JI MONITORING REPORT

(for reporting period 01.01.2008 – 31.12.2009**)**

Title of manager of the developer of documentation

Director of Evo Carbon Trading Services Ltd

______________	______________	**N.L. Egorova**
(date)	(signature) PS	(name and patronymic, last name)

Title of manager of the economic activity subject - JI Project Host Party

General Director of LLC "Koziivske"

______________	______________	**V.V. Mohyla**
(date)	(signature) PS	(name and patronymic, last name)

MONITORING REPORT OF JI PROJECT

Monitoring period:
01/01/2008 – 31/12/2009

Version 03
February 04, 2014

Reduction of greenhouse gas emissions by application of No-till technology at LLC "Koziivske" farmlands

CONTENTS

ANNEXES

[1]Annex 2 is submitted in electronic form.

SECTION A. General project activity and monitoring information

A.1. Project title:

Reduction of greenhouse gas emissions by application of No-till technology at LLC “Koziivske" farmlands

A.2. Information about registration and approval of the project:

The Joint Implementation Project “Reduction of greenhouse gas emissions by application of No-till technology at LLC “Koziivske" farmlands” was determined by Bureau Veritas Certification, Determination Report No. UKRAINE-DET/0611/2012 dated 25/10/2012.

The project obtained approval from Ukraine (the Host country) in December 2012 (Letter of Approval No.3713/23/7, issued by the State Environmental Investment Agency of Ukraine on 03/12/2012), as well as from the country-participant, Estonia, (Letter of Approval 12-1/10256-2, issued by the Estonian Ministry for the Environment dated 18/12/2012).

A.3. Brief description of the project:

The purpose of the Joint Implementation (JI) Project is to reduce anthropogenic greenhouse gas (GHG) emissions resulting from agricultural activities by changing the agricultural land management system, namely replacement of traditional soil tillage in agriculture with No-till technology.

Historical details of LLC “Koziivske” development.
In 2006, the Farm started to grow crops applying No-till technology (also referred to as “direct sowing technology”) (see Table 1). This technology differs from the traditional technology with fewer technological procedures, which prevents the topsoil from a major disturbance, as well as with the way to utilize plant residues. The number of technological procedures of plant growing and harvesting is almost the same in the two technologies, the main difference being that the traditional technology separates fertilizer application, land ploughing, cultivation furrowing and seeding (multiple passage of the machinery in the field) in contrast to direct sowing with simultaneous fertilizer application (single pass of the machinery). The lower number of technological procedures in No-till provides for up to 60% lower fuel consumption in internal combustion engines of tractors and other agricultural machinery.
In the absence of the Joint Implementation project, LLC “Koziivske” would apply traditional soil cultivation technology. This system involves tillage that provides for turning over of topsoil to create homogeneous and mellow seedbed. The basic operation causing CO_2 emissions is ploughing during which crop residues are buried in the soil and weeds are removed.

The project provides for GHG emission reductions due to:

- lower carbon dioxide emissions from farmland by lower (almost zero) topsoil disturbance by tillage in the course of crops growing.

The project implies the change in crops growing technology. This includes the following measures:

- change of soil cultivation and sowing technology;
- change of plant residue management;
- equipping the machine-tractor fleet with high-efficiency equipment to meet the No-till technology requirements.

In the current monitoring period, the following equipment was commissioned:

- seed drills for direct seeding;
- special tractors;
- herbicide sprayers;
- seed and fertilizer drill systems;
- combine harvesters and other machinery required by the technology.

According to the data collected, the following GHG emission reductions were achieved:

Table 1. GHG emission reductions over the monitoring period

Monitoring period (01/01/2008 – 31/12/2009)	Baseline emissions (t CO_2 equivalent)	Project emissions (t CO_2 equivalent)	Emission reductions (t CO_2equivalent)
2008	530 679	0	530 679
2009	847 206	0	847 206
Total, t CO_2eq	**1 377 885**	**0**	**1 377 885**

A.4. Monitoring period:

- Starting date of the monitoring period: 01/01/2008.
- End date of the monitoring period: 31/12/2009.

A.5. Methodology applied to the project:

A.5.1. Baseline methodology:

The project activity is aimed at the reduction of greenhouse gases emissions fro the fields of LLC "Koziivske" due to the implementation of No-till technology.

When the project was under development, there were no approved CDM methodologies for this type of activity. Therefore, this project applies a specific approach according to p. 9 of the "Guidance on criteria for baseline setting and monitoring", Version 03[2], approved by the JI Supervisory Committee[3].

Calculation of greenhouse gas emissions due to ***mechanical tillage*** when traditional farming technology is applied, is based on the following documents:

- *2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 5, Vol. 4, 5.2.3. Soil Carbon (Agriculture, Forestry and Other Land Use)*[4]

These provisions determine the type of greenhouse gas subject to control by project participants, i.e. carbon dioxide.

- *"Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities" (Version 01.1.0)*[5].

Provisions of this Tool are used for calculation of CO_2 emissions due to mechanical tillage in the course of crops production.

The activity level is reflected in annual amount of cultivated land at LLC "Koziivske" farmlands.

Within the baseline, project participants control the following GHG emission sources:

- *mechanical tillage* in the course of crops growing;

Soil organic carbon (humus) oxidation that occurs due to mechanical tillage causes most GHG emissions in the project. Emissions from diesel fuel combustion by tractors and agricultural machinery are beyond the control of project participants.

The estimated GHG emission reduction due to fewer technological procedures in the project is about 1% of the total GHG emission reductions and is not included into calculations under the conservative principle.

Greenhouse gas emissions in the project are calculated based on the "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities" (Version 01.1.0)[6].

The content of humus in the soil for the baseline scenario is calculated, taking into account its linear decrease over time, under the condition of the use of conventional mechanical tillage that involves ploughing.

Data on humus content in 2003-2006 for fields cultivated by baseline tillage technology, with similar crop rotation patterns were taken as historical data to establish the baseline.

---

[2] http://ji.unfccc.int/Ref/Documents/Baseline_setting_and_monitoring.pdf
[3] http://ji.unfccc.int/Ref/Documents/Baseline_setting_and_monitoring.pdf
[4] http://www.ipcc-nggip.iges.or.jp/public/2006gl/russian/pdf/4_Volume4/V4_05_Ch5_Cropland.pdf
[5] http://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-16-v1.1.0.pdf
[6] http://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-16-v1.1.0.pdf

A.5.2. Monitoring methodology:

Verification of emission reduction units and baseline scenario

The proposed project applies a JI-specific approach based on the JI Guidance on criteria for baseline setting and monitoring, Version 03[7], which meets the requirements of Decision 9/CMP.1, Appendix B of the "Criteria for baseline setting and monitoring".

The monitoring plan for this project was developed based on the monitoring of soil organic carbon content using traditional tillage technology and No-till technology.

The key variables that are subject to monitoring are the content of humus (organic carbon) in the soil cultivated using No-till technology and area cultivated by No-till technology.

Indicator of project implementation

The most objective and cumulative factor that provides a clear picture of whether the emission reduction took place is the difference between the humus content in the soil where No-till technology was applied and humus content in the soil where conventional mechanical cultivation, that includes tillage, was used. Id est lower number of technological operations in No-till technology, which minimizes topsoil disturbance, results in emission reductions under the project.

Verification of project implementation indicators

LLC "Koziivske" collects and archives all the data on area of fields cultivated by No-till technology, as well as data of agrochemical analyses conducted in the fields to determine humus content. Information on the field areas and humus content is enclosed to the monitoring report with all the relevant documents.

The described approach to monitoring clearly states:

1) Data and parameters that are not monitored throughout the crediting period, but are determined only once and that are available already at the stage of PDD development:

- humus content in the soil of field *i* cultivated using traditional tillage in period *y*, $k_{b,i,y}$;
- soil density at field *i* cultivated using traditional tillage before the start of the project, ρ_i;
- depth of soil layer disturbance at field *i* cultivated using traditional tillage, $h_{b,i}$;

2) Data and parameters that are not monitored throughout the crediting period, but are determined only once and that are not available already at the stage of PDD development:

3) Data and parameters that are monitored throughout the crediting period:

- area of field *i* cultivated using No-till technology, $S_{p,i}$;
- humus content in the soil of field *i* cultivated using No-till technology in period *y*, $k_{p,i,y}$.

A.6. Status of implementation including schedule of project milestones:

The starting date of the crediting period is on the date when the first emission reductions were generated, namely March 8, 2007.

The end of the crediting period is the last date of the period of validity of the Seller's obligations under the sale and purchase agreement under which the project owner has to transfer verified anthropogenic greenhouse gas emission reductions resulting from the project, namely the ones generated from January 1, 2013 to December 31, 2020.

The project implementation status during the reporting period of 01/01/2008 – 31/12/2009, including its milestones and implementation schedule, is provided in Tables 2 and 3 of the Monitoring Report.

Table 2. Implementation status: areas of project lands at LLC "Koziivske"

Year	Area, ha
2008	9 508,00

[7] http://ji.unfccc.int/Ref/Documents/Baseline_setting_and_monitoring.pdf

2009	10 966,00

Table 3. Schedule of JI project implementation at LLC "Koziivske" farmlands

Year	Koziivka village	Kaplunivka village	Riabokonevo village	Kotelevka village	Pioner village	Kolontaiv village
2008	+	+	+	+	+	-
2009	+	+	+	+	+	+

Implementation of project activities is carried out mainly according to the schedule provided in the PDD version 02.

A.7. Deviations from or revisions to the registered PDD:

There aren't any deviations from or changes in the registered PDD. In the process of the PDD development project area of LLC "Koziiivske" land for growing crops was not taken into account fully, due to the lack of comprehensive data on the land area of LLC "Koziyivke" as of the time of PDD writing. The values of humus content in the soil also changed. The cause of this is the fact that at the time of PDD (version 02) writing it was not possible to process a large amount of information that hadn't been provided to the company – PDD developer in full. NSC "Institute of Agriculture of NAAS of Ukraine", a third party was involved to determine the humus content in the soil for the current monitoring period. It provided the company-developer with a research report "The scientific rationale for the dynamics of humus in the soil of climatic zones for tillage and no-till technologies". According to a scientific report, the final data on characteristics of humus content in the soil of LLC "Koziyivske" lands was determined. This made it possible to determine the final data for the calculation of baseline emissions of greenhouse gases and reduction respectively. According to LLC "Koziivske" data depths of soil destruction by tillage were also specified.

A.8. Deviations from or revisions to the registered monitoring plan:

There are no deviations from or revisions to the registered monitoring plan.

A.9. Persons responsible for the preparation and submission of monitoring report:

LLC "Koziivske"
Koziivka village, Krasnokutsky district,
Kharkiv region, Ukraine
Oleksandr Naidenko, Director
Phone: +38(05756) 94-1-46
Fax: +38(05756) 94-1-46
LLC "Koziivske" is a project participant

CEP Carbon Emissions Partners S. A.
52 Route de Thonon, Geneva, Casepostale 170 CH-1222 Vésenaz, Switzerland
Fabian Knodel
Phone: +41 (76) 3461157
E-mail: 0709bp@gmail.com
CEP Carbon Emissions Partners S.A. is a project participant.

LHCarbon OÜ
Sügise 4-2, Tallinn, Estonia
Hannu Lamp
Phone: +372 51 41 800
E-mail: hannu@online.ee
LHCarbon OÜ is a project participant.

SECTION B. Key monitoring activities

The key variables that are subject to monitoring are the content of humus (organic carbon) in the soil cultivated using No-till technology and area cultivated by No-till technology. Other parameters are sourced from calculations or statistical data.

Humus content

Humus (organic carbon) content of the soil cultivated using No-till technology is measured annually in September, after the harvesting (National Academy of Agricultural Sciences of Ukraine, National Scientific Centre "Institute of Agriculture, NAAS").

Area of the field

Data from the Land Inventory are applied to determine the land area. If the data change, field areas are measured by agrotechnicians and verified by accountants of LLC "Koziivske" using GPS equipment installed in John Deere agricultural machinery, which is in disposal of LLC "Koziivske".

B.1. Types of metering equipment:

Humus (organic carbon) content is measured in accordance with state standards of Ukraine 4289:2004 "Soil quality. Methods for determining organic matter" using the following key equipment:

1. Photoelectric colorimeter (Figure 1)

Figure 1. Photoelectric colorimeter

2. Torsion balance (Figure 2)

Figure 2. Torsion balance

3. Ashless filters (Figure 3)

Figure 3. Ashless filters

Other equipment and reagents are on the books of the laboratory of National Academy of Agricultural Sciences of Ukraine, National Scientific Centre “Institute of Agriculture, NAAS”.

Field area is measured with GPS equipment:
GreenStar2, a GPS system installed in each LLC “Koziivske” tractor is used to measure project areas. This system not only allows to measure each field’s area, but also to use the time spent in the field more effectively.
The GPS system includes main devices listed below.

1. StarFire iTC receiver is a receiver of machinery location, which is compatible with all satellite signals used nowadays. The receiver is equipped with a module for location adjustment based on the relief, which automatically corrects all locations received from a satellite, taking into account soil roughness and skew. The device uses RTK signal with accuracy of ±2 cm from pass to pass.

Figure 4. StarFire iTC receiver

2. GreenStar2 system display shows all field operations. The installed GreenStar Basics software includes manual navigation as well as map display and data saving option.

Figure 5. GreenStar2 display

B.1.2. Calibration procedure:

According to current legislation "On metrology and metrological activity"[8], all metering equipment in Ukraine must meet the specified requirements of relevant standards and is subject to a periodic check.
Calibration of all required devices for humus content measurement is conducted annually by SE "Ukrainian State Centre for Standardization and Certification".
The devices for measurement of field areas do not require calibration or verification. All the GPS equipment is under thecontrol of LLC "Koziivske" service managers.

B.1.3. Involvement of third parties:

Calibration of all required devices for humus content measurement is conducted annually by NSC "Institute of Agriculture NAAS of Ukraine".
If necessary, John Deere specialists may be involved into adjustment of GreenStar2 system[9].

B.2. Data collection (data collected for all the monitoring period):

Data used to calculate emission reductions are provided in table of Section B.2.1 (List of constant values, variables and fixed values), Annex 2 : Calculation of CO_2eq emission reductions by implementation of No-till technology at LLC "Koziivske" to this Monitoring Report.

All the parameters required to calculate emission reductions are provided in Tables of Section B.2.1 of this Monitoring Report.

B.2.1. List of constant values, variables and fixed values:

Table 4. List of constant values, variables and fixed values

No.	Symbol	Parameter	Measuring units	Measured (m), calculated (c), estimated (e)	Comments
1	$S_{p,i}$	area of field *i* cultivated using No-till technology	ha	m	2008-2009 Field Registry of the Farm
2	$k_{p,i,y}$	humus content in the soil of field *i* cultivated using No-till technology in period *y*	%	m	Soil quality assessment logs
3	$k_{b,i,y}$	humus content in the soil of field *i* cultivated using traditional tillage in period *y*	%	c	Calculated using data defined for every field *i* prior to the start of the project, "The scientific study of the dynamics of humus in the soil climatic zones for conventional and zero tillage"
4	ρ_i	soil density at field *i* cultivated using traditional tillage before the start of the project	t/m^3	m	Soil quality assessment logs
5	$h_{b,i}$	depth of soil layer disturbance at field *i* cultivated using traditional tillage	m	m	Determined at the beginning of the project activity

B.2.2. Data related to GHG emissions by sources in the project scenario:

8 http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1765-15
9 http://www.deere.ua/wps/dcom/uk_UA/regional_home.page

Project emissions are absent.

B.2.3. Data related to GHG emissions by sources in the baseline scenario:

Table 5. Data related to GHG emissions by sources in the baseline scenario

	Symbol	Parameter	Measuring units	Measured (m), calculated (c), estimated (e)
1	$S_{p,i}$	area of field *i* cultivated using No-till technology	ha	m
2	$k_{p,i,y}$	humus content in the soil of field *i* cultivated using No-till technology in period *y*	%	m
3	$k_{b,i,y}$	humus content in the soil of field *i* cultivated using traditional tillage in period *y*	%	c
4	ρ_i	soil density at field *i* cultivated using traditional tillage before the start of the project	t/m^3	m
5	$h_{b,i}$	depth of soil layer disturbance at field *i* cultivated using traditional tillage	m	m

B.2.4. Leakage:

Leakage is absent

B.2.5. Data concerning environmental impacts:

According to the law of Ukraine "On Environmental Protection"[10] and DBN A.2.2-1-2003 "Composition and content of the materials of environment impact assessment (EIA) for design and construction of plants, buildings and structures"[11], LLC "Koziivske" is not obliged to carry out EIA development for this type of project.

In general, the project will have positive impact on the environment because the replacement of conventional tillage with No-till technology will result in lower GHG emissions into the atmosphere and lower diesel fuel consumption for LLC "Koziivske" farmland cultivation.

Transboundary impacts from the project activity, according to their definition in the text of "Convention on long-range transboundary pollution" ratified by Ukraine, will not take place.

Impact on water medium
The impact on water medium is absent.

Impact on air environment
Permanent, insignificant. Harmful emissions from technological equipment during the implementation of No-till technology. Since the number of technological procedures associated with diesel fuel combustion will decrease, greenhouse gas emissions will shrink. In addition, the implementation of No-till technology will reduce carbon dioxide emissions from humus decomposition (oxidation).

Impact on land use

[10] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1264-12
[11] http://www.budinfo.com.ua/dbn/8.htm

The project will have a positive impact on land use, increasing humus content in the soil. Soil rich in humus brings better yields of crops which are more resistant to diseases and harmful environmental factors and provide better quality of products.

B.3. Data processing and archiving:

All the data are processed and archived in electronic and/or hard copy.

B.4. Extraordinary situations and technical malfunctions:

No extraordinary situations were registered at LLC "Koziivske" in the 2 years (January 1, 2008, through December 31, 2009).

B.5. Malfunction detection and repair procedures at LLC "Koziivske":

If a malfunction is detected, the technician informs the master of LLC "Koziivske". If the malfunction cannot be repaired immediately (absence of the required spare part, engine breakdown, etc.), a commission of 6-7 people shall be created, which includes technical department representatives, chief engineer and lead engineers. Depending on the type of malfunction, a Damage or Emergency Report is drawn up to be submitted to the management board of LLC "Koziivske"; repair of the equipment is conducted.

B.6. Level of error of metering equipment:

The level of error is determined for every type of metering equipment. This level of error is generally low. The level of error for humus content metering devices complies with the standards of Ukraine. All equipment is in accordance with state standards of Ukraine 4289:2004 "Soil quality. Methods for determining organic matter".

SECTION C. Quality assurance and quality control measures

C.1. Documented procedures and structure of management:

C.1.1. Responsibility and authority:

To implement the project the operational structure was created; it includes LLC "Koziivske" agrotechnicians and engineers (responsible for accounting of area treated with No-till technology), National Academy of Agricultural Sciences of Ukraine, National Scientific Centre "Institute of Agriculture, NAAS" (responsible for provision of agrochemical data for project monitoring), LLC "Koziivske" chief agrotechnician (recording and reporting data in the table), and LLC "Koziivske" manager (data processing and archivation). The data subject to monitoring and required for the determination and further verification will be archived and stored in paper and electronic form at LLC "Koziivske" for two years after the transfer of emission reduction units generated by the project.
The structure of monitoring data collection is as follows:

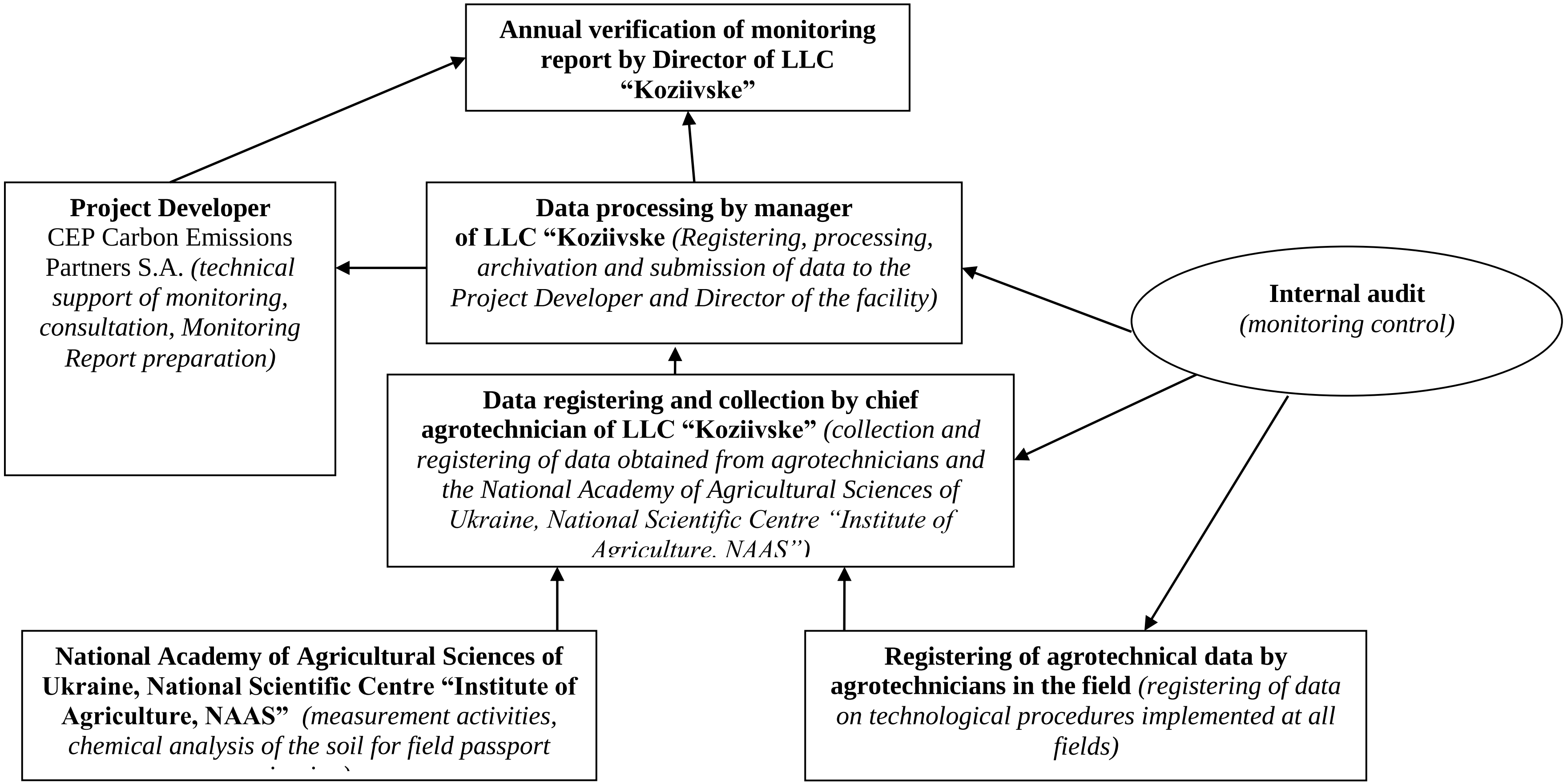

Figure 5. Operational structure and data collection scheme for the project monitoring

C.1.2. Trainings

No special trainings for the personnel are required, because primary activity of LLC "Koziivske" did not change. Technical personnel of the company has relevant knowledge and experience for project implementation and equipment maintenance.

If new equipment (not operated before) is installed, the manufacturer is obliged to provide trainings for the personnel. In the period of monitoring, no equipment was installed which requires special training of the staff.

LLC "Koziivske" conducts trainings for its employees in accordance with Labour Safety requirements. The company has the Labour Safety Department responsible for professional training of the personnel.

C.2. Stakeholders' comments:

LLC "Koziivske" informed the community through mass media. All comments relating to the project implementation were positive.

No negative comments were received.

C.3. External audit and control activities:

Metering devices used for project monitoring are subject to state calibration. Calibration and verification of all required devices for humus content measurement is conducted annually by SE "Kharkiv Regional Centre for Standardization and Metrology".
If necessary, John Deere specialists may be involved into adjustment of GreenStar2 system[12].
LLC "Koziivske" employees are subject to periodic testing for requirements:

- of data collection in accordance with the monitoring report (data collection in accordance with monitoring coincides with the customary data collection practice);
- of labour protection;
- of safety rules.

Every quarter, the project developers CEP Carbon Emissions Partners S.A. conduct internal audit at LLC "Koziivske".
The plan of internal audit at LLC "Koziivske" includes the following activities:

1. verification of areas of fields where Notill technology is implemented;
2. verification of humus content;
3. verification of verification frequencies for humus metering devices;
4. verification of calibration frequencies for humus metering devices.

[12] http://www.deere.ua/wps/dcom/uk_UA/regional_home.page

SECTION D. Calculation of GHG emission reductions

This section contains formulae used to assess project emissions, baseline emissions and total emission reductions provided in tables below.

D.1.1. Project emissions:

Greenhouse gas emission under the Project scenario:none.

$$PE_y = 0 \quad (1)$$

Where:
PE_y – project GHG emissions in period y, t CO_2eq;
[y] - index for monitoring period.

D.1.2. Baseline emissions:

Greenhouse gas emissions under the Baseline scenario:

Baseline emissions in period y are calculated using the following formula:

$$BE_y = BE_{A,y}, \quad (2)$$

where:
BE_y – baseline GHG emissions in period y, tCO_2e;
$BE_{A,y}$ – baseline GHG emissions due to baseline land cultivation technology, in period y, tCO_2e;
[y] - index for monitoring period;
[A] – index for baseline land cultivation technology.

Baseline emissions due to application of baseline land cultivation technology can be calculated as follows:

$$BE_{A,y} = \sum BE_{A,i,y}, \quad (3)$$

where:
$BE_{A,y}$ – baseline GHG emissions due to baseline land cultivation technology, in period y, tCO_2e;
$BE_{A,i,y}$ – baseline GHG emissions due to baseline land cultivation technology, in period y, tCO_2e;
[y] - index for monitoring period;
[A] – index for baseline land cultivation technology;
[i] - index for number of fields.

Baseline GHG emissions due to baseline land cultivation technology, which involves tillage, for field i are calculated using the formula, according to the "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities" (Version 01.1.0)[13]:

$$BE_{A,i,y} = 0{,}9 \times S_{p,i} \times (SOC_{p,y,i} - SOC_{b,y,i}) \times \frac{44}{12}, \quad (4)$$

where:
$BE_{A,i,y}$ – baseline GHG emissions due to baseline land cultivation technology, in period y, tCO_2e;
$S_{p,i}$ – area of field i cultivated using No-till technology, ha;
$SOC_{p,y,i}$ – soil organic carbon content in the soil of field i cultivated using No-till technology in period y, t C/ha;
$SOC_{b,y,i}$ – soil organic carbon content in the soil of field i cultivated using traditional tillage technology in period y, t C/ha;
44/12 – CO_2 to C molecular masses ratio;
0.9 – factor that takes account of 10% of emissions from the project activity, which includes creation of anti-fire furrows and minimal topsoil disturbance when No-till technology is implemented;
[y] - index for monitoring period;

[13] http://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-16-v1.1.0.pdf

[b] - index for baseline technology;
[p] - index for project technology;
[A] – index for baseline land cultivation technology;
[*i*] - index for number of fields.

Soil organic carbon content in soil of field *i* cultivated using No-till technology is calculated by the following formula:

$$SOC_{p,y,i} = h_{b,i} \times \rho_i \times k_{p,i,y} \div 1.724 \times 10000 \div 100\% \quad , \qquad (5)$$

where:
$SOC_{p,y,i}$ – soil organic carbon content in the soil of field *i* cultivated using No-till technology in period *y*, t C/ha;
$h_{b,i}$ – depth of soil disturbance in field *i* cultivated using traditional tillage, m;
ρ_i– pre-project soil density in field *i*, cultivated using traditional tillage in period *y*, t/m^3;
$k_{p,i,y}$ – humus content in the soil of field *i* cultivated using No-till technology in period *y*, %;
1,724 – organic carbon to humus conversion coefficient (according to GOST 23740*[14])
10000 – m^2 to ha conversion coefficient;
[*y*] - index for monitoring period;
[b] - index for baseline technology;
[p] - index for project technology;
[*i*] - index for number of fields.

Soil organic carbon content in soil of field *i* cultivated using No-till technology is calculated by the following formula:

$$SOC_{b,y,i} = h_{b,i} \times \rho_i \times k_{b,i,y} \div 1{,}724 \times 10000 \div 100\%, \qquad (6)$$

where:
$SOC_{b,y,i}$ – soil organic carbon content in the soil of field *i* cultivated using traditional tillage technology in period *y*, t C/ha;
$h_{b,i}$ – depth of soil disturbance in field *i* cultivated using traditional tillage, m;
ρ_i– soil density in field *i*, cultivated using traditional tillage in period *y*, t/m^3;
$k_{b,i,y}$ – humus content in the soil of field *i* cultivated using traditional tillage in period *y*, %;
1,724 – organic carbon to humus conversion coefficient (according to GOST 23740*[15])
10000 – m^2 to ha conversion coefficient;
[b] - index for baseline technology;
[*y*] - index for monitoring period;
[*i*] - index for number of fields.

The content of humus in the soil in the baseline scenario is calculated using historical data over a four-year period. Linear dependence proved to be the most reliable (100%) of them all. It provides for the extrapolation of humus content to years of the project life. As a result of linear approximation, the dependence is as follows (extrapolation is performed for each field individually):

$$k_{b,i,y} = a \cdot y + b \quad , \qquad (7)$$

coefficients a, b (see Supporting Document 1) are determined using Microsoft Excel features by building a trend line on the basis of historical data over the 3 years prior to the project. The linear dependence has the lowest function error.
This is due to the fact that the enterprise LLC “” was founded in 2003, so the baseline settings were adopted first 4 years for the period of 2003-2006. Moreover, there already exists a determinated project “Reduction of CO_2 emissions by systematic utilization of No-till technologies in agricultural industry” (LLC “Beta-Agro-Invest”), where 5 years were taken to develop the trend. That is why, given the linear nature of the function, 4 years are enough to set the baseline.
Where:
$k_{b,i,y}$ – humus content in the soil of field *i* cultivated using traditional tillage in period *y*, %;

[14] http://www.complexdoc.ru/text/%D0%93%D0%9E%D0%A1%D0%A2%2023740-79
[15] http://www.complexdoc.ru/text/%D0%93%D0%9E%D0%A1%D0%A2%2023740-79

a – coefficient of linear dependence;
b - coefficient of linear dependence;
y – monitoring period;
[b] - index for baseline technology;
[*i*] - index for number of fields;
[*y*] - index for monitoring period.

Baseline analysis showed that humus content in the soil will drop by 0.5% over the 20 years of the project life.
Supporting Document 1 contains a calculation of baseline emissions and project emissions as well as emission reductions for each year of the reporting period.

D.1.4. Leakage:

There is no leakage associated with this project.

SECTION E. Results of the GHG emission reductions monitoring

E.1. GHG emissions under the project scenario

Greenhouse gas emissions under the Project scenario:none.

E.2. Leakage

There is no leakage associated with this project.

E.3. GHG emissions under the baseline scenario

Baseline emissions were estimated in accordance with the formulae given in Section D.2 of the Monotoring Report (see Annex No.2- Excel file). The results of calculations of GHG emissions in the baseline scenario are presented Table 6:

Table 6. Baseline emissions for the period of January 1, 2008 – December 31, 2009

Years	Baseline emissions (t CO_2 equivalent)
2008	530 679
2009	847 206
Total baseline emissions over the crediting period of 2008-2009 (t CO_2 equivalent)	**1 377 885**

E.4. Emissions reductions as a result of JI project implementation over the monitoring period

Emissions reduction as a result of project implementation is calculated as difference between baseline and project emissions. Emission reductions were estimated in accordance with the formulae given in Section D.3 of the MR (see Annex No.2 - Excel file). Implementation of project activities during the reporting period caused the following GHG emission reductions:

Table 7. Results of calculation of emission reductions for the period of January 1, 2008 – December 31, 2009

Year	Project emissions (t CO_2 equivalent)	Leakage (t CO_2 equivalent)	Baseline emissions (t CO_2 equivalent)	Emission reductions (t CO_2 equivalent)
2008	0	0	530 679	530 679
2009	0	0	847 206	847 206
Total emissions (t CO_2 equivalent)	**0**	**0**	**1 377 885**	**1 377 885**

Ex-post emission reductions during the project period slightly differ from the values stated in the PDD. This is attributable to the fact that it was impossible to obtain precise data to calculate GHG emission reductions for the reporting period at the moment of PDD development (Section A.7). All the required information has been provided to calculate GHG emissions for the reporting period, which ensured accurate calculation of emissions in the baseline and the project scenarios.

Annex 1: Parameters of Monitoring Plan

Data in this Annex are provided in accordance with the Parameters of Monitoring Plan.

Parameter number and title (according to the Monitoring Plan)	$S_{p,i}$
Data unit	ha
Description	Area of field *i* cultivated using No-till technology
Value for the monitoring period	Ref. to Annex 2 : Calculation of CO_2eq emission reductions by implementation of No-till technology at LLC "Koziivske"
Monitoring method	Data from the Land Inventory are applied. If the area of the field cultivated in the corresponding year changes, the actual area is measured using GPS equipment.
Recording frequency	Annually
Documentary evidence	The Main Administration of the State Land Committee in Kharkiv region conducts relevant area verification once a year
Calculation method	N/A
Comments	Detailed information on project areas is provided in Annex 2.

Parameter number and title (according to the Monitoring Plan)	$k_{p,i,y}$
Data unit	%
Description	Humus content in the soil of field *i* cultivated using No-till technology in period *y*
Value for the monitoring period	Ref. to Annex 2 : Calculation of CO2eq emission reductions by implementation of No-till technology at LLC "Koziivske"
Monitoring method	National Academy of Agricultural Sciences of Ukraine, National Scientific Centre "Institute of Agriculture, NAAS" determines the value of humus content in soil according to the State Standard of Ukraine 4289:2004 and fills in field passports with these data.
Recording frequency	Once a year
Documentary evidence	Soil quality assessment logs
Calculation method	N/A
Comments	Detailed information on humus content in fields of LLC "Koziivske" is provided in Annex 2.

Parameter number and title (according to the Monitoring Plan)	ρ_i
Data unit	t/m^3
Description	Soil density at field *i* cultivated using traditional tillage before the start of the project
Value for the monitoring period	Ref. to Annex 2 : Calculation of CO2eq emission reductions by implementation of No-till technology at LLC "Koziivske"
Monitoring method	National Academy of Agricultural Sciences of Ukraine, National Scientific Centre "Institute of Agriculture, NAAS" determines soil density and fills in measurement logs with the obtained figures.
Recording frequency	Calculated for every field *i* prior to the start of the project
Documentary evidence	Soil quality assessment logs

Calculation method	N/A
Comments	Detailed information on density of soil in fields of LLC "Koziivske" is provided in Annex 2.

Parameter number and title (according to the Monitoring Plan)	$k_{b,i,y}$
Data unit	%
Description	Humus content in the soil of field *i* cultivated using traditional tillage in period *y*
Value for the monitoring period	Ref. to Annex 2 : Calculation of CO_2eq emission reductions by implementation of No-till technology at LLC "Koziivske"
Monitoring method	Historical data for the 4 years prior to the start of the project (provided in Annex 2) are obtained from the National Academy of Agricultural Sciences of Ukraine, National Scientific Centre "Institute of Agriculture, NAAS" authorized to conduct measurements according to the state standards of Ukraine.
Recording frequency	Calculated using data defined for every field *i* prior to the start of the project
Documentary evidence	Soil quality assessment logs
Calculation method	The content of humus in the soil for the baseline scenario is calculated, taking into account its linear decrease over time, under the condition of the use of conventional mechanical tillage that involves ploughing. This linear dependence is based on the historical data using the least square method.
Comments	N/A

Parameter number and title (according to the Monitoring Plan)	$h_{b,i}$
Data unit	m
Description	Depth of soil layer disturbance at field i when conventional tillage is applied
Monitoring method	Regulatory document
Value for the monitoring period	Ref. to Annex 2 : Calculation of CO_2eq emission reductions by implementation of No-till technology at LLC "Koziivske"
Recording frequency	Determined at the beginning of the project activity
Documentary evidence	Company data
Calculation method	N/A
Comments	N/A