JOINT IMPLEMENTATION PROJECT

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

Position of the head of the organization, institution, body, which prepared the document

Director of Evo Carbon Trading Services Ltd

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

PS

Position of the economic entity – owner of the source, where the Joint Implementation Project is planned to be carried out

Director of LLC "Koziivske"

________ (date)	________ (signature)	**O.V. Naidenko** (surname, name and patronymic of the person)

PS

__________ 2012

JOINT IMPLEMENTATION PROJECT DESIGN DOCUMENT FORM
Version 01 - in effect as of: 15 June 2006

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SECTION A. General description of the project

A.1. Title of the project:

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

Sectoral scope:
Sector 15 - Agriculture.

PDD Version: 02

Date: 21/09/2012

A.2. 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.

Emissions are reduced due to lower carbon dioxide emissions from farmland by lower (almost zero) topsoil disturbance by tillage in the course of crops growing.

Situation that existed prior to the Project
LLC "Koziivske" (the Farm), established in 2000, is engaged in agricultural activity in the south-eastern part of Ukraine.
The company’s primary activity is growing, processing, storage and sale of agricultural products.

Circumstances of project implementation.
Prior to the project, LLC "Koziivske" used traditional land cultivation system. 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. For more details on this technology see Section B.
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.

Baseline scenario
The baseline scenario provides for the continued use of traditional farming systems, involving mechanical soil tillage with ploughing. As a result, humus oxidation and carbon dioxide emissions will take place. In addition, the baseline scenario provides for the use of diesel fuel in volumes usual for traditional farming. The baseline scenario is characterized with a permanent decrease of humus (organic carbon) content in the soil of fields, which causes their exhaustion and has a negative effect on the yields.

Project scenario

The project is planned to be implemented step-by-step, with annual increase in land area cultivated by using direct sowing technology (Table 1).

Table 1. *Project land area cultivated using direct sowing technology*

Year	Area, ha
2007	9 412,00
2008	9 412,00
2009	10 870,00
2010	10 870,00
2011	10 870,00
2012	10 870,00

In 2007, the Farm started purchases of necessary agricultural equipment for direct sowing farming as part of the Joint Implementation Project. The equipment package included:

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

No-till technology provides for the ground surface covered with a layer of mulch, i.e. residues of purposely shredded plants. The topsoil is not disturbed creating a protective layer along with the plant residues, which prevents water and wind erosion of soil and ensures much better water retention; in addition, direct sowing nullifies GHG emissions into the atmosphere.

Additional benefits of the project (apart from those indicated in the purpose of the project):

a) lower consumption of chemical fertilizers;
b) lower impact of weather conditions on yields;
c) lower wind and water soil erosion, better soil fertility.

Table 2. *Historical details of the project*

Project milestones	Documentary evidence	Date
Signing of an equipment purchase contract (starting date of the project)	Agreement No.0804 for the rent of a transport vehicle between LLC “Koziivske” and “T.M.M.” company dated 08/03/2007	08/03/2007
Preparation and submission of project design documents to substantiate anthropogenic emission reductions to the State Environmental Investment Agency of Ukraine.	Supporting documents on possible JI project "Reduction of greenhouse gas emissions by application of No-till technology at LLC “Koziivske" farmlands"	18/07/2012
Obtaining of a Letter of Endorsement from the State Environmental Investment Agency of Ukraine	Letter of Endorsement No.2363/23/7 for the JI project “Reduction of greenhouse gas emissions by application of No-till technology at LLC “Koziivske" farmlands” dated 28/08/2012	28/08/2012

A.3. Project participants:

Party involved*	Legal entity project participant (as applicable)	Please indicate if the Party involved wishes to be considered as project participant (Yes/No)
Ukraine (Host Party)	• LLC "Koziivske"	No
Estonia	• LHCarbon OÜ	No
*Please indicate if the Party involved is a host Party.		

The project developer will be official project owner, project manager and person responsible for all administrative affairs of parties involved concerning the Host Party and Party-investor.

LLC "Koziivske" is an organization that implements the project (Applicant). USREOU Code: 30739637. Type of activity: 01.11.0 – Grain and technical crops production. LLC "Koziivske" is responsible for project activities implemented using in-house manpower or by subcontractors. The enterprise provides project financing and receives no profit.

LHCarbon OÜ is a research and engineering organization. It provides consulting services on the implementation of joint implementation projects.

A.4. Technical description of the project:

A.4.1. Location of the project:

The project is located in Kharkiv region, Ukraine.
The geographical location of the project is shown in Figures 1 and 2.

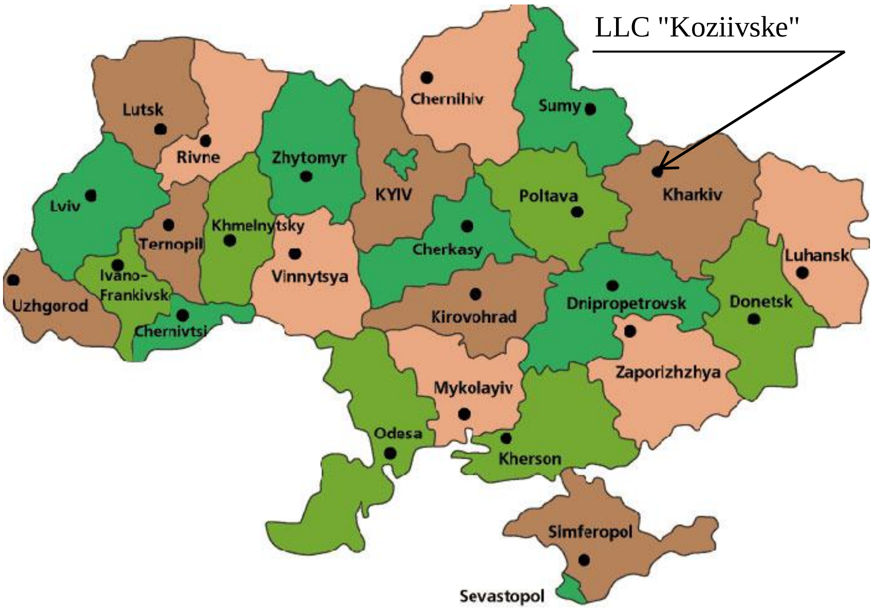

Figure 1. Location of facilities of LLC "Koziivske" on the map of Ukraine

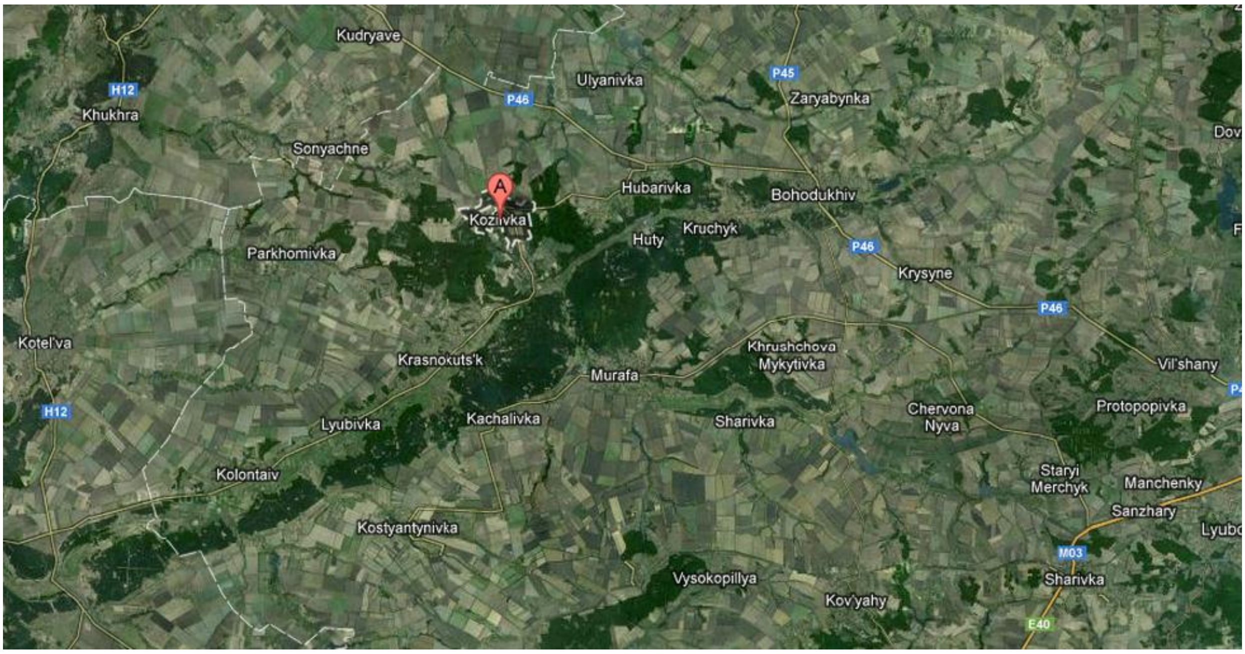

Figure 2. Location of LLC "Koziivske" on the map of Krasnokutskyi district, Kharkiv region

A.4.1.1. Host Party(ies):

The project is located in the territory of Ukraine.
Ukraine is an Eastern European country that ratified the Kyoto Protocol to the UN Framework Convention on Climate Change on February 4, 2004[1]. It is listed in Annex 1 and meets the requirements of participation in Joint Implementation projects[2].

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

Kharkiv region.

A.4.1.3. City/Town/Community etc.:

LLC "Koziivske" facilities are located in Krasnokutskyi district of Kharkiv region, Ukraine.

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

LLC "Koziivske" headquarters
Koziivka village, Krasnokutskyi district, Kharkiv region
Coordinates of Koziivka village
Latitude: 50^{o} 08'44'' N
Longitude: 35o 12' 19'' E
Koziivka is a village located in Krasnokutskyi district in the north-eastern part of Kharkiv region.
Population is 2338 people.
Kharkiv region is an administrative unit of Ukraine.
The JI project is planned to be implemented in the territory of agricultural facilities of "Koziivske" LLC:

[1] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1430-15

[2] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?page=1&nreg=995_801

Table 3. *Agricultural facilities of LLC "Koziivske" where the JI project is implemented*

Facility of the Farm	District	Locality
Koziivka Village Council	Krasnokutskyi	Koziivka
Kaplunivka Village Council	Krasnokutskyi	Kaplunivka
Riabokonevo Village Council	Krasnokutskyi	Riabokonevo
Kolontaivska Village Council	Krasnokutskyi	Kotelevka
Parkhomivka Village Council	Krasnokutskyi	Pionerske
Kolontaivska Village Council	Krasnokutskyi	Kolontaiv

A.4.2. Technology(ies) to be employed, or measures, operations or actions to be implemented by the project:

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.

No-till technology proposed under the JI project has several important technological aspects, namely:
- availability of farm crop residues to cover the ground surface;
- optimal use of crop rotation and agro-technological terms of all technological procedures (from sowing to harvesting) adapted to regional climatic conditions;
- direct sowing of crops into the soil (without any preliminary tillage of the soil), that involves attachment of the complex of organic and mineral fertilizers;
- soil spraying with herbicides to eliminate weeds.

There is one more important element of the systematic use of direct sowing technology in addition to strict fulfilment of all technological procedures that must be synchronized in time and space. It is specialized agricultural machinery, including modern herbicide spraying systems, special combined wheat harvesters, sunflower and corn harvesters, special combined seed and fertilizer drill systems, and power units whose specifications affect quality and guarantee of compliance with required agrotechnological sowing dates, etc. and, as a result, efficiency of crop production in general.
Prior to application of direct sowing technology to all crop areas, the pilot application of direct sowing technology and preparation of agricultural resources for LLC "Koziivske" were carried out on the basis of import Bourgault sowing complexes.
The project provides for the use of technology that corresponds to current global practice. In particular, such countries as the USA, Brazil, Argentina, and Canada started to implement direct sowing technology back in the 1980s. Some of these countries apply No-till farming at over 50% of their farmlands[3].
Optimization of crop rotations, crop range broadening, as well as further reduction of energy consumption per crop unit should be improved and replacement of the existing sowing complexes with the new ones that should satisfy a series of new requirements, including the possibility of soil relief

[3]http://ru.wikipedia.org/wiki/%D0%A1%D0%B8%D1%81%D1%82%D0%B5%D0%BC%D0%B0_%D0%BD%D1%83%D0%BB%D0%B5%D0%B2%D0%BE%D0%B9_%D0%BE%D0%B1%D1%80%D0%B0%D0%B1%D0%BE%D1%82%D0%BA%D0%B8_%D0%BF%D0%BE%D1%87%D0%B2%D1%8B

copying, which would allow exclusion of several technological procedures from the technological cycle, making it available to many farms and more effective; as well as the possibility of sowing wider crop range.
These implementations require modern machinery and equipment for land cultivation. The project provides for the use of modern equipment from Bourgault[4]. Operation of this equipment requires relevant staff training. All the personnel will be trained in accordance with the requirements. Project activity is unlikely to be replaced during the project life because this technology meets the modern agricultural standards.
Technological issues of soil cultivation using the traditional technology and No-till technology are provided in Table 4.

Table 4. *Main activities disturbing topsoil*

No.	Type of activity	Traditional technology	No-till
1	Ploughing	+	-
2	Cultivation with simultaneous furrowing	+	-
3	Seeding	+	+
4	Plant growing	+	+
5	Harvesting	+	+
6	Removal of plant residues	+	-

Implementation and use of direct sowing technology, which will cause GHG emission reductions, include:

1. Planning crop rotation and rotation cultures

The project provides for rotation of high-residue crops (corn, sunflower) with low-residue crops (grain) to create sufficient soil cover. Some of the mulch from high-residue crops may cover the surface while growing low-residue crops. Low-residue crops should be followed by high-residue crops so that sufficient cover was created for the following culture. About 50-70% of plant residues should always cover the soil surface.

[4] http://www.bourgault.com/

Figure 3. Soil covered with crop residues

As direct sowing technology slows down the warming of the soil, yields may decrease either if vegetation period is shorter than the total of effective temperature periods or if the soil has poor drainage system. In order to minimize the risk of slow soil warming, the project provides for balance of sufficient soil cover and achievement of soil warming at the beginning of the vegetation period.

Project crop rotation schemes are provided in Table 5.

Table 5. *Possible crop rotation schemes*

Crop rotation # 1	Crop rotation # 2	Crop rotation # 3	Crop rotation # 4	Crop rotation # 5
Winter wheat	Winter wheat	Winter wheat	Winter wheat	Spring wheat
Soybeans	Corn	Corn	Soybeans	Soybeans
Spring wheat	Soybeans	Soybeans	Corn	Spring barley
Corn	Barley	Spring wheat	Flax	Corn

The choice of the variety of seeds will depend on the following criteria:

- The ability of seeds to germinate at low temperatures;
- The ability of seeds to grow earlier;
- Resistance to specific diseases that may be associated with massive cover of crop residues.

2. Evaluation of soil

Soil analysis is necessary to achieve a balanced pH ratio; it is important for achieving the best results in the direct sowing system. If low content of any element is detected in the soil, corresponding fertilizers, including lime, should be applied, to achieve at least average rates of any element at the beginning and ultimately a high level of nutrients in the soil. Usually direct sowing technology causes high moisture content and low temperature in the top layer of the soil, which allows roots to develop well under the mulch and consume a large amount of phosphorus in this layer. If the analysis shows a low level of phosphorus, it will be increased to a level above average. If necessary, a surface lime application will be made every 2-3 years in amount from 1/7 to ½ of the normal amount.

3. Crop residue management

The project provides for even and sufficient soil cover of plant residues which remain after harvesting of the previous crops. To ensure even distribution of crop residues, harvesters equipped with spreaders or choppers will be used.

4. Topsoil management

The field microrelief should be levelled out prior to sowing. If this stage is omitted, uneven ground will lower the efficiency of seed drills. Thus, seeds will either stay on the surface or be put not deeply enough or too deep to germinate, which will result in thin stand. Efficient farming requires putting all seeds at the same depth, which can be achieved only if the soil surface is smooth.

Removal of soil compaction. Many years of ploughing with the same tools, especially when the soil is moist, result in plough pans at a depth of 20 cm and more, depending on the depth of ploughing[5], as well as in compacted layer of the soil at a depth of 40-45 cm[6] due to the pressure of heavy equipment moving across the field. In some cases, the soil develops paedogenetic (natural) compaction. The first stages of direct sowing implementation may show poor yields and low profit without a prior anti-compaction campaign. Natural and ploughing-caused compaction should be eliminated with a chisel plough or other deep tillage tools.

Mulching the soil surface. Almost all the benefits of direct sowing system arise from permanent soil cover and only a few of them are caused by refusal from ploughing. Direct sowing system will not be effective with little amount of crop residues.

5. Weed control

Refusal from ploughing requires additional weed control measures because ploughing in spring is aimed at loosening the ground and weed plouphing while ploughing in autumn is carried out to cut and bury weeds. This project provides for two methods:

1. Chemical method. This method is based on chemical destruction or inhibition of weed development. The method involves herbicide spraying of the soil before sowing or after sowing, depending on the crops. The active ingredients of such herbicides are prometryn or hyzalofor-R-tefuryl for perennial and annual weed control.
2. Biological method. This method is based on crop protection from a wide range of fungal and bacterial diseases. Application of Trykhodermin biological preparation promotes root development and stimulates the growth of plants due to biologically active substances secreted by Trichoderma lignorum (a biofungicide). Giving the basic biological protection to crops strengthens their domination in the struggle for basic resources (water, organic and non-organic components) compared with weeds, which leads to developmental inhibition and reduction of weed populations in the area.

6. Mound-mice population control

Growth of mound-mice population is one of the problems in the area of the project location that may be aggravated after the refusal from ploughing. During their life cycle, the mice create mounds which make the use of direct sowing technology less efficient given the basic requirement of smooth ground surface. The project budget includes the cost of Baktorodentsyd (formulation: loose granules populated by single-purpose murine typhus bacillus Salmonella enteritidis). The preparation is spread in 10-gramme portions within 5-meter radius from rodent habitats.

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[5] http://ebooktime.net/book_115_glava_57_4.2.1._%D0%9F%D0%BE%D0%BB%D0%B8%D1%86%D0%B5%D0%B2%D0%B8%D0%B9_%D0%BE%D0%B1.html

[6] http://www.ebooktime.net/book_115_glava_69_4.6.2._%D0%9E%D0%B1%D1%80%D0%BE%D0%B1%D1%96%D1%82%D0%BE%D0%BA_%D0%BE%D1%81.html

All the above-mentioned steps are necessary technological procedures of direct sowing technology implementation, leading to GHG emission reductions.

The description of agricultural machinery planned to be used in the project activity is provided in Annex 4.

Machinery will ensure optimization of agricultural equipment operation in the field and reduce the number of technological procedures.
Table 6 shows the JI project schedule at the Farm

Table 6. *Schedule of JI project implementation at the Farm*

Year	Koziivka village	Kaplunivka village	Riabokonevo village	Kotelevka village	Pioner village	Kolontaiv village
2007	+	+	+	+	+	
2008	+	+	+	+	+	
2009	+	+	+	+	+	+
2010	+	+	+	+	+	+
2011	+	+	+	+	+	+
2012	+	+	+	+	+	+

A.4.3. Brief explanation of how the anthropogenic emissions of greenhouse gases by sources are to be reduced by the proposed JI project, including why the emission reductions would not occur in the absence of the proposed project, taking into account national and/or sectoral policies and circumstances:

Emissions are reduced due to lower carbon dioxide emissions from farmland due to the absence of soil carbon oxidation on lower (almost zero) topsoil disturbance by tillage in the course of crops growing. The project also provides for lower carbon dioxide emissions due to a decrease of fossil fuel (diesel fuel) combustion by tractors and agricultural machinery, which is not included into the project boundary under the conservative principle.

The project is unlikely to be implemented without the JI mechanism, which is a strong additional incentive. This is caused by the following:

- In Ukraine there are no legal requirements associated with the introduction of direct sowing technology instead of conventional mechanical tillage systems. Implementation of this project could only be an initiative of an enterprise itself. No significant changes in the legislation that could force enterprises to give up the existing tillage practice, involving ploughing, are expected.
- GHG emission restrictions are absent and not expected to be implemented until 2014 at the earliest;
- Implementation of the project requires considerable investment in agricultural equipment and is associated with financial risks and risks relating to the operation of new technology, such as issues of productivity and use of new machinery. The project is not attractive enough in terms of investment without the income from sales of emission reduction units (ERUs).

A.4.3.1. Estimated amount of emission reductions over the crediting period:

Table 7. *Estimated emission reductions before the first commitment period*

	Years
Length of the crediting period	1
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent

2007	314 809
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	**314 809**
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	**314 809**

Table 8. *Estimated emission reductions for the first commitment period*

	Years
Length of the crediting period	5
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2008	504 514
2009	814 290
2010	1 158 911
2011	1 572 051
2012	1 974 570
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	**6 024 336**
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	**1 204 867**

Table 9. *Estimated emission reductions after the first commitment period*

	Years
Length of the crediting period	8
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2013	1 974 570
2014	1 974 570
2015	1 974 570
2016	1 974 570
2017	1 974 570
2018	1 974 570
2019	1 974 570
2020	1 974 570
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	**15 796 560**
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	**1 974 570**

For more details on calculation of emission reductions, refer to Supporting Document 1 (Excel file).

For description of formulae used for preliminary estimation of emission reduction units, see Section D and Supporting Document 1.

A.5. Project approval by the Parties involved:

Letter of Endorsement No. 2363/23/7 for the Joint Implementation project "Reduction of greenhouse gas emissions by application of No-till technology at LLC "Koziivske" farmlands" dated 28/08/2012 was issued by the State Environmental Investment Agency of Ukraine.

After the project determination, the project design document (PDD) and the Determination Report will be submitted to the State Environmental Investment Agency of Ukraine to obtain a Letter of Approval.

SECTION B. Baseline

B.1. Description and justification of the baseline chosen:

According to p. 9 of the "Guidance on criteria for baseline setting and monitoring", Version 03[7], approved by the JI Supervisory Committee, project participants may select either:
(a) An approach for baseline setting and monitoring developed in accordance with appendix B of the JI guidelines (JI-specific approach); or
(b) A methodology for baseline setting and monitoring approved by the Executive Board of the clean development mechanism (CDM); or
(c) An approach for baseline setting and monitoring already taken in comparable JI cases.
When the project was under development, there were no approved CDM methodologies for this type of activity. Therefore, the proposed project applies a specific approach to baseline setting and monitoring based on provisions of the following documents:
Calculation of greenhouse gas emissions due to ***mechanical tillage*** when traditional farming technology is applied:
- 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 5, Vol. 4, 5.2.3. Soil Carbon (Agriculture, Forestry and Other Land Use) [8]
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).[9]
Provisions of this Tool are used for calculation of CO_2 emissions due to mechanical tillage in the course of crops production.

For the description of the specific approach, see Section D (Monitoring Plan).

The specific approach applied in the project is based on constant monitoring of field areas (land use is situation-dependent), where CO_2 emissions occur, as well as such parameters as humus content in the soil of the field, soil density, list of crops grown by the Farm (new crops may be introduced during the project implementation).
Anthropogenic GHG emissions from this project take place at cultivated lands, namely farmlands, due to the commercial activity. (Cultivated land includes lands occupied by annual and perennial crops, as well as black fallow lands) According to 2006 IPCC Guidelines (IPCC Chapter 1 Vol.4)[10] , the project boundary may include the following GHG emissions:

- CO_2 emissions due to the change in soil carbon content;
- N_2O emissions due to nitrogen fertilizers applied into the soil.

No-till technology, i.e. the project scenario, provides for lower amount of nitrogen fertilizers used for crops growing than the baseline scenario[11]. Thus, the project scenario provide for lower N_2O emissions. However, according to the conservative principle, project participants do not include N_2O into the project boundary.

A stepwise approach was chosen to describe and justify the baseline:

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

[8] http://www.ipcc-nggip.iges.or.jp/public/2006gl/russian/pdf/4_Volume4/V4_05_Ch5_Cropland.pdf

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

[10] http://www.ipcc-nggip.iges.or.jp/public/2006gl/russian/pdf/4_Volume4/V4_01_Ch1_Introduction.pdf

[11] http://www.bioinvest.com.ua/index.php?option=com_content&view=article&id=70:-no-till&catid=23:publicationstat&Itemid=42

Step 1. Identification and description of the approach chosen to establish the baseline.

The proposed project applies a JI-specific approach based on the JI Guidance on criteria for baseline setting and monitoring, Version 03[12], which meets with the requirements of Decision 9/CMP.1, Appendix B of the "Criteria for baseline setting and monitoring".

The baseline is established by selecting the most plausible scenario from the list and description of plausible future scenarios based on conservative assumptions.

The following steps were made to determine the most plausible baseline scenario:
1. Identification of plausible alternatives that could be the baseline scenario
2. Justification of exclusion from consideration of alternatives, which are unlikely to take place from a technical and / or economic point of view.

To set the baseline scenario and further development of additionality justification in Section B.2. the following was taken into account:

- State policy and applicable law in the agrarian sector;
- Economic situation in the agrarian sector of Ukraine and demand forecast for agricultural products;
- Technical aspects of agricultural land management system;
- Availability of capital (including investment barriers);
- Local availability of technology / equipment;
- Price and availability of fuel.

Step 2. Application of the approach chosen.

The choice of the plausible baseline scenario is based on assessment of coal mining alternatives, which potentially could occur as of early 2007.

These alternatives are the following:
Alternative 1.1: Continuation of the current situation, without the JI project implementation.
Alternative 1.2: Project activity without the use of the JI mechanism.
Alternative 1.3: Partial project activities (some of the project activities are implemented) without the use of the Joint Implementation Mechanism.

All of these Alternatives comply with the requirements of the legislation of Ukraine.

Alternative 1.1: Continuation of the existing practice without the JI project implementation, which provides for the use of tillage technology and obsolete and worn-out agricultural machines. The traditional tillage technology of grain cultivation comprises about a dozen of technological procedures. In autumn, after the harvesting, primary tillage is carried out with hydroficated disk tiller to 6-8 cm depth. Then mineral fertilizers are applied and soil is simultaneously ploughed with a plough-point to a depth of up to 30 cm. In the spring, when the soil reaches its physical maturity, harrowing is conducted to retain the moisture and level out the field surface. Just prior to sowing, the soil is cultivated to a depth of seed sowing. Then sowing is carried out to a depth of 6-8 cm. During the period of tillering, the crops are sprayed with herbicides to destroy annual and perennial weeds.
This technology allows the Farm to keep its yields at a sustainable level without re-equipment, with subsequent ineffective combustion of fossil fuels in obsolete agricultural machinery and disturbance of the soil to a depth of up to 30 cm.

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

This Alternative is the most plausible baseline scenario, as it:
- allows growing required amount of crops
- requires no investment into new technological equipment.

Subsequently, Alternative 1.1 can be considered the most plausible baseline.

Alternative 1.2: Proposed project activity without the use of the JI mechanism. Project No-till technology with zero tillage provides either direct sowing into the soil previously sprayed with herbicides or sowing in the spring with stubble drill with starter dose of fertilizer application after the soil reaches maturity. The technology also involves spraying of crops with herbicides and, if necessary, insecticides. Harvesting is traditionally made by combines. Zero tillage eliminates ploughing and soil cultivation and implies extensive use of plant protection agents.
This Alternative is the least plausible baseline scenario because:
- it requires large investment in new equipment without payback;
- it requires higher expenses for chemical plant protection from weeds, pests and diseases;
- it requires compliance with higher requirements towards the use of plant protection agents, mineral fertilizers, ameliorants; there may be difficulties with the use of organic fertilizers which are inefficient unless directly applied in the soil;
- there are significant financial risks for the enterprise since not all cultures give high yields with zero tillage.

So, Alternative 1.2 cannot be seen as a plausible baseline.

Alternative 1.3: Partial implementation of the project (only some of project activities implemented) without the use of the JI mechanism. This alternative provides for exclusion of any non-core activities from the project, such as introduction of tractors, combines, etc. Since the proposed new technology is a complex process that requires a comprehensive approach, the partial implementation will not lead to neither extensive implementation of No-till technology nor substantial reduction in consumption of energy resources. Moreover, Alternative 1.3 requires investment in new equipment and is characterized by a lack of qualified personnel to service this equipment. Therefore, Alternative 1.3 may not be considered a plausible baseline.

The analysis of the above alternatives shows that *Alternative 1.1* is the most plausible one.

The investment analysis (see Section B.2) showed that Alternatives 1.2 and 1.3 could not be considered as the most attractive ones from a financial standpoint. The analysis carried out in accordance with the "Tool for the demonstration and assessment of additionality" (Version 6.0.0)[13] in Section B.2. show that the project is additional.

Baseline scenario

The baseline scenario provides for continuation of current practices of traditional mechanical tillage system that involves ploughing process. The issues of application of this technology are provided above. Continuation of this practice is characterized by a continuous reduction of humus (soil organic carbon) content in the soil caused by the following factors:
- soil organic carbon oxidation and its emission into the atmosphere in the form of CO_2 as a result of soil turnover during tillage;
- activity of aerobic organisms, which consume the organic component of the soil in the course of tillage.

[13] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v6.0.0.pdf

Humus loss causes lower soil fertility and has a bad impact on yields. In such conditions, application of additional fertilizers in the soil is required to maintain stable yields. However, the problem of descending soil fertility remains unsolved.

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 1.1.0). [14]

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 for 4 years prior to the start of the project using the least square method for each field individually. This tendency is illustrated for field No.1 (118 ha) in Koziivka village, Figure 4.

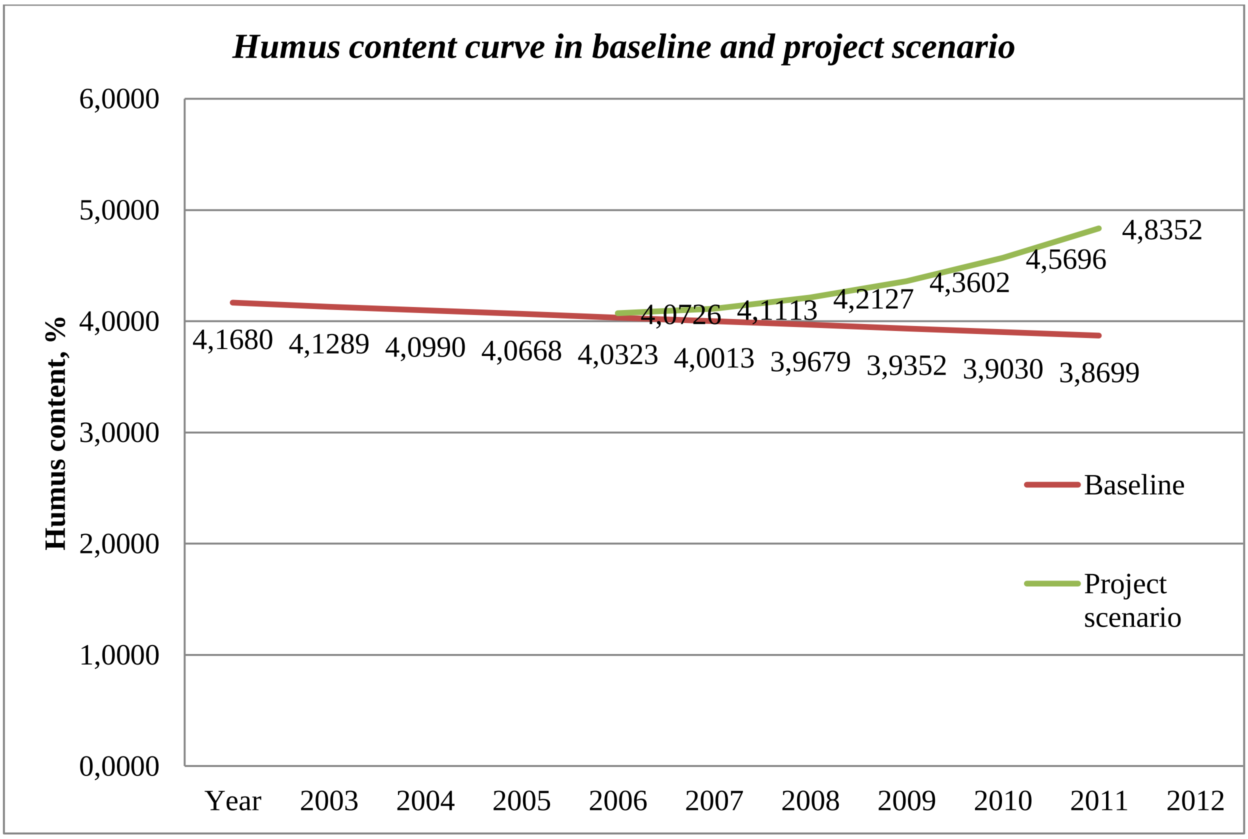

Figure 4. Humus content curve in baseline and project scenario

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.

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

The results of the baseline analysis indicate that humus content in the soil would have slid by 0.1% over the 4 years. The Ukrainian legislation does not regulate the minimum humus content in the soil required for agricultural activity, although it has been proven that low humus content has bad impact on yields. Humus-rich soils bring stable yields of high-quality crops with better resistance to disease excitants and bad environment. There is a direct relation between humus content and soil energy and yields. US researchers Alexander and Middleton stated that "organic content in the soil indicates its condition and physical properties"[15]. Thus, further decline in humus content would lead to soil exhaustion and lower yields of the farm.

Detailed GHG emission calculations are provided in Section D.

Greenhouse gas emissions under the Baseline scenario:

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

$$BE_y = BE_{A,y} , \qquad (B1)$$

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:

$$BE_{A,y} = \sum BE_{A,i,y} , \qquad (B2)$$

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)[16]:

$$BE_{A,i,y} = 0,9 \times S_{p,i} \times (SOC_{p,y,i} - SOC_{b,y,i}) \times \frac{44}{12}, \qquad (B3)$$

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, t CO_2eq/t C;
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;

[15] http://pidruchniki.ws/18870109/geografiya/vpliv_sivozmini_vmist_organichnoyi_rechovini_grunti

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

[y] - index for monitoring period;
[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:

$$SOC_{p,y,i} = h_{b,i} \times \rho_i \times k_{p,i,y} \div 1.724 \times 10000 \div 100\%, \quad \text{(B4)}$$

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*[17])
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:

$$SOC_{b,y,i} = h_{b,i} \times \rho_i \times k_{b,i,y} \div 1{,}724 \times 10000 \div 100\%, \quad \text{(B5)}$$

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*[18])
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):

$$k_{b,i,y} = a \cdot y + b, \quad \text{(B6)}$$

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 4 years prior to the project. The linear dependence has the lowest function error.
where:

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

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

$k_{b,i,y}$ – humus content in the soil of field *i* cultivated using traditional tillage in period *y*, %;
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 14 years of the project life.

Key data used for baseline identification is presented in tables below.

Data / Parameter	$S_{p,i}$
Data unit	ha
Description	Area of field *i* cultivated using No-till technology
Time of determination/monitoring	Annually
Source of data (to be) used	2006-2012 Field Registry of the Farm
Value of data applied (for ex ante calculations/determinations)	See Supporting Document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	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.
QA/QC procedures (to be) applied	The Main Administration of the State Land Committee in Kharkiv region conducts relevant area verification once a year
Any comment	Data will be archived in paper and electronic format.

Data / Parameter	$k_{p,i,y}$
Data unit	%
Description	Humus content in the soil of field *i* cultivated using No-till technology in period *y*
Time of determination/monitoring	Once a year
Source of data (to be) used	Humus content measurement logs
Value of data applied (for ex ante calculations/determinations)	See Supporting Document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The research laboratory 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
QA/QC procedures (to be) applied	The research laboratory
Any comment	Data will be archived in paper and electronic format.

Data / Parameter	$k_{b,i,y}$
Data unit	%
Description	Humus content in the soil of field *i* cultivated using traditional tillage in period *y*

Time of determination/monitoring	Calculated using data defined for every field *i* prior to the start of the project
Source of data (to be) used	Humus content measurement logs
Value of data applied (for ex ante calculations/determinations)	See Supporting Document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	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.
QA/QC procedures (to be) applied	Historical data for the 4 years prior to the start of the project (provided in Supporting Document 1) are obtained from the research laboratory authorized to conduct measurements according to the state standards of Ukraine.
Any comment	Data will be archived in paper and electronic format.

Data / Parameter	ρ_i
Data unit	t/m^3
Description	Soil density at field *i* cultivated using traditional tillage before the start of the project
Time of determination/monitoring	Calculated for every field *i* prior to the start of the project
Source of data (to be) used	Measurement logs
Value of data applied (for ex ante calculations/determinations)	See Supporting Document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The research laboratory determines soil density and fills in measurement logs with the obtained figures.
QA/QC procedures (to be) applied	The research laboratory is authorized to conduct measurements according to the state standards of Ukraine.
Any comment	Data will be archived in paper and electronic format.

Data / Parameter	$h_{b,i}$
Data unit	m
Description	Depth of soil layer disturbance at field *i* when conventional tillage is applied
Time of determination/monitoring	Determined at the beginning of the project activity
Source of data (to be) used	Company data; ploughing depth is a fixed value (for each crops) for traditional land cultivation.
Value of data applied (for ex ante calculations/determinations)	See Supporting Document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This is the usual depth of soil layer disturbance when conventional tillage is applied[19]

[19] http://sg.dt-kt.net/books/book-4/chapter-430/

QA/QC procedures (to be) applied	N/A
Any comment	Data will be archived in paper and electronic format.

B.2. Description of how the anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the JI project:

Additionality of the project

Additionality of the project activity is demonstrated and assessed below using the "Tools for the demonstration and assessment of additionality"[20] (Version 06.0.0). This tool was originally developed for CDM projects but it is also applicable to JI projects.

Step 1. Identification of alternatives to the project activity and their consistency with current laws and regulations

Sub-step 1a. Definition of alternatives to the project activity

There are three alternatives to this project (which have already been discussed in Section B.1 above):

Alternative 1.1: Continuation of the current situation, without the JI project implementation.
Alternative 1.2: Proposed project activity without the use of the JI mechanism.
Alternative 1.3: Partial implementation of the project (only some of project activities implemented) without the use of the JI mechanism.

Outcome of Sub-step 1a. Two realistic alternative scenarios to the project activity were identified.

Sub-step 1b. Consistency of the alternatives with mandatory laws and regulations

Alternative 1.1: Continuation of the current situation, without the JI project implementation.
Continuation of the current situation in the agricultural sector of Kharkiv region is the most realistic and plausible alternative to the Project implementation because it entails minimum expenses for LLC "Koziivske".
According to Article 2 of the Law of Ukraine "On the basic principles of the governmental agrarian policy for the period until 2015"[21] the agrarian policy of the Government is aimed at achievement of the following goals:

- guaranteeing the food security of the state;
- turning the agrarian sector into sector of the state economy that is highly effective and competitive in both domestic and foreign markets;
- preservation of peasants as mediums of Ukrainian national identity, culture and spirit;
- complex development of rural territories and solving social problems in rural communities.

The Ukrainian legislation does not prohibit the activities envisaged by the baseline scenario, so this scenario is the most plausible among the existing ones.
Despite the high ambitions of the Government, agriculture is currently in a bad state. Governmental financial support of the sector remains at the minimum level, so independent production upgrading is not the best option.

[20] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v6.0.0.pdf

[21] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=2982-15

The existing system of tariffs for agricultural products in Ukraine does not envisage any investment component for agricultural industry improvement. Therefore, LLC "Koziivske" is not obliged to and not motivated to spend their own funds to build and improve the agricultural production system, according to Ukrainian legislation. There are neither programmes nor policies to bind LLC "Koziivske" to implement No-till technology and nothing puts legislative limits on the baseline scenario.

Alternative 1.2: Proposed project activity without the use of the JI mechanism.
LLC "Koziivske" did not conduct any agricultural modernization campaigns prior to the project. Moreover, LLC "Koziivske" has neither incentive nor means to implement the measures planned in the framework of the JI project in the absence of its support with mechanisms established by Article 6 of the Kyoto Protocol to the UN Framework Convention on Climate Change (Step 1.2, Step 2 and Step 3 below). LLC "Koziivske" has no other financial interest to bear the cost of this project or similar activities, except for possible investment under the mechanism established by Article 6 of the Kyoto Protocol to the UN Framework Convention on Climate Change.

Alternative 1.3: Partial implementation of the project (only some of project activities implemented) without the use of the JI mechanism.
This alternative provides for exclusion of any non-core activities from the project, such as introduction of tractors, combines, etc. Since the proposed new technology is a complex process that requires a comprehensive approach, the partial implementation will not lead to neither extensive implementation of No-till technology nor substantial reduction in consumption of energy resources. Moreover, Alternative 1.3 requires investment in new equipment and is characterized by a lack of qualified personnel to service this equipment. Therefore, Alternative 1.3 may not be considered a plausible baseline.
Modernization activities in the agrarian industry without the use of JI mechanisms comply with binding laws and regulations. The legal consistency analysis was made for Alternative 1.1, which is similar in regards to consistency with mandatory laws and regulations for Alternatives 1.2 and 1.3.

Outcome of Sub-step 1b. Under such circumstances, it is believed that all the scenarios are consistent with current laws and regulatory acts.

Therefore, Step 1 is satisfied.

According to the "Tool for the demonstration and assessment of additionality"[22] (Version 06.0.0), further justification of additionality shall be performed by means of investment analysis.

Step 2 – Investment analysis.
The main purpose of investment analysis is to determine whether the proposed project:
(a) is the most economically or financially attractive, or
(b) is economically or financially feasible without income from the sale of emission reduction units (ERUs) related to the JI project.

Sub-step 2a - Determination of appropriate analysis method.
There are three methods used for investment analysis: a simple cost analysis (Option I); an investment comparison analysis (Option II); and a benchmark analysis (Option III). If the project activities and alternatives identified in Step 1 generate no financial or economic benefits other than JI related income, then the simple cost analysis (Option I) is applied. Otherwise, the investment comparison analysis (Option II) or the benchmark analysis (Option III) are used.
Additionality guidelines allow for performance of investment comparison analysis, which compares corresponding financial indicators for the most realistic and plausible investment alternatives (Option II),

[22] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v6.0.0.pdf

or the benchmark analysis (Option III). For this project it is appropriate to apply analysis using Option III, according to the instructions of the Additionality guidelines.

Sub-step 2b – Simple cost analysis.

Project implementation requires expenses additional to the existing costs on soil surface management, weed control, implementation of No-till technology itself. Additional implementation costs include purchase of new agricultural machinery. Implementation costs for the project “Reduction of greenhouse gas emissions by application of No-till technology at LLC "Vishva Ananda" farmlands” will be implemented by LLC "Koziivske” exceed EUR 12 000 ths (UAH 78 989 366.1).

Table 9. Project expenses

Equipment	**UAH**
Tractor NEW HOLLAND T8050 - 4 un	123 956.58
CHALLENGER MT865B - 2 un	653 287.11
Seed drill TANZI 6750 (6.5 m), Argentina - 2 un	888 331.2
Reaper for grain legumes 925F, used, USA - 2 un	145 170
Grain Loader ZM-60, Ukraine - 1 un	12 500
Grain Loader ZM-60A, Ukraine - 1 un	15 500
Seed-Fertilizer Drill S3-5,4 , Ukraine - 1 un	59889.6
Seed-Fertilizer Drill S3-5,4 , Ukraine - 1 un	59 889.6
Seed Drill S3-5,4 (2 disks with one-row coulters), Ukraine - 2 un	119 780.4
Tractor Trailer TMK-160 with patches, Ukraine 3 un	210 000
Tractor KhTZ-150K-09, Ukraine - 1 un	277 200
Tractor KhTZ -150K-09, Ukraine - 1 un	277 200
Montana Sprayer, Brazil - 1 un	928 200
Sprayer MVD-900, Ukraine - 2 un	15 579.6
Disk harrow BDVP-4,2 Lada, Ukraine - 1 un	89 280
Disk harrow BDVP A-4,2 Lada, Ukraine - 2 un	211 000
Parallel driving system EZ-Guide 250 344 - 2 un	38 619.996
Fuel expenses	21 686 393.17
Fertilizer expenses	16 989 800.22
Herbicide expences	13 964 128.99
Land lease	23 000 903.32
Total	**78 989 366.1**

Equipment used in this project is the best from the standpoint of performance quality and technical solutions among the equipment and materials present in the Ukrainian market. An important criterion was the availability of spare parts in Ukraine.

As of the beginning of the project, LLC "Koziivske" was using old agricultural machinery of USSR production.

Application of Kyoto mechanisms makes these activities economically feasible, being the only way for the implementation.

Since emission reductions bring no economic profit to LLC "Koziivske" except the profit created within the JI Project, a conclusion is made that the Project implementation would be impossible without the profit from JI project, since investment barriers exist.

Outcome of Sub-step 2b. The implementation of the project "Reduction of greenhouse gas emissions by application of No-till technology at LLC "Koziivske" farmlands" requires major additional expenses and is thus unattractive from the financial standpoint.

Sub-step 2c – Calculation and comparison of financial indicators.
According to the Additionality Guidelines, no calculation and comparison of financial indicators was conducted.

Sub-step 2d: Sensitivity analysis
According to the Additionality Guidelines, no sensitivity analysis was conducted.

Step 3: Barrier analysis
According to the Additionality guidelines, the barrier analysis was not conducted.

Step 4: Common practice analysis

Sub-step 4a. Analysis of other activities similar to the proposed project activity
Analysis similar activities demonstrated the absence of similar projects in Ukraine.
The existing practice of operation of agricultural facilities presented in the baseline option chosen for this Project is the common one for Ukraine. Due to the current practice all the modernization activities aimed at the improvement of the agrarian industry through implementation of No-till technology shall be borne by the enterprise, and the companies engaged in agricultural activities do not have any incentive to implement new equipment and technologies.

Outcome of Sub-step 4a: Since there are no similar projects in Ukraine, there is no need to conduct the analysis of similar project activity.
Sub-step 4b. Discussion of any similar Options that are occurring

N/A

According to the "Tool for the demonstration and assessment of additionality"[23] (Version 06.0.0), all steps are satisfied although there are some obstacles.
One of them is additional expenses for the JI project implementation to modernize operations.
The obstacle is associated with the structure of the existing tariffs for agricultural products, which does not consider investment in improvement of agrarian industry system by creating appropriate conditions for the reduction of GHG emissions. This situation entails a constant fund shortage as well as the impossibility of timely technological updates and investment in infrastructure upgrade and development.
We may conclude that the above-mentioned factors might hamper the implementation of the proposed project as well as other alternatives - Partial implementation of the project (only some of project activities implemented) without the use of the JI mechanism.
However, one of the alternatives is continuation of "business as usual" scenario. Since the barriers identified above are directly related to investment in technology upgrade, LLC "Koziivske" has no

[23] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v6.0.0.pdf

obstacles for further exploitation of land at the previous level. Therefore, the identified obstacles cannot prevent the introduction of at least one alternative scenario - "business as usual."

Conclusion
Based on the above analysis it can be concluded that the project is additional.

B.3. Description of how the definition of the project boundary is applied to the project:

The project boundary encompasses farmlands (fields) where LLC “Koziivske" grows crop products using No-till technology (6713 ha).

Table 13. *Emission sources under the baseline scenario*

Source	Gas	Included / excluded	Substantiation / Explanation
Baseline scenario			
GHG emissions due to mechanical tillage	CO_2	Included	Primary source of emissions
	CH_4	Excluded	CH_4 emissions as a result of the project technology implementation are absent.
	N_2O	Excluded	N_2O emissions when project technology is applied are lower than when traditional tillage is applied. Excluded for simplification. This is a conservative practice.

Table 14. *Emission sources under the project scenario*

Source	Gas	Included / excluded	Substantiation / Explanation
Project activity			
GHG emissions due to No-till technology application	CO_2	Included	Emissions from No-till technology implementation
	CH_4	Excluded	CH_4 emissions as a result of the project technology implementation are absent.

B.4. Further baseline information, including the date of baseline setting and the name(s) of the person(s)/entity(ies) setting the baseline:

Date of baseline setting: 21/07/2012
The baseline is identified by CEP Carbon Emissions Partners S.A., project developer, and LLC “Koziivske"

LLC “Koziivske”
Koziivka village, Krasnokutskyi 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 (stated in Annex 1).

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

EVO CARBON TRADING SERVICES LTD
869 High Road
London, United Kingdom, N12 8QA
Telephone: +447500828771
E-mail: negorova@evocarbontrading.co.uk

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

The starting date of the project was identified using the "Glossary of Joint Implementation Terms" version 03[24] and is considered 08/03/2007, when a contract for equipment purchase was signed.

C.2. Expected operational lifetime of the project:

In accordance with the Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities[25] Version 01.1.0, the accumulation of soil organic carbon in the project scenario will be increasing for 20 years at a constant rate, so the project lifetime is set at 14 years, or 168 months.

C.3. Length of the crediting period:

The duration of the crediting period in years and months during the project lifecycle, which is 14 years, or 166 months: 08/03/2007- 31/12/2012 (5 years and 10 months, or 70 months), upon prolongation of the Kyoto Protocol: 01/01/2013- 31/12/2020 (8 years, or 96 months).
The starting date of the crediting period is the date when the first emission reductions are expected to be generated, namely March 8, 2007.
ERU generation belongs to the first commitment period of 5 years (January 1, 2008 – December 31, 2012).
The end date of the crediting period is the end date of the commitment period according to the Emission Reductions Purchase Agreement under which the project owner shall transfer to the buyer verified greenhouse gases emission reductions resulting from the project, which is 01/01/2013-31/12/2020.
Prolongation of the crediting period beyond 2012 is subject to approval by the Host Party.

[24] http://ji.unfccc.int/Ref/Documents/Glossary_JI_terms.pdf

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

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

The proposed project applies a JI-specific approach based on the JI Guidance on criteria for baseline setting and monitoring, Version 03[26] , which meets with 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.
Humus (organic carbon) content of the soil cultivated using No-till technology are measured annually after the September harvesting by the research laboratory, which is subject to certification in accordance with the state standards of Ukraine. The method is based on the oxidation of organic matter by potassium dichromate with further estimation of its amount used in the process of oxidation. The amount of dichromate used in oxidation is equivalent to the amount of organic carbon in the sample. The output organic carbon content is converted into humus content by multiplying the obtained value by the constant coefficient of 1.724 (according to GOST 23740-79*[27]) in order to fight the crisis in the industry. Thus, the obtained values of humus content in the soil can be converted back into the content of organic carbon knowing the constant coefficient on which humus content should be divided. The mass of samples may vary from 3 to 5 grams. The number of samples depends on the field area. A sample is taken from the grinded soil for further blenderizing preceded with removal of nutrients and plant residues. The sample is sieved through a wicker mesh (0.25 mm). Then the sample is blenderized in pounders and blenders from solid materials. No significant fluctuations of soil characteristics are expected, therefore this measurement periodicity is appropriate.
Soil density in project fields is measured by the research laboratory prior to the project for each field individually since no major fluctuations of the parameter are expected. Research laboratory engineers measure soil density using standard bottle method.
The Center conducts measurement of humus (organic carbon) content in accordance with state standards of Ukraine 4289:2004 "Soil quality. Methods for determining organic matter" by using the Tyurin method.
Field areas are measured by agrotechnicians and verified by accountants of LLC "Koziivske" using GPS equipment installed in Bourgault agricultural machinery.

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:

$k_{b,i,y}$	humus content in the soil of field *i* cultivated using traditional tillage in period *y*, %

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

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

ρ_i	soil density at field *i* cultivated using traditional tillage before the start of the project, t/m3
$h_{b,i}$	depth of soil layer disturbance at field *i* cultivated using traditional tillage, m

Data and parameters that are monitored throughout the crediting period:

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

Data and parameters not subject to monitoring during the crediting period but identified only once and are not available at the PDD development stage: none.

D.1.1. Option 1 – Monitoring of the emissions in the project scenario and the baseline scenario:

D.1.1.1. Data to be collected in order to monitor emissions from the project, and how these data will be archived:

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comments

Project emissions are absent.

D.1.1.2. Description of formulae used to estimate project emissions (for each gas, source etc.; emissions in units of CO_2 equivalent):

Greenhouse gas emission under the Project scenario: none.

$PE_y = 0$, (D.1)

where:
PE_y – project GHG emissions in period y, t CO_2e;
[y] - index for monitoring period.

D.1.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions of greenhouse gases by sources within the project boundary, and how such data will be collected and archived:

Data / Parameter	$S_{p,i}$
Data unit	ha
Description	Area of field *i* cultivated using No-till technology
Time of determination/monitoring	Annually
Source of data (to be) used	2006-2012 Field Registry of the Farm
Value of data applied (for ex ante calculations/determinations)	See Supporting Document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	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.
QA/QC procedures (to be) applied	The Main Administration of the State Land Committee in Kharkiv region conducts relevant area verification once a year
Any comment	Data will be archived in paper and electronic format.

Data / Parameter	$k_{p,i,y}$
Data unit	%
Description	Humus content in the soil of field *i* cultivated using No-till technology in period *y*
Time of determination/monitoring	Once a year
Source of data (to be) used	Humus content measurement logs
Value of data applied (for ex ante calculations/determinations)	See Supporting Document 1

Justification of the choice of data or description of measurement methods and procedures (to be) applied	The research laboratory 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
QA/QC procedures (to be) applied	The research laboratory
Any comment	Data will be archived in paper and electronic format.

Data / Parameter	$k_{b,i,y}$
Data unit	%
Description	Humus content in the soil of field *i* cultivated using traditional tillage in period *y*
Time of determination/monitoring	Calculated using data defined for every field *i* prior to the start of the project
Source of data (to be) used	Humus content measurement logs
Value of data applied (for ex ante calculations/determinations)	See Supporting Document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	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.
QA/QC procedures (to be) applied	Historical data for the 3 years prior to the start of the project (provided in Supporting Document 1) are obtained from the research laboratory authorized to conduct measurements according to the state standards of Ukraine.
Any comment	Data will be archived in paper and electronic format.

Data / Parameter	ρ_i
Data unit	t/m^3

Description	Soil density at field *i* cultivated using traditional tillage before the start of the project
Time of determination/monitoring	Calculated for every field *i* prior to the start of the project
Source of data (to be) used	Measurement logs
Value of data applied (for ex ante calculations/determinations)	See Supporting Document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The research laboratory determines soil density and fills in measurement logs with the obtained figures.
QA/QC procedures (to be) applied	The research laboratory is authorized to conduct measurements according to the state standards of Ukraine.
Any comment	Data will be archived in paper and electronic format.

Data / Parameter	$h_{b,i}$
Data unit	m
Description	Depth of soil layer disturbance at field *i* when conventional tillage is applied
Time of determination/monitoring	Determined at the beginning of the project activity
Source of data (to be) used	Company data; ploughing depth is a fixed value (for each crops) for traditional land cultivation.
Value of data applied (for ex ante calculations/determinations)	See Supporting Document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This is the usual depth of soil layer disturbance when conventional tillage is applied[28]
QA/QC procedures (to be)	N/A

[28] http://sg.dt-kt.net/books/book-4/chapter-430/

applied	
Any comment	Data will be archived in paper and electronic format.

D.1.1.4. Description of formulae used to estimate baseline emissions (for each gas, source etc.; emissions in units of CO_2 equivalent):

Greenhouse gas emissions under the Baseline scenario:

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

$$BE_y = BE_{A,y} \quad , \qquad \text{(D.2)}$$

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:

$$BE_{A,y} = \sum BE_{A,i,y} \quad , \qquad \text{(D.3)}$$

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)[29]:

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

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

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, t CO_2eq/t C;
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;
[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:

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

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*[30])
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.

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

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

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

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*[31])
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):

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

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 4 years prior to the project. The linear dependence has the lowest function error.
where:
$k_{b,i,y}$ – humus content in the soil of field *i* cultivated using traditional tillage in period *y*, %;
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.

D. 1.2. Option 2 – Direct monitoring of emission reductions from the project (values should be consistent with those in section E.):

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

D.1.2.1. Data to be collected in order to monitor emission reductions from the project, and how these data will be archived:								
ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

Option 1 was chosen for monitoring.

D.1.2.2. Description of formulae used to calculate emission reductions from the project (for each gas, source etc.; emissions/emission reductions in units of CO_2 equivalent):

Option 1 was chosen for monitoring.

D.1.3. Treatment of leakage in the monitoring plan:

No leakage is expected.

D.1.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project:								
ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

No leakage is expected.

D.1.3.2. Description of formulae used to estimate leakage (for each gas, source etc.; emissions in units of CO_2 equivalent):

No leakage is expected.

D.1.4. Description of formulae used to estimate emission reductions for the project (for each gas, source etc.; emissions/emission reductions in units of CO_2 equivalent):

Emission reductions in the project scenario are calculated under the formula that follows:

$$ER_y = BE_y - PE_y \, , \qquad \text{(D.8)}$$

where:
ER_y – emission reduction due to project activity in period y, t CO_2e
BE_y – baseline GHG emissions in period y, t CO_2eq;
PE_y – project GHG emissions in period y, t CO_2eq;
[y] - index for monitoring period.

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.1.5. Where applicable, in accordance with procedures as required by the host Party, information on the collection and archiving of information on the environmental impacts of the project:

According to Law of Ukraine "On environmental protection"[32] and the State Building Norms A.2.2-1-2003, "Structure and content of environmental impact assessment (EIA) in the process of design and construction of plants, buildings and structures"[33] SE "Koziivske" is not obliged to carry out collection of data on the environmental impact for this type of project.

D.2. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:		
Data *(Indicate table and ID number)*	Uncertainty level of data (high/medium/low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.

[32] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1264-12

[33] http://www.budinfo.com.ua/dbn/8.htm

$S_{p,i}$	low	Measurements of parameter are conducted in accordance with the standards of Ukraine
$k_{p,i,y}$	low	The research laboratory

For the sake of conservativeness of parameters, metering equipment is subject to regular calibration and the latest versions of regulations and specifications are used. If the latest versions are unavailable, the previous versions are used.
Verification (calibration) of measurement devices is carried out in accordance with manufacturer's manuals, approved methodologies on metering devices verification/calibration, as well as with the state standards of Ukraine.

D.3. Please describe the operational and management structure that the project operator will apply in implementing the monitoring plan:

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), the research laboratory (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 archiving). 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.
Management structure includes the Director of LLC "Koziivske" and developers of the project (CEP Carbon Emissions Partners S.A.).
Detailed operational structure and data collection scheme for the project activity are provided in Figure 5.

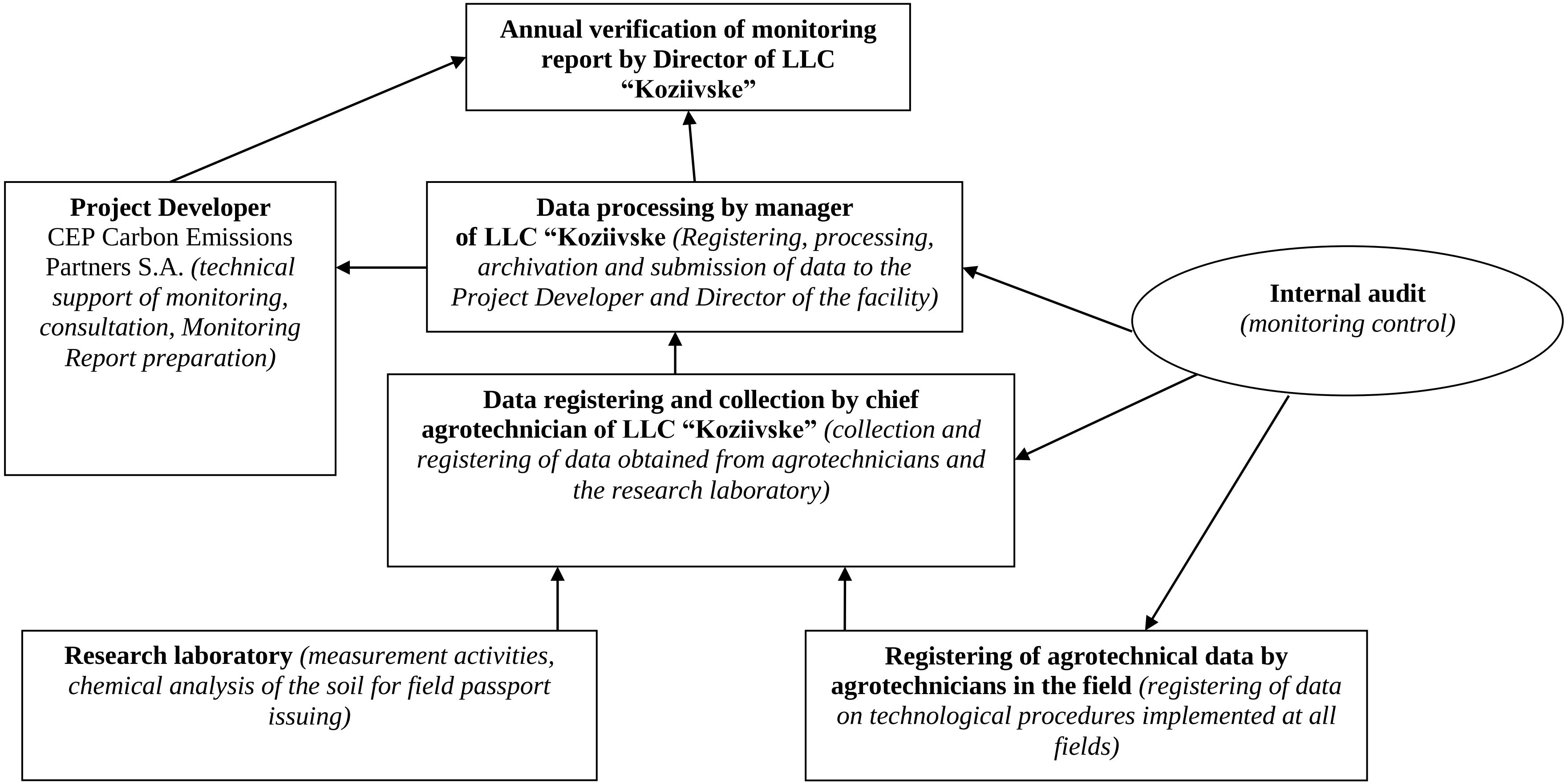

Figure 5. Operational structure and data collection scheme for the project monitoring

D.4. Name of person(s)/entity(ies) establishing the monitoring plan:

The monitoring plan is established by LLC "Koziivske" and CEP Carbon Emissions Partners S.A.

LLC "Koziivske"
Koziivka village, Krasnokutskyi 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 (stated in Annex 1).

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

EVO CARBON TRADING SERVICES LTD
869 High Road
London, United Kingdom, N12 8QA
Telephone: +447500828771
E-mail: negorova@evocarbontrading.co.uk

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

Project emissions are absent.

E.2. Estimated leakage:

No leakage is expected.

E.3. The sum of E.1. and E.2.:

Since no leakage is expected, the sum of E.1 and E.2 equals E.1.

E.4. Estimated baseline emissions:

Baseline emissions were estimated in accordance with the formulae given in Section D.1.1.4.
Results of the calculations are provided in the tables below. Calculations are provided in Supporting Document 1 enclosed to the PDD.

Table 15. *Estimated baseline emissions for the period of March 8, 2007 – December 31, 2007*

	Years
Length of the crediting period	1
Year	Estimate of annual baseline emissions in tonnes of CO_2 equivalent
2007	314 809
Total estimated baseline emissions over the crediting period (tonnes of CO_2 equivalent)	**314 809**
Annual average of estimated baseline emissions over the crediting period (tonnes of CO_2 equivalent)	**314 809**

Table 16. *Estimated baseline emissions for the period of January 1, 2008 – December 31, 2012*

	Years
Length of the crediting period	5
Year	Estimate of annual baseline emissions in tonnes of CO_2 equivalent
2008	504 514
2009	814 290
2010	1 158 911

2011	1 572 051
2012	1 974 570
Total estimated baseline emissions over the crediting period (tonnes of CO_2 equivalent)	**6 024 336**
Annual average of estimated baseline emissions over the crediting period (tonnes of CO_2 equivalent)	**1 204 867**

Table 17. *Estimated baseline emissions for the period of January 1, 2013 – December 31, 2020*

	Years
Length of the crediting period	8
Year	Estimate of annual baseline emissions in tonnes of CO_2 equivalent
2013	1 974 570
2014	1 974 570
2015	1 974 570
2016	1 974 570
2017	1 974 570
2018	1 974 570
2019	1 974 570
2020	1 974 570
Total estimated baseline emissions over the crediting period (tonnes of CO_2 equivalent)	**15 796 560**
Annual average of estimated baseline emissions over the crediting period (tonnes of CO_2 equivalent)	**1 974 570**

E.5. Difference between E.4. and E.3. representing the emission reductions of the project:

Emission reductions are calculated according to formula (8) given in Section D.1.4.
Results of the calculations are provided in tables below. Calculations are provided in Supporting Document 1 enclosed to the PDD.

Table 18. *Estimated emission reductions for the period of March 8, 2007 – December 31, 2007*

	Years

Length of the crediting period	1
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2007	314 809
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	**314 809**
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	**314 809**

Table 19. *Estimated emission reductions for the period of January 1, 2008 – December 31, 2012*

	Years
Length of the crediting period	5
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2008	504 514
2009	814 290
2010	1 158 911
2011	1 572 051
2012	1 974 570
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	**6 024 336**
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	**1 204 867**

Table 20. *Estimated emission reductions for the period of January 1, 2013 – December 31, 2020*

	Years
Length of the crediting period	8
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2013	1 974 570
2014	1 974 570
2015	1 974 570

2016	1 974 570
2017	1 974 570
2018	1 974 570
2019	1 974 570
2020	1 974 570
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	**15 796 560**
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	**1 974 570**

E.6. Table providing values obtained when applying formulae above:

Table 21. *Table containing results of estimation of emission reductions for the period of March 8, 2007 – December 31, 2007*

Year	Estimated project emissions (tonnes of CO_2 equivalent)	Estimated leakage (tonnes of CO_2 equivalent)	Estimated baseline emissions (tonnes of CO_2 equivalent)	Estimated emission reductions (tonnes of CO_2 equivalent)
2007	0	0	314 809	314 809
Total (tonnes of CO_2 equivalent)	0	0	**314 809**	**314 809**

Table 22. *Table containing results of estimation of emission reductions for the period of January 1, 2008 – December 31, 2012*

Year	Estimated project emissions (tonnes of CO_2 equivalent)	Estimated leakage (tonnes of CO_2 equivalent)	Estimated baseline emissions (tonnes of CO_2 equivalent)	Estimated emission reductions (tonnes of CO_2 equivalent)
2008	0	0	504 514	504 514
2009	0	0	814 290	814 290
2010	0	0	1 158 911	1 158 911
2011	0	0	1 572 051	1 572 051
2012	0	0	1 974 570	1 974 570
Total (tonnes of CO_2 equivalent)	0	0	**6 024 336**	**6 024 336**

Table 23. *Table containing results of estimation of emission reductions for the period of January 1, 2013 – December 31, 2020*

Year	Estimated project emissions (tonnes of CO_2 equivalent)	Estimated leakage (tonnes of CO_2 equivalent)	Estimated baseline emissions (tonnes of CO_2 equivalent)	Estimated emission reductions (tonnes of CO_2 equivalent)
2013	0	0	1 974 570	1 974 570
2014	0	0	1 974 570	1 974 570
2015	0	0	1 974 570	1 974 570
2016	0	0	1 974 570	1 974 570
2017	0	0	1 974 570	1 974 570
2018	0	0	1 974 570	1 974 570
2019	0	0	1 974 570	1 974 570
2020	0	0	1 974 570	1 974 570
Total (tonnes of CO_2 equivalent)	0	0	**15 796 560**	**15 796 560**

SECTION F. Environmental impacts

F.1. Documentation on the analysis of the environmental impacts of the project, including transboundary impacts, in accordance with procedures as determined by the host Party:

According to Law of Ukraine "On environmental protection"[34] and the State Building Norms A.2.2-1-2003, "Structure and content of environmental impact assessment (EIA) in the process of design and construction of plants, buildings and structures"[35] LLC “Koziivske” is not obliged to carry out EIA 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.
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.

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

As mentioned above, the environmental impact assessment has proved that the project has a positive impact on the environment.

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. In addition, the implementation of No-till technology will reduce carbon dioxide emissions from humus decomposition (oxidation).

Impact on land use
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.

SECTION G. Stakeholders’ comments

G.1. Information on stakeholders’ comments on the project, as appropriate:

LLC “Koziivske" informed the community through mass media. All comments relating to the project implementation were positive.
No negative comments were received.

[34] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1264-12

[35] http://www.budinfo.com.ua/dbn/8.htm

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

Owner of the project

Organisation:	LLC "Koziivske"
Street/P.O.Box:	Lenin St.
Building:	40
City:	Koziivka village
State/Region:	Kharkiv region
Postal code:	62011
Country:	Ukraine
Phone:	+38(05756) 94-1-46,+38(05756) 94-1-46
Fax:	+38(05756) 94-1-46
E-mail:	olegkoziivka666@rambler.ru
URL:	
Represented by:	
Title:	Director
Salutation:	
Last name:	Naidenko
Middle name:	-
First name:	Oleksandr
Department:	
Phone (direct):	
Fax (direct):	+38(05756) 94-1-46
Mobile:	
Personal e-mail:	

Project developer and ERU purchaser

Organisation:	EVO CARBON TRADING SERVICES LTD
Street/P.O.Box:	High Road
Building:	869
City:	London
State/Region:	
Postal code:	N12 8QA
Country:	UK
Phone:	+ 44 7500828771
Fax:	+ 44 7500828771
E-mail:	negorova@evocarbontrading.co.uk
URL:	www.evocarbontrading.co.uk
Represented by:	
Title:	Director
Salutation:	
Last name:	Egorova
Middle name:	Lvivna
First name:	Natalia
Department:	
Phone (direct):	
Fax (direct):	
Mobile:	
Personal e-mail:	

Technical consultant

Organisation:	CEP Carbon Emissions Partners S.A.
Street/P.O.Box:	Route de Thonon
Building:	52
City:	Geneva
State/Region:	
Postal code:	Casepostale 170 CH-1222 Vésenaz
Country:	Switzerland
Phone:	+41 (76) 3461157
Fax:	+41 (76) 3461157
E-mail:	0709bp@gmail.com
URL:	
Represented by:	
Title:	Director
Salutation:	Mr
Last name:	Knodel
Middle name:	
First name:	Fabian
Department:	
Phone (direct):	+41 (76) 3461157
Fax (direct):	
Mobile:	
Personal e-mail:	

Technical consultant

Organisation:	LHCarbon OÜ
Street/P.O.Box:	Sügise
Building:	4-2
City:	Tallinn
State/Region:	
Postal code:	10149
Country:	Estonia
Phone:	+372 51 41 800
Fax:	+372 51 41 800
E-mail:	hannu@online.ee
URL:	
Represented by:	
Title:	Director
Salutation:	Mr
Last name:	Lamp
Middle name:	
First name:	Hannu
Department:	
Phone (direct):	+372 51 41 800
Fax (direct):	+372 51 41 800
Mobile:	
Personal e-mail:	hannu@online.ee

Annex 2

BASELINE INFORMATION

Key data used for baseline identification is presented in tables below.

Data / Parameter	$S_{p,i}$
Data unit	ha
Description	Area of field *i* cultivated using No-till technology
Source of data (to be) used	2006-2012 Field Registry of the Farm
Justification of the choice of data or description of measurement methods and procedures (to be) applied	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.

Data / Parameter	$k_{p,i,y}$
Data unit	%
Description	Humus content in the soil of field *i* cultivated using No-till technology in period *y*
Source of data (to be) used	Humus content measurement logs
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The research laboratory 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

Data / Parameter	$k_{b,i,y}$
Data unit	%
Description	Humus content in the soil of field *i* cultivated using traditional tillage in period *y*
Source of data (to be) used	Humus content measurement logs
Justification of the choice of data or description of measurement methods and procedures (to be) applied	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.

Data / Parameter	ρ_i
Data unit	t/m^3
Description	Soil density at field *i* cultivated using traditional tillage before the start of the project
Source of data (to be) used	Measurement logs
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The research laboratory determines soil density and fills in measurement logs with the obtained figures.

Data / Parameter	$h_{b,i}$

Data unit	m
Description	Depth of soil layer disturbance at field *i* when conventional tillage is applied
Source of data (to be) used	Company data; ploughing depth is a fixed value (for each crops) for traditional land cultivation.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This is the usual depth of soil layer disturbance when conventional tillage is applied[36]

Baseline emission calculation methodology is given in Section D.1.1.4, and estimation of baseline emissions is given in Tables E.4 - E.6 of Section E.4.
Calculations are provided in Supporting Document 1 enclosed to the PDD.

[36] http://sg.dt-kt.net/books/book-4/chapter-430/

Annex 3

MONITORING PLAN

The proposed project applies a JI-specific approach based on the JI Guidance on criteria for baseline setting and monitoring, Version 03[37] , which meets with 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.
Humus (organic carbon) content of the soil cultivated using No-till technology are measured annually after the harvesting by the research laboratory, which is subject to certification in accordance with the state standards of Ukraine. The method is based on the oxidation of organic matter by potassium dichromate with further estimation of its amount used in the process of oxidation. The amount of dichromate used in oxidation is equivalent to the amount of organic carbon in the sample. The output organic carbon content is converted into humus content by multiplying the obtained value by the constant coefficient of 1.724 (according to GOST 23740-79*[38]) in order to fight the crisis in the industry. Thus, the obtained values of humus content in the soil can be converted back into the content of organic carbon knowing the constant coefficient on which humus content should be divided. The mass of samples may vary from 3 to 5 grams. The number of samples depends on the field area. A sample is taken from the grinded soil for further blenderizing preceded with removal of nutrients and plant residues. The sample is sieved through a wicker mesh (0.25 mm). Then the sample is blenderized in pounders and blenders from solid materials. No significant fluctuations of soil characteristics are expected, therefore this measurement periodicity is appropriate.
Soil density in project fields is measured by the research laboratory prior to the project for each field individually since no major fluctuations of the parameter are expected. Research laboratory engineers measure soil density using standard bottle method.
The Center conducts measurement of humus (organic carbon) content in accordance with state standards of Ukraine 4289:2004 "Soil quality. Methods for determining organic matter" by using the Tyurin method.
Field areas are measured by agrotechnicians and verified by accountants of LLC "Koziivske" using GPS equipment installed in *Bourgault* agricultural machinery.

Monitoring data and parameters:

Data / Parameter	$S_{p,i}$
Data unit	ha
Description	Area of field *i* cultivated using No-till technology
Time of determination/monitoring	Annually
Source of data (to be) used	2006-2012 Field Registry of the Farm
Value of data applied (for ex-ante calculations/determinations)	See Supporting Document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	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.
QA/QC procedures (to be)	The Main Administration of the State Land Committee in Kharkiv

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

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

applied	region conducts relevant area verification once a year
Comments	Data will be archived in paper and electronic format.

Data / Parameter	$k_{p,i,y}$
Data unit	%
Description	Humus content in the soil of field *i* cultivated using No-till technology in period *y*
Time of determination/monitoring	Once a year
Source of data (to be) used	Humus content measurement logs
Value of data applied (for ex-ante calculations/determinations)	See Supporting Document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The research laboratory 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
QA/QC procedures (to be) applied	The research laboratory
Comments	Data will be archived in paper and electronic format.

Annex 4

OVERVIEW AND SPECIFICATIONS OF AGRICULTURAL MACHINERY TO BE USED WITHIN THE PROJECT ACTIVITY

Harvesting machines

The project provides for the use of tractors; a brief overview and specifications are available below and at the seller's web-site[39,40].

Figure 1. New Holland T8050 Tractor

Table 1. Specifications of New Holland T8050 Tractor

Engine	New Holland
Engine displacement	8300 cm^3
Max power	263/358 kW/h.p.
Number of gears	18 x 4
Weight with standard tools	9 259 kg
Max weight	14 000 kg

No-till harvesting machines allow shredding plant residues and creating a uniform field cover.

Sowing machines

The project provides for the use of Bourgault sowing complexes. The brief overview and specifications are available below and at the seller's web-site[41].

Table 2. Specifications of Bourgault 5725 Air Coulter Drill

[39] http://www.newholland.com/Pages/index.html

[40] http://www.sunflowermfg.com/

[41] http://www.bourgault.com/

Model	5725-42		5725-52	
No. of Sections	3		5	
No. of Rows	4		4	
Transport Height	17' 6"	5.3 m	17' 5"	5.3 m
Transport Height	22' 3"	6.8 m	23'	7 m

Other Specifications	
Frame Depth	197 cm
Caster to packer depth	404 cm working at 25 mm of seeding depth.
Hydraulic system	Master/slave series cylinders, single point quick shift depth control.
Spacing	250 mm and 320 mm
Tools	Disk openers, diameter 509 mm
Packer wheels	57 mm Steel, 89 mm Steel, 114 mm Steel, 140 mm Pneumatic, 76 mm Rubber, 102 mm Rubber
Packer Wheel Mud Scrapers	Optional for steel wheels
Stone Kickers	Standard for steel and semipneumatic wheels
Field clearance	FHBs 10", MRB 8"
Transportation clearance	FHBs 2", MRB 22-1/2"
Air kits	Single shoot, double shoot

Figure 2. Bourgault 5725 Air Coulter Drill 180 series

Machines for field protection

It is necessary that the spray material protecting crops against diseases, blasts and weeds covers the leaves uniformly and that works on temperature measurement, wind speed and others are well timed.

The project provides for the use of self-propelled sprayers Challenger SPRA COUPE 4460/4660[42]. Challenger SPRA COUPE 4460/4660 () is designed for application of protective spray materials at large areas of grain and technical crops as well as sugarbeet.

Figure 3. Challenger SPRA COUPE 4460/4660

Auxiliary equipment (power and transport units)

The brief overview and specifications are available below and at the seller's web-site[43].

Figure 4. Challenger MT865B.

Table 3. Challenger MT865B Tractor Specifications

Specifications	
Engine	CAT® C18 ACERT™
Max power @ 2 000 rpm	583 h.p.
Max torque @ 1 400 rpm	2 525 Nm
Engine displacement	18.1 l

[42] http://www.applylikeapro.com/brands/SpraCoupe/

[43] http://www.challenger-ag.com/EMEA/RU/default.aspx

Fuel capacity	1250 l
Transmission / type	CAT® Powershift
Number of gears (front / rear)	16 | 4
Lift capacity @ thrust end	14 000 kg