs (€)	-595.238	-553.571	-514.821	-478.784	445.269	-414.100	-385.113	-358.155	-333.084	-309.769	-4.387.906
Total revenue (€)	198.413	198.413	198.413	198.413	198.413	198.413	198.413	198.413	198.413	198.413	1.984.127
Discounted total revenue (€)	198.413	184.524	171.607	159.595	148.423	138.033	128.371	119.385	111.028	103.256	1.462.635

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Net profit (€)	-396.825	-369.048	-343.214	-319.189	296.846	-276.067	-256.742	-238.770	-222.056	-206.512	-2.925.270
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The fully absorbed production costs for an inoculant dose is 3.00 €. The project participant will sell the inoculant for a price of 1.00 € per dose. Assuming a discount rate of 7%, the NPV over the ten year project lifetime is -2,925,270 €. It is therefore obvious that the project activity is not economically attractive.

At an assumed CER price of 10 €, the NPV calculation of the project activity yields the following results.

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total
Return in CERs (€)	376.900	376.900	376.900	376.900	376.900	376.900	376.900	376.900	376.900	376.900	3.769.003
Discounted return in CERs (€)	376.900	350.517	325.981	303.162	281.941	262.205	243.851	226.781	210.907	196.143	2.778.389
Net profit with CERs (€)	-19.925	-18.530	-17.233	-16.027	-14.905	-13.862	-12.891	-11.989	-11.150	-10.369	-146.881

It can be seen that the sale of CERs can provide a strong economic incentive for the project participant to distribute the inoculant for a reduced price². If the proposed project activity were not to be registered as a CDM project activity, it would not make economic sense for the project participant to implement it.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:
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As the inoculant carrier used in the programme is peat that comes from locations outside of the project boundary, potential GHG emissions from peat extraction will need to be accounted for as leakage. However, the quantities of peat used due to the programme can be expected to be negligible and no detailed data on the quantities used was available at the point of completion of this PDD draft. This effect therefore has been neglected in calculation of emissions reductions.

As the inoculant production facility only consumes electricity as an energy source (also for peat-drying), no source of GHG emissions from the production of inoculant other than electricity needs to be taken into account.

B.6.2. Data and parameters that are available at validation:

(Copy this table for each data and parameter)

Data / Parameter:	
Data unit:	
Description:	
Source of data used:	

² It should be noted that the annual CER volumes projected in this PDD are conservative because the lowest value of the uncertainty range of the global emission factor (EF1) for emissions from N inputs (0.003 kg N₂O-N/kg N) has been used for baseline N₂O emissions calculation (see Table 11.1 IPCC Guidelines 2006). We expect that the soil sampling will lead to a slightly higher emission factor and that the NPV will become positive but that annual emission reductions will remain below 60,000 t CO₂e per year over the crediting period.

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Value applied:	
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

Estimation of baseline emissions

In the following it is assumed that all 100 farmers join the programme at the start of the crediting period which is the start of the planting season (October). It is further assumed that:

- The land of the farmers that participate in the programme belongs to only one land area type j which has been classified as follows³:
 - low soil organic carbon content
 - acidic soil
 - medium soil texture
 - temperate moist climate
 - poorly drained soils
- Each farmer will grow soybean on 1,984 ha of land
- Each farmer's historic urea application rate is 0.174 t urea/ha, i.e. at 100% of the recommended application rate (the recommended application rate of N in Brazil for soybean is 0.08 t N/ha; urea contains 46% of N on a mass-ratio basis)
- The emission factor from urea application that conservatively corresponds to the historic urea application rate of each farmer is the lowest value of the uncertainty range of the global emission factor (EF1) for emissions from N inputs of 0.003 t N₂O-N/t N (see Table 11.1 IPCC Guidelines 2006). This corresponds to an emission factor of 0.00037714 t N₂O/ha.⁴

$$UB_{i,j} = ha_{i,j} * UAR_{i,j} = 198,400 \text{ ha} * 0.174 \text{ t urea/ha} = 34,524.80 \text{ t urea}$$

$$\begin{aligned}
 BE &= \sum_i \sum_j (UB_{i,j} * 0.420 + ha_{i,j} * EF_{N_2O, UAR, i,j} * 310) \\
 &= 34,524.80 \text{ t urea} * 0.420 \text{ t CO}_2/\text{t urea} + 198,400 \text{ ha} * 0.00037714 \text{ t N}_2\text{O/ha} * 310 \text{ CO}_2/\text{N}_2\text{O} \\
 &\approx 37,690 \text{ t CO}_2
 \end{aligned}$$

Where:

\sum_i is the sum of farmers i which apply inoculant in the programme

\sum_j is the sum of classified land area j where inoculant is used in the programme

$UB_{i,j}$ is the urea baseline per each farmer i in the programme (in t urea)

³ See Lal, R.; Cerri, C. C.; Bernoux, M. Etchevers, J.; Cerri, E. (Editors) (2006): Carbon Sequestration in Soils of Latin America, p. 355

⁴ The conservative choice of $UAR_{i,j}$ shall be based on N₂O emission factors derived from sampling at experimental sites (see Annex 4-II: Soil sampling for N₂O emission factor determination). Actual sampling will be conducted once the methodology gets approved. For the sake of simplification, the IPCC default value is applied in this draft PDD.

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0.420 is the emission factor from the production of urea (in t CO₂e/t urea)

EF_{N₂O,UAR,i,j} is the emission factor from urea application that conservatively corresponds to UAR_{i,j} of farmer i on the classified land area j (in t N₂O/ha)

ha_{i,j} is the area of land where the inoculant is applied by farmer i in the classified land area j in the programme (in ha)

UAR_{i,j} is the average urea application (in t urea/ha) applied by farmer i in the classified land area j in the recent three growing seasons before joining the programme

Note: Conservative choice of EF_{N₂O,UAR,i,j} based on results of N₂O emission factor sampling

In order not to overestimate the baseline emissions, conservative choice of EF_{N₂O,UAR,i,j} shall be made based on the results of N₂O emission factor sampling at the experimental sites. This is because EF_{N₂O,UAR,i,j} is based on a historical urea application rate of each farmer, who could have been applied urea at below the recommended application rate.

If UAR_{i,j} of farmer i falls between the UAR_{x%,j} values given in the table below, one has to apply EF_{N₂O,UAR,x%,j} which corresponds to next lower value of UAR_{x%,j}. As an illustration of such conservative choice, it is assumed that farmer “i” has UAR_{i,j} at 80% of the recommended urea application rate. Then, one has to take the N₂O emission factor which corresponds to urea application rate at 75% of the recommended urea application rate, i.e. EF_{N₂O,UAR,75%,j}.

Urea application rate applied in the experimental sampling (UAR _{x%,j})	N ₂ O emission factor from urea application based on the experimental sampling (EF _{N₂O,UAR,x%,j})
100% of the recommended urea application rate	EF _{N₂O,UAR,100%,j}
75% of the recommended urea application rate	EF _{N₂O,UAR,75%,j}
50% of the recommended urea application rate	EF _{N₂O,UAR,50%,j}
25% of the recommended urea application rate	EF _{N₂O,UAR,25%,j}
No application of urea/ inoculant/ other fertilizer	EF _{N₂O,UAR,0%,j}

Estimation of project activity emissions

For ex-ante project emission calculation, the following assumptions were made:

- The land of the farmers that participate in the programme belongs to only one land area type j;
- Each farmer apply $1 * 10^{15}$ rhizobia bacteria per year;
- The emission factor of inoculant production is $142 * 10^{-17}$ t CO₂/rhizobia bacteria;
- Each farmer will grow soybean on 1,984 ha of land;
- Each farmer will apply inoculant at a rate of $5.04 * 10^{11}$ rhizobia bacteria/ha;
- The emission factor from inoculant application is 0 t N₂O/ha.

$$\begin{aligned}
 PE &= \sum_i (Q_i * EF_{CO_2,PROD}) + \sum_i \sum_j (ha_{i,j} * IAR_{i,j} * EF_{N_2O,IAR,i} * 310) \\
 &= 1 * 10^{17} \text{ rhizobia bacteria} * 142 * 10^{-17} \text{ t CO}_2/\text{rhizobia bacteria} \\
 &\quad + 198,400 \text{ ha} * 5.04 * 10^{11} \text{ rhizobia bacteria/ha} * 0 \text{ t N}_2\text{O/ha} \\
 &= 142 \text{ t CO}_2
 \end{aligned}$$

Where:

Q_i is the amount of inoculant applied by each farmer i in the programme (in number of rhizobia bacteria)

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$EF_{CO_2,PROD}$ is the emission factor from production of inoculant that is used in the programme (in t CO₂/number of rhizobia bacteria)

Σ_i is the sum of farmers i which apply inoculant in the programme

Σ_j is the sum of classified land area j where inoculant is used in the programme

$ha_{i,j}$ is the area of land where the inoculant is applied by farmer i in the classified land area j in the programme (in ha)

$IAR_{i,j}$ is the average inoculant application rate (in number of rhizobia bacteria/ha) applied by farmer i in the classified land area j in the programme

$EF_{N_2O,IAR,i,j}$ is the emission factor from inoculant application that conservatively corresponds to $IAR_{i,j}$ of farmer i on the classified land area j in the programme (in t N₂O/ha)

Estimation of leakage

No leakage is expected.

Estimation of emission reductions

$$\begin{aligned} ER &= BE - PE - LE \\ &= 37,690 - 142 - 0 \\ &= 37,548 \text{ t CO}_2 \end{aligned}$$

B.6.4 Summary of the ex-ante estimation of emission reductions:

Year	Estimation of project activity emission reductions (tonnes of CO ₂ e)	Estimation of baseline emissions (tonnes of CO ₂ e)	Estimation of leakage (tonnes of CO ₂ e)	Estimation of emission reductions (tonnes of CO ₂ e)
2007	36	9,423	0	9,387
2008	142	37,690	0	37,548
2009	142	37,690	0	37,548
2010	142	37,690	0	37,548
2011	142	37,690	0	37,548
2012	142	37,690	0	37,548
2013	142	37,690	0	37,548
2014	142	37,690	0	37,548
2015	142	37,690	0	37,548
2016	142	37,690	0	37,548
2017	107	28,268	0	28,161
Total	1,422	376,900	0	375,478

B.7 Application of a monitoring methodology and description of the monitoring plan:**B.7.1 Data and parameters monitored:**

(Copy this table for each data and parameter)

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Data / Parameter:	Urea _{hist}
Data unit:	t
Description:	Average amount of urea the farmer i has applied to all his land planted with soybean in the classified land area j in the previous three years before joining the programme
Source of data to be used:	Farmer
Value of data applied for the purpose of calculating expected emission reductions in section B.5	345.24
Description of measurement methods and procedures to be applied:	Internal historic records of the farmer
QA/QC procedures to be applied:	Cross-checking with seed and urea sales records of the distributor. Data from the farmer and the distributor to be checked for consistency by an independent national expert.
Any comment:	This data is gathered only once (when the farmer joins the programme). Data is used to calculate UAR _{i,j} .

Data / Parameter:	ha _{hist}
Data unit:	ha
Description:	Average amount of ha the farmer i planted with soybean in the classified land area j in the previous three years before joining the programme
Source of data to be used:	Farmer
Value of data applied for the purpose of calculating expected emission reductions in section B.5	1,984
Description of measurement methods and procedures to be applied:	Internal historic records of the farmer.
QA/QC procedures to be applied:	Cross-checking with seed and urea sales records of the distributor. Data from the farmer and the distributor to be checked for consistency by an independent national expert.
Any comment:	This data is gathered only once (when the farmer joins the programme). Data is used to calculate UAR _{i,j} .

Data / Parameter:	ha _{i,j,y}
Data unit:	ha
Description:	Amount of ha the farmer i planted with soybean in the classified land area j in year y

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Source of data to be used:	Farmer
Value of data applied for the purpose of calculating expected emission reductions in section B.5	1,984
Description of measurement methods and procedures to be applied:	Internal records of the farmer and results from satellite imagery systems.
QA/QC procedures to be applied:	Cross-checking with seed and inoculant sales records of the distributor. Data from the farmer and the distributor to be checked for consistency by an independent national expert. Data from the farmer and cross-check calculations to be checked for consistency by an independent national expert.
Any comment:	For an explanation of the satellite imagery system to be used see Annex 4. Data used to calculate $IAR_{i,j,y}$.

Data / Parameter:	$EF_{N_2O,UAR,i,j,y}$
Data unit:	t N ₂ O/ha
Description:	N ₂ O emission factor from urea application that conservatively corresponds to $UAR_{i,j,y}$ of farmer i in the classified area j in year y
Source of data to be used:	Soil sampling
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.00037714
Description of measurement methods and procedures to be applied:	For an explanation of the soil sampling techniques and procedures to be used see Annex 4.
QA/QC procedures to be applied:	Data to be checked for consistency by an independent national expert.
Any comment:	

Data / Parameter:	$Q_{i,j,y}$
Data unit:	Number
Description:	Total number of rhizobia bacteria distributed under the programme in year y
Source of data to be used:	Seed distributor
Value of data applied for the purpose of calculating expected emission reductions in section B.5	$1 \cdot 10^{17}$

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Description of measurement methods and procedures to be applied:	Calculated based on the amount of packages of inoculant distributed and the guaranteed number of rhizobia bacteria per package given on the package.
QA/QC procedures to be applied:	Cross-checking with amount of inoculant produced at the inoculant production facility. Cross-checking with seed purchase records of the farmers. Data from the farmer and cross-check calculations to be checked for consistency by an independent national expert.
Any comment:	

Data / Parameter:	$IN_{i,j,y}$
Data unit:	Number
Description:	Total number of rhizobia bacteria applied by farmer i to all his land planted with soybean in the classified land area j in year y.
Source of data to be used:	Farmer
Value of data applied for the purpose of calculating expected emission reductions in section B.5	$1 * 10^{15}$
Description of measurement methods and procedures to be applied:	Calculated based on the amount of packages of inoculant distributed and the guaranteed number of rhizobia bacteria per package given on the package.
QA/QC procedures to be applied:	Cross-checking with amount of inoculant produced at the inoculant production facility. Cross-checking with seed purchase records of the farmers. Data from the farmer and cross-check calculations to be checked for consistency by an independent national expert.
Any comment:	Data used to calculate $IAR_{i,j,y}$.

Data / Parameter:	$EF_{N_2O,IAR,i,j,y}$
Data unit:	t N_2O /ha
Description:	N_2O emission factor from inoculant application that conservatively corresponds to $IAR_{i,j,y}$ of farmer i in the classified area j in year y.
Source of data to be used:	Soil sampling
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.0
Description of measurement methods and procedures to be applied:	For an explanation of the soil sampling techniques and procedures to be used see Annex 4.
QA/QC procedures to	Data to be checked for consistency by an independent national expert.

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be applied:	
Any comment:	

Data / Parameter:	EC_y
Data unit:	MWh
Description:	Electricity consumption required for production of inoculant in the amount of $\sum_i Q_i$ in year y
Source of data to be used:	Electricity metering
Value of data applied for the purpose of calculating expected emission reductions in section B.5	316
Description of measurement methods and procedures to be applied:	Electricity consumption will be allocated to different product types and amounts and corresponding number of rhizobia bacteria produced in the facility.
QA/QC procedures to be applied:	Internal monitoring procedures in the production facility
Any comment:	Data used to calculate $EF_{CO_2,PROD,y}$.

Data / Parameter:	$EF_{CO_2,y}$
Data unit:	t CO ₂ /MWh
Description:	Grid emission factor of Brazil
Source of data to be used:	Brazilian power supply data
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.450
Description of measurement methods and procedures to be applied:	Calculated according to ACM0002
QA/QC procedures to be applied:	See ACM0002.
Any comment:	Data used to calculate $EF_{CO_2,PROD,y}$.

B.7.2 Description of the monitoring plan:

The monitoring plant requires the following methodological steps before start of the programme.

Step 0-1: Soil classification

Classify all agricultural land in the programme area based on soil organic carbon content, soil pH, soil texture, climate and soil moisture according to the following classification system:

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Factor	Unit	Classification	Remark	Reference
Soil organic carbon content	%	1. <1 2. 1 to 3 3. >3	1. Low 2. Medium 3. High	See Stehfest (2005)
Soil pH	-	1. <5.5 2. 5.5 - 7.3 3. >7.3	1. Acidic 2. Neutral 3. Alkaline	See Stehfest (2005)
Soil texture	Type	1. Coarse 2. Medium 3. Fine	1. Sandy, loamy sandy, sandy loam, silt loam, silt 2. Sandy clay loam, clay loam, silty clay loam 3. Sandy clay, silty clay, clay	See Stehfest (2005)
Climate	Type	1. Boreal 2. Cold temperate dry 3. Cold temperate wet 4. Warm temperate 5. Moist 6. Tropical dry 7. Tropical moist 8. Tropical wet		See IPCC (2006)
Soil moisture (soil drainage)	-	1. Well drained 2. Poorly drained		See Stehfest (2005)

Step 0-2: Set-up of soil sampling system (see Annex 4).

After the **start of the programme**, the monitoring plan follows the following procedure:

Step 1-1: Mapping of the land of farmer i **before land preparation** starts and classification of the land of the farmer according to the classification system described under Step 0-1

Step 1-2: **Before land preparation** monitoring of:

- Average amount of N the farmer i has applied to all his land planted with soybean in the classified land area j in the previous three years
- Average amount of ha the farmer i planted with soybean in the classified land area j in the previous three years

Step 1-3: **Before harvest** monitoring of:

- Total number of rhizobia bacteria applied by farmer i to all his land planted with soybean in the classified land area j in year y
- Amount of ha the farmer i planted with soybean in the classified land area j in year y (for a description of the satellite imagery system see Annex 4)
- Monitoring of electricity consumption required for producing the amount of rhizobia bacteria distributed under the programme
- Monitoring of the grid emission factor

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B.8 Date of completion of the application of the baseline and monitoring methodology and the name of the responsible person(s)/entity(ies)

May 9, 2007

Mr. Matthias Krey, Perspectives Climate Change GmbH, Hamburg, Germany

Ms. Peg Armstrong-Gustafson, Amson Technology, Des Moines, IA 50311, United States

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

01.09.2007

C.1.2. Expected operational lifetime of the project activity:

Not applicable.

C.2 Choice of the crediting period and related information:

The project activity will use a fixed crediting period.

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

C.2.1.2. Length of the first crediting period:

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

15.09.2007

C.2.2.2. Length:

10 years

SECTION D. Environmental impacts

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D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

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D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

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SECTION E. Stakeholders' comments

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E.1. Brief description how comments by local stakeholders have been invited and compiled:

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E.2. Summary of the comments received:

>>

E.3. Report on how due account was taken of any comments received:

>>

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Annex 1**CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY**

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

Annex 3

BASELINE INFORMATION

Annex 4

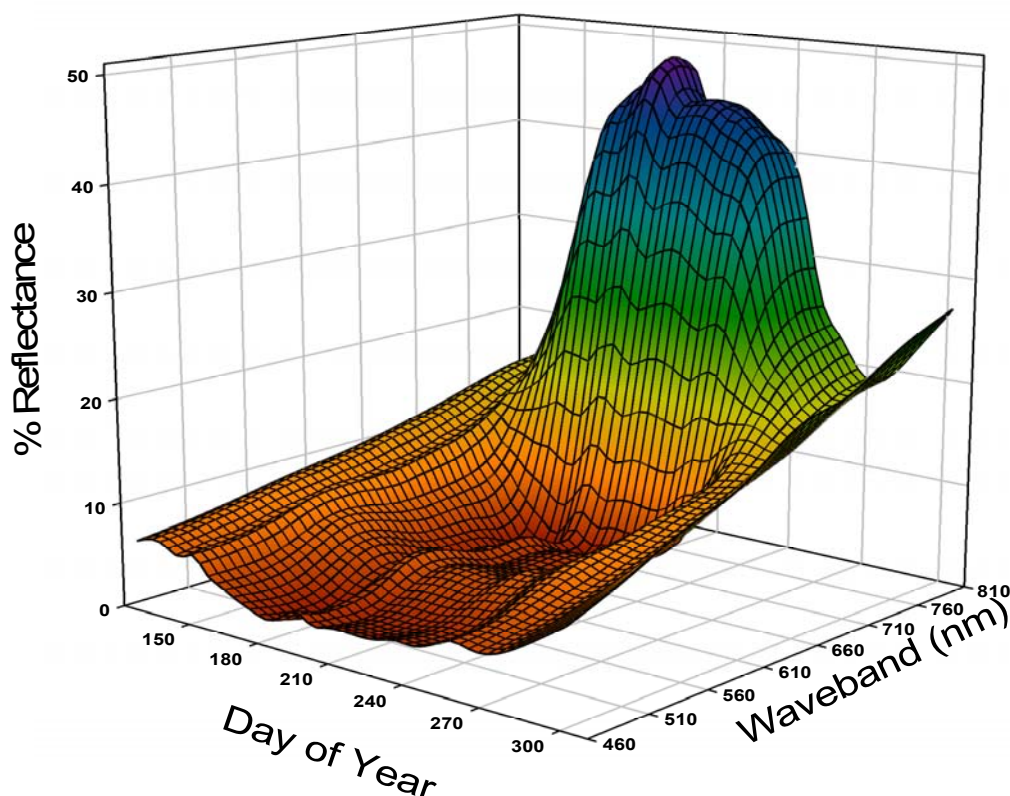
MONITORING INFORMATION

Satellite imagery system

Remote sensing is used in order to cross-check $ha_{i,j}$ provided by farmers. We use Landsat or MODIS platforms in order to carry out the cross-check. Images obtained from either Landsat or MODIS platforms obtain data in several wavebands. These wavebands in the visible and near-infrared regions of the spectrum are combined in a different combinations referred to as vegetative indices (VI's). These VI's are used to determine a number of different agronomic parameters at a general uncertainty of less than 10%.

Land use comparisons can be made with combinations to these wavelengths to separate soybean from other crops. The repeat interval on Landsat is 16 days with a pixel size of 30 m. An example of the changes in reflectance from a corn crop throughout the season is shown in the following diagram. Soybean canopies exhibit a similar response in general terms.

Corn 2006



This allows the separation of the soybean from other crops throughout the growing season. These differences between crops provide a framework for the detection of differences with classification

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accuracy above 95%. These methods are used by the National Agricultural Statistics Service for crop identification in the U.S. and throughout the world by the Foreign Agricultural System.

Soil sampling for N₂O emission factor determination

1. Number of experimental sites

The following experimental sites with different (a) urea/ inoculant application rates, and (b) land classification will be monitored.

1. Site in land class “j” with urea application at 100% of the recommended urea application rate;
2. Site in land class “j” with urea application at 75% of the recommended urea application rate;
3. Site in land class “j” with urea application at 50% of the recommended urea application rate;
4. Site in land class “j” with urea application at 25% of the recommended urea application rate;
5. Site in land class “j” with inoculant application at 100% of the recommended inoculant application rate; and
6. Site in land class “j” without any application of urea/ inoculant/ other fertilizer.

Monitoring of experimental sites with different urea application rates are necessary to derive N₂O emission factors from urea application to be used for conservative choice of $EF_{N_2O, UAR, ij}$ in the baseline emission calculation. Such conservative choice is required not to overestimate the baseline emission. This is because $EF_{N_2O, UAR, ij}$ is based on a historical urea application rate of each farmer, who could have been applied urea at below the recommended application rate. On the other hand, the inoculant application rate is set at 100% of the recommended rate because seed distributors will apply peat-based inoculant to seeds at 100% of the recommended rate and sell the seeds to farmers. Therefore, farmers' behaviour does not have any impact on the inoculant application rate.

2. Details of experimental site

Location

Each experimental site shall have sufficient size to allow for the installation of 10 gas collection chambers (at least 20m*20m) and shall be located in the classified land area j. The geographical position (latitude and longitude) the administrative location of the plot and the name of farmer/land owner shall be recorded and archived.

Soil details

Before the starting of the experiments soil details such as classification, type, texture, pH, conductivity, and available nutrients, particularly total N, NH₄⁺, NO₃⁻ and % organic carbon shall be obtained from authentic sources or through measurements using standard soil analysis procedures.

Meteorological Data

The standard meteorological data for the region shall be obtained from authentic sources. The number of rainy days, and rainfall during the cropping season as well as the non-cropping season specific to the experimental site shall be recorded.

Cropping patterns

The crops grown annually and other land use patterns shall be recorded. (Sowing date, harvesting date... for multiple crop)

3. Details of experimental treatments

Dose and method of Urea application

Simulate the site as per farmer's practice in the region. The dose of urea and method of application (broadcast, band placement, soil incorporation etc) shall be the same as that is followed in the region and the details such as number of split applications dose per split application and timings of application shall be recorded.

Cultural Practices

The following details shall be recorded:

Details of land/seed bed preparation, such as primary tillage, harrowing, levelling, seed-bed form (flat land, beds, ridges etc), puddling etc.

The crop spacing (crop row to row and plant to plant distances and seed rate), and methods and dates of sowing conforming to the normal practices followed in the region.

The application method of urea shall conform to the normal practices followed in the region (e.g. choose the most common method that could be either basal, top dressings or foliar spraying). Crop residue management shall also follow the normal practices followed in the region.

Irrigation details such as method of irrigation, number irrigations, timing of irrigation (crop stage, days after sowing), amount of water applied in each irrigation and the rainfall received during the cropping season.

4. Experimental setup

The gas collection chamber should set on Aluminium channel in the plots and inserted into the soil up to a depth of 5 cm. Such gas collection chambers shall be installed at 10 different points within each experimental site. A water proof seal shall be used throughout the sampling period at the chamber channel junction in order to make the arrangement airtight. A stopcock should be fitted at the top to collect the gas samples.

Collection and analysis of gas samples:

Monitoring of each gas chamber's N₂O-N emissions shall be conducted every day throughout the year. For gas collection, boxes should be kept over the crop rows for two hours per each sample. At least four samples must be taken a day with even time intervals. Gas samples shall be collected through sampling ports fitted at the top of the chambers by gas tight syringes equipped with stopcocks to check diffusion of the collected gas samples. Before taking the sample the chambers should be flushed several times thoroughly to homogenize the air inside the chambers. The gas samples should be immediately transferred into evacuated sample tubes through hypodermic needles⁵ and taken to the laboratory for analysing N₂O-N using gas Chromatograph, fitted with stainless steel column (e.g. Porapack-N) and electron capture detector (ECD). Nitrogen shall be used as a carrier gas with a defined flow rate (for ex

⁵ The hypodermic needle is used so that the gas in tubes remained at slightly higher pressure than atmosphere which helped to avoid contamination of dilution.

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20 ml min⁻¹). Column, injector and detector temperatures shall be set at 50, 120, and 350 °C respectively. A sample of N₂O-N shall be used as a primary standard for N₂O-N estimation.

5. Determination of N₂O emission factors

The arithmetic average of the 4 sampling results per gas chamber shall be calculated. Based on the different values obtained from the 10 gas chambers at each experimental site, the arithmetic average value is obtained as the daily average N₂O-N emissions of the experimental site. The arithmetic average of each daily average N₂O-N emissions over the year shall be the representative N₂O-N emissions from the relevant experimental site. As the N₂O-N emissions will be measured in mg N₂O-N/m², the sampling results will need to be converted to t N₂O/ha. The monitoring shall be repeated every year during the crediting period(s).
