JOINT IMPLEMENTATION PROJECT

«Reduction of CO2 emissions by systematic utilization of No-till technology at Ltd «Obriy-MTS-Rozdylna» farmlands»

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

Director of Evo Carbon Trading Services Ltd		**N.L. Egorova**
(position)	(signature) PS	(name and patronymic, last name)

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

Director Ltd «Obriy-MTS-Rozdylna»		**D.O. Dobrovolskyi**
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PS

Rozdilna, 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 CO_2 emissions by systematic utilization of No-till technology at Ltd "Obriy-MTS-Rozdylna" farmlands

Sectoral scope:
Sector 15 - Agriculture.

Project Design Document Version: 02**.**

Date: 20/08/2012.

A.2. Description of the project:

The purpose of the Joint Implementation (JI) Project is to reduce anthropogenic greenhouse gas (GHG) emissions due to changing the agricultural land management system, namely replacement of traditional soil tillage in agriculture with No-till (direct sowing) technology. Humus oxidation that occurs during ploughing causes greenhouse gases emissions into the atmosphere. Emissions are reduced due to lower (almost zero) topsoil disturbance by tillage and, as a result, higher carbon sequestration (storage) in the soil by plants that take carbon from the atmosphere and transfer it into the soil (with further fixation in the soil) in the course of their biological activity. The project also envisages a decrease of diesel fuel consumption due to shorter land cultivation cycle and refusal from ploughing. In addition, water consumption for field irrigation will drop.

Situation existing prior to the commencement of the Project
Ltd "Obriy-MTS-Rozdylna" established in 2005, is engaged in agricultural activity in the southern part of Ukraine. Among company's advantages are favourable location, farmlands proximity to grain elevators owned by Ltd "Obriy-MTS-Rozdylna" as well as to the Odesa Sea Port.

The company's primary activity is growing, processing, storage and sale of agricultural products.

Circumstances in which the project is implemented
Prior to the project, Ltd "Obriy-MTS-Rozdylna" 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 2008, 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 passage 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 the Farm. The wasted humus is oxidized and emitted into the air in the form of carbon dioxide. Furthermore, the waste of humus causes soil 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 No-till technology (see Table 1).

Table 1. Project land area cultivated using No-till technology

Year	Land area processed using No-till technology, ha
Actual results of the Farm by years	
2008	5 276.00
2009	5 724.00
2010	6 381.61
2011	7 128.55
2012	7 128.55

In 2006, the Farm started purchases of necessary agricultural equipment for No-till 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, etc.

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 crops production costs due to lower diesel fuel consumption;
b) lower consumption of chemical fertilizers;
c) lower impact of weather conditions on yields;
d) lower wind and water soil erosion, better soil fertility;
e) reduced greenhouse gases emissions into the atmosphere due to lower diesel fuel combustion by agricultural machinery in the course of crop production using No-till technology.
f) yields with preserved soil fertility, reduced consumption of energy, labor and materials.

Table 2. Historical details of project development

Type of actions	Documentary evidence	Date
Signing of an equipment purchase contract (the starting date of the project)	Contract between Ltd “Obriy-MTS-Rozdylna” and “Khlibna Havan” LLC for the purchase of agricultural equipment dated 28/09/2006.	28/09/2006

Preparation and submission of the project idea note to support anthropogenic GHG emissions reductions, to the State Environmental Investment Agency of Ukraine	Supporting materials for the potential JI project "Reduction of CO_2 emissions by systematic utilization of No-till technology at Ltd "Obriy-MTS-Rozdylna" farmlands"	28/05/2012
Obtaining of a Letter of Endorsement from the State Environmental Investment Agency of Ukraine	Letter of Endorsement No. 1969/23/7 for the Joint Implementation project "Reduction of CO_2 emissions by systematic utilization of No-till technology at Ltd "Obriy-MTS-Rozdylna" farmlands" dated 25/07/2012	25/07/2012

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)	• Ltd "Obriy-MTS-Rozdylna"	No
Estonia	• LHCarbon OÜ	No
*Please indicate if the Party involved is a host Party.		

The Developer's company will be the official project owner and managing entity and the responsible body for all administrative affairs of the involved parties in Host and Investor Countries.

A.4. Technical description of the project:

A.4.1. Location of the project:

The project is located in Odesa region, Ukraine.
Geographic localization of the project is shown in Figure 1.

Figure 1. Location of Ltd “Obriy-MTS-Rozdylna” facilities on the map of Ukraine.

Figure 2. Location of Ltd “Obriy-MTS-Rozdylna” farmlands on the map of Donetsk region.

A.4.1.1. Host Party(ies):

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

[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

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

Odesa region.

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

Ltd "Obriy-MTS-Rozdylna" facilities are located in Rozdlnianskyi district of Odesa region, Ukraine.

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

Geographic coordinates of Rozdilna city:
46°50′55″ N
30°04′45″ E
Time zone: UTC+2
Rozdilna is a city located in the western part of the Black Sea lowland, the administrative capital of Rozdilnianskyi district, Odesa region.

The JI project will be implemented at the farmlands of Ltd "Obriy-MTS-Rozdylna":

Table 3. Farmlands of Ltd "Obriy-MTS-Rozdylna" where the JI project is realized

Faclity in Rozdilnanskyi district	Area, ha
Yakovlivska local council	693.72
Starostynska local council	2 582.08
Kosharska local council	1 162.89
Poniativska local council	2 494.38
Kamianska local council	195.48

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 fulfillment 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 resourses for Ltd "Obriy-MTS-Rozdylna" were carried out on the basis of import John Deere sowing complexes.

The project provides for the use of technology that corresponds to current global practice. In articular, such countries as the USA, Brazil, Argentina, and Canada started to implement direct sowing technology back in in the 80-ies of the 20 century.. Some of these countries apply direct sowing 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 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 John Deere[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

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

Implementation and use of No-till technology, which will cause GHG emission reductions, include:

1. Planning crop rotation and rotation cultures

The project provides for rotation of high-residue crops (beans, 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.

[331] http://en.wikipedia.org/wiki/No-till_farming

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

Figure 3. Soil covered with crop residues

As No-till 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
Winter wheat	Sunflower	Sunflower	Corn
Black fallow	Summer barley	Winter wheat	Winter barley
Winter wheat	Black fallow	Winter barley	Sunflower
Sunflower	Sunflower	Black fallow	Sorghum
Sorghum	Winter wheat	Winter rapeseed	Black fallow

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 No-till 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 No-till 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. Surface soil 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[6] cm due to the pressure of heavy equipment moving across the field. In some cases, the soil develops paedogenetic (natural) compaction. The first stages of No-till 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 No-till system arise from permanent soil cover and only a few of them are caused by refusal from ploughing. No-till 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 No-till 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.

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.

The use of John Deere machinery will ensure optimization of agricultural equipment operation in the field, reduce the number of technological procedures, which entails lower diesel fuel consumption and lower GHG emissions into the atmosphere.

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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

Table 6 shows JI project schedule at the Farm

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

Facility of Ltd "Obriy-MTS-Rozdylna"	Year of No-till technology implementation
Yakovlivka village	2008 – 2012
Starostyne village	2008 – 2012
Koshary village	2008 – 2012
Poniatovka village	2008 – 2012
Kamianka village	2008 – 2012
Koshary village	2008 – 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 by 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.

It is unlikely that the project would be implemented without the JI mechanism which provides a significant additional incentive. This is due to the following factors:

- 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.
- There are no restrictions for Ukrainian enterprises regarding GHG emissions and they are unlikely to be imposed till 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. Without the income from the sale of emission reduction units (ERUs), the project is not attractive enough for investment.

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

Table 7. Estimated amount of emission reductions over the first commitment period

	Years
Duration of the crediting period	5
Year	Estimated annual emission reductions in tonnes of CO_2 equivalent
2008	17 702
2009	37 050
2010	58 484
2011	82 783
2012	105 329
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	**301 348**

Annual average of estimated emission reduction over the crediting period (tonnes of CO_2 equivalent)	**60 270**

Table 8. Estimated amount of emission reductions for the period following the first commitment period

	Years
Length of the crediting period	15
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2013	105 329
2014	105 329
2015	105 329
2016	105 329
2017	105 329
2018	105 329
2019	105 329
2020	105 329
2021	105 329
2022	105 329
2023	105 329
2024	105 329
2025	105 329
2026	105 329
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	105 329
Annual average of estimated emission reduction over the crediting period (tonnes of CO_2 equivalent)	**1 579 935**

A.5. Project approval by the Parties involved:

Letter of Endorsement No. 1969/23/7 dated 25/07/2012 for the JI project “Reduction of CO_2 emissions by systematic utilization of No-till technology at Ltd “Obriy-MTS-Rozdylna” farmlands” 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 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, Chepter 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 Far (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), 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[10]. 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:

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

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

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

The proposed project applies a JI-specific approach based on the JI Guidance on criteria for baseline setting and monitoring, Version 03[11], 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 tillage alternatives, which potentially could occur at the beginning of 2005.

These alternatives are the following:
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 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.
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 20-30 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 Ltd "Obriy-MTS-Rozdylna" 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 20-30 cm.
This *Alternative* is the most plausible baseline scenario, as it:

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

- allows growing crops in required volumes
- does not require any investment in new equipment.

Accordingly, *Alternative 1.1* can be considered the most plausible baseline.

Alternative 1.2

Project activities without the use of the Joint Implementation 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. Fossil fuel (diesel fuel) consumption by agricultural machinery decreases.

This *Alternative* is the least plausible baseline scenario because:

- it requires large investment in new equipment with long payback period;
- 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.

Therefore, the plausibility of *Alternative 1.2* is very low.

Alternative 1.3

Partial project activities (not all project activities are implemented) without the use of the Joint Implementation 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 as a plausible baseline**.**

The analysis of the alternatives given above 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 point of view.

The results of the analysis carried out in accordance with the "Tool for demonstration and assessment of additionality" (Version 06.0.0)[12], section B2, show that the project is additional.

Baseline description

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.

[12] 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 01.1.0).[13]

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 3 years prior to the start of the project using the least square method for each field individually. This tendency is illustrated for the field #1 C (87.48 - ha) p. Starostine, Rozdilnjansky District, Figure 4.

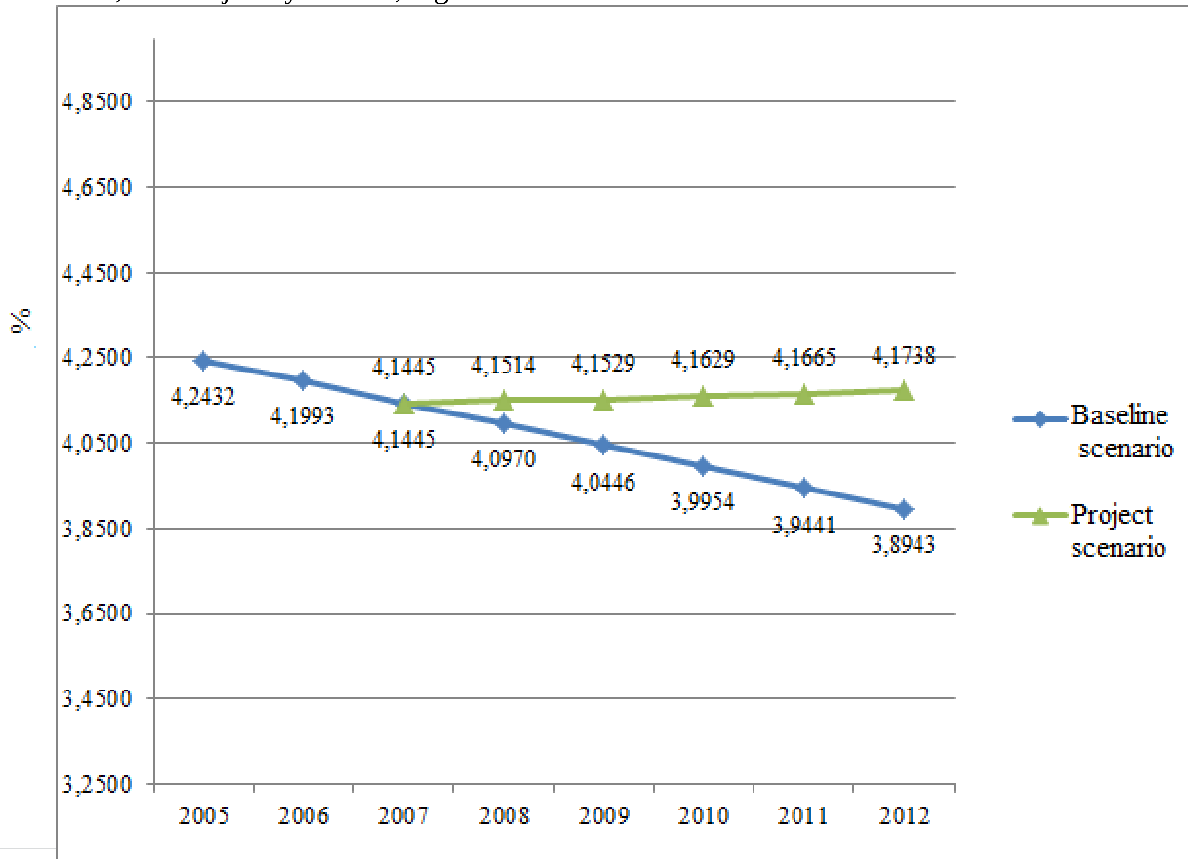

Figure 4. Trend of changes of humus content in the soil field # 1 C (87.48-ha) p. Starostine, Rozdilnjansky area for baseline and project project.

Data on humus content in 2005-2007 for fields cultivated by baseline tillage technology, with similar crop rotation patterns were taken as historical data to establish the baseline.

The results of the baseline analysis indicate that humus content in the soil would have slid by 0.1% over the 3 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-

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

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"[14]. Thus, further decline in humus content would lead to soil exhaustion and lower yields of the farm.

Detailed calculation is provided in Section D.

GHG emissions in the Baseline scenario:

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

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] – monitoring period;
[A] – 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] – monitoring period;
[A] – baseline land cultivation technology;
[i] – 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)[15]:

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

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;
0.9 – conservative factor that makes up for possible emissions in the project scenario in the course of anti'fire furrow creation and minimum topsoil disturbance when No-till technology is implemented;
[y] – monitoring period;
[b] – baseline technology;
[p] – project technology;
[A] – baseline tillage technology;
[i] – number of fields.

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

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

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

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

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*)
10000 – m^2 to ha conversion coefficient;
[y] – monitoring period;
[b] – baseline emissions;
[p] – project emissions;
[i] – system of number of fields.

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

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

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 of 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*[16])
10000 – m^2 to ha conversion coefficient;
[b] – baseline emissions;
[y] – monitoring period;
[i] – system of number of fields.

The content of humus in the soil in the baseline scenario is calculated using historical data over a 3-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):

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

Coefficients a, b (see Supporting Document 1) are determined using trend line generation methods in Microsoft Excel application based on historical data of 3 years prior to the project. The linear dependance ensures the lowest function error. Taking account of the fact that Ltd “Obriy-MTS-Rozdylna” was established in 2005, the period of 2005-2007 was taken as the historical period for baseline setting. Given the linearity of the function (refer to the determined project "Reduction of CO2 emissions by systematic utilization of No-till technologies in agricultural industry" (LLC "Beta Agro Invest")), it is noteworthy that 3 years is enough to identify the baseline.
Where:
$k_{b,i,y}$ – humus content in the soil of field *i* in period *y* cultivated using traditional tillage, %;
a – coefficient of linear dependence, %;
b - coefficient of linear dependence, %;
y – monitoring period;

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

[b] – baseline emissions;
[i] – number of fields;
[y] – monitoring period.

Baseline analysis showed that humus content in the soil will drop by 0.5% over the 20 years of the project life.

Key information and input data for baseline setting are provided in the 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	2008-2012 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 Odesa region conducts relevant area verification once a year
Any comment	The information will be archived in paper and electronic form

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 Biotekhnika Engineering Institute 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 Biotekhnika Engineering Institute
Any comment	The information will be archived in paper and electronic form

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	Defined for every field *i* prior to the start of the project
Source of data (to be) used	Calculated using data defined for every field *i* prior to the start of the project
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	Humus content in the soil for the baseline scenario is calculated taking into account its linear decrease over the time where traditional tillage is applied. This linear dependence is based on 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 Biotekhnika Engineering Institute authorized to conduct measurements according to the state standards of Ukraine.
Any comment	The information will be archived in paper and electronic form

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	Defined 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 Biotekhnika Engineering Institute determines soil density and fills in measurement logs with the obtained figures.
QA/QC procedures (to be) applied	The Biotekhnika Engineering Institute is authorized to conduct measurements according to the state standards of Ukraine.
Any comment	The information will be archived in paper and electronic form

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	Prior to the start 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[17]
QA/QC procedures (to be) applied	N/A
Any comment	The information will be archived in paper and electronic form

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:

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

Additionality of the project

The additionality of the project activity is demonstrated and assessed by using the “Tool for the demonstration and assessment of additionality”.[18] (Version 06.0.0). This manual was elaborated in original for CDM projects, but it may be also applied 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 were described in Section B1 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 project activities (some of the project activities are implemented) without the use of the Joint Implementation Mechanism.

Outcome of Sub-step 1a. Three realistic alternatives 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 in the agricultural sector of Odesa region is the most realistic and plausible alternative to the Project implementation because it entails minimum expenses for Ltd “Obriy-MTS-Rozdylna”.
According to Article 2 of the Law of Ukraine “On the basic principles of the governmental agrarian policy for the period untill 2015”[19] , 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.
The existing system of tariffs for agricultural products in Ukraine does not envisage any investment component for agricultural industry improvement. Therefore, Ltd “Obriy-MTS-Rozdylna” 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 Ltd “Obriy-MTS-Rozdylna” to implement No-till technology and nothing puts legislative limits on the baseline scenario.
Alternative 1.2: Ltd “Obriy-MTS-Rozdylna” did not conduct any agricultural modernization campaigns prior to the project. Moreover, Ltd “Obriy-MTS-Rozdylna” 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

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

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

Step 3 below). Ltd "Obriy-MTS-Rozdylna" 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: 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 complies 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, one may say that all the scenarios are consistent with current laws and regulations.

Therefore, Step 1 is satisfied.

According to the "Tool for the demonstration and assessment of additionality"[20] (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, an investment comparison analysis and a benchmark analysis. 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), or the benchmark analysis (Option III). For this project it is appropriate to apply analysis using Option III, according to the instructions of Additionality guidelines.

Sub-step 2b – Application of simple cost analysis
Project implementation will require costs in addition to the existing costs for the management of surface soil, control weeds, proper implementation technology no-till. Additional costs for the Project include the costs of: purchase of new agricultural technology. The cost of implementation and realization of the project Reduction of CO_2 emissions by systematic utilization of No-till technology at Ltd "Obriy-MTS-Rozdylna" farmlands are of approximately 700 thousand EUR (4 643 925.1 UAN.):
Table 9. Project costs

Name	**UAN**
Tractor MTZ-82.1 "Belorus" Belarus - 2 pcs	226538.4

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

Mulchyrovatel KORNIK 2.8 RP (Y-knives), Poland - 1 pc	43152
Conventional TANZI 6750 (6.5 m), Argentina - 2 pcs	888331.2
Sprayers rod OPSH-2000, Ukraine - 2 pcs	167664
Grain handler NC-20, Ukraine - 2 pcs	27799.2
Trailer TMK-160 Awning, Ukraine - 3 pieces	191000.4
Planter John Deere 7000 Planter, B / A, United States - 2 pcs	232830.36
Planter John Deere 7000, B / A, United States - 2 pcs	232830.36
Header legumes mod925F, b / y, United States - 2 pcs	142170
Header legumes mod925F, b / y, United States - 2 pcs	145170
Used grain P-60, Ukraine - 1 pc	12500
Used grain P-60A, Ukraine - 1 pc	15500
Conventional zernotukova SZ-5, 4, Ukraine - 1 pc	59889.6
Conventional zernotukova SZ-5, 4, Ukraine - 1 pc	59889,6
Conventional RS-5, 4 (2 discs with single-openers), Ukraine - 2 pcs	119780.4
Tractor trailers TMK-160 with stripes, Ukraine 3 pc	210000
Tractor HTZ-150K-09, Ukraine - 1 pc	277200
Tractor HTZ-150K-09, Ukraine - 1 pc	277200
Sprayers "Montana", Brazil - 1 pc	928200
Spray MVD-900, Ukraine - 2 pcs	15579.6
Harrow dyskovaBDVP-4, 2 "Lada", Ukraine - 1 pc	89280
Disk harrow BDVP A-4, 2 "Lada", Ukraine - 2 pcs	211000
Used PKU-0 ,8-05-02 with a bucket, Ukraine - 1 pc	38619.996
Systems of parallel driving EZ-Guide 250 344 - 2 pcs	31800
Total, UAN	**4643925.1**

Equipment used in this project is the best in terms of Efficiency Factor, quality of execution and applied technical solutions among the materials and equipment available on Ukrainian market. Availability of spare parts in Ukraine was an important parameter of equipment selection.
At the moment of the project at Ltd “Obriy-MTS-Rozdylna” use outdated agricultural machinery produced in the USSR.
Application of Kyoto mechanisms to this project makes these measures economically efficient and is the only way for their implementation.

Since the reduction does not bring economic benefit Ltd “Obriy-MTS-Rozdylna” wrong except that formed the Project Joint Implementation (JI), concludes that the project is not possible without receiving proceeds under JI, since 'are barriers to investment.

Sub-step 2c – Calculation and comparison of financial indicators.
According to the Additionality guidelines, sensitivity analysis was not conducted.

Sub-step 2d – Sensitivity analysis.

According to the Additionality guidelines, sensitivity analysis was not 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 of other activity similar to the one proposed in the Project demonstrated the absence of similar projects in Ukraine.

The existing practice of exploitation of agricultural facilities, presented in the variant of the baseline 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 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"[21] (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 farms.

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 project activities (reduction of the project activities) and project activities without the use of the Joint Implementation 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, Ltd "Obriy-MTS-Rozdylna" has no obstacles for further exploitation of land at the previous level. Therefore, the identified obstacles can not prevent the introduction of at least one alternative scenario - "business as usual."

Conclusion

Based on the above analysis we can conclude 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 with the total area of 7 128.55 ha where Ltd "Obriy-MTS-Rozdylna" grows crop products, as well as tractors, harvesters and other agricultural machinery which consume diesel fuel when No-till technology is applied.

Table 10. An overview of all sources of emissions in the baseline scenario

Source	Gas	Included / Excluded	Substantiation / Explanation

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

Baseline scenario			
GHG emissions due to mechanical tillage	CO_2	Included	The main source of emissions.
	CH_4	Excluded	CH4 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 conservative.

Table 11. An overview of all sources of emissions in the project scenario

Source	**Gas**	**Included / Excluded**	**Substantiation/ explanation**
Project scenario			
GHG emissions due to No-till technology	CO_2	Excluded	Emissions due to No-till technology are absent.
	CH_4	Excluded	CH4 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 conservative.

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

Baseline formation date: 20/06/2012
The baseline has been set by Ltd “Obriy-MTS-Rozdylna”, CEP Carbon Emissions Partners S.A.
Ltd “Obriy-MTS-Rozdylna”.
103 Lenin St., Rozdilna city
Odesa region, Ukraine
Dmytro Dobrovolskyi, Director
Telephone: +38 (04853) 5-05-05
Fax: +38 (04853) 5-05-05
Ltd “Obriy-MTS-Rozdylna” is a project participant (stated in Annex 1).

Technical consultants
CEP Carbon Emissions Partners S.A.
52 Route de Thonon, Geneva, Casepostale 170 CH-1222 Vésenaz, Switzerland
Telephone: +41 (76) 3461157
E-mail: 0709bp@gmail.com
CEP Carbon Emissions Partners S.A. is a project participant (stated in Annex 1).

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

The starting date of the project was determined based on the "Glossary of Joint Implementation Terms" version 03[22] and is set on 28/09/2006, when the contract for the purchase of agricultural machinery 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 [23] 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 20 years, or 240 months.

C.3. Length of the crediting period:

The duration of the crediting period in years and months during the project lifecycle, which is 20 years, or 240 months: 01/01/2008- 31/12/2012 (5 years, or 60 months), upon prolongation of the Kyoto Protocol: 01/01/2013- 30/12/2026 (15 years, or 180 months).
The date on which the first ERUs are expected to be generated, namely 01/01/2008, was taken as the starting date of the crediting period.
ERU generation belongs to the first commitment period of 5 years (01/01/2008 – 31/12/2012).
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 01/01/2013-31/12/2027.
Prolongation of the crediting period beyond 2012 is subject to approval by the Host Party.

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

[23] 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:

A JI specific approach based on the Guidance on criteria for baseline setting and monitoring (Version 03)[24] of the Joint Implementation Supervisory Committee is used in the proposed project; this meets the requirements of Resolution 9/CMP.1, Appendix B to 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, as well as on the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" Version 02[25]**.**
The key variables that are subject to monitoring are the content of humus (organic carbon) in the soil cultivated using No-till technology; area cultivated by No-till technology and area cultivated by ploughing to create anti-fire furrows.
Humus (organic carbon) content of the soil cultivated using No-till technology are measured annually by the Biotekhnika Engineering Institute, which is subject to certification in accordance with the state standards of Ukraine. No significant fluctuations of soil characteristics are expected, therefore this measurement periodicity is appropriate. Soil density is measured by the Biotekhnika Engineering Institute prior to the project for each field individually since no major fluctuations of the parameter are expected.
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. 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*[26]).
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.
Since it is virtually impossible to organize the measurement of the volume of diesel fuel consumed for every farmland area i, the data obtained during the annual research of Ltd "Obriy-MTS-Rozdylna" will be used for the calculation. Diesel fuel consumption will depend on the particular crops.

Data and parameters that are not monitored over the crediting period but are identified only once and are available at the PDD development stage:

$k_{b,i,y}$	Humus content in the soil of field *i* cultivated using traditional tillage, %
$\rho_{i,y}$	Soil density at field *i* cultivated using traditional tillage in period *y*, t/m^3

[24] http://ji.unfccc.int/Ref/Documents/Baseline_setting_and_monitoring.pdf
[25] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf
[26] http://www.complexdoc.ru/text/%D0%93%D0%9E%D0%A1%D0%A2%2023740-79

$h_{b,i}$	Depth of soil layer disturbance at field *i* cultivated using traditional tillage, m

Data and parameters that monitored over 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-tilltechnology in period *y*, %

Data and parameters that are not monitored over the crediting period but are 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)	Comment

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):

GHG emissions in the Project scenario:

$PE_y = 0$ (1)

where

PE_y – project GHG emissions in period *y*, tCO_2e;

[y] – 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	2008-2012 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 Odesa region conducts relevant area verification once a year
Any comment	The information will be archived in paper and electronic form

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 Biotekhnika Engineering Institute 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	Ensured by the Biotekhnika Engineering Institute
Any comment	The information will be archived in paper and electronic form

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	Defined for every field *i* prior to the start of the project
Source of data (to be) used	Calculated using data defined for every field *i* prior to the start of the project
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	Humus content in the soil for the baseline scenario is calculated taking into account its linear decrease over the time where traditional tillage is applied. This linear dependence is based on 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 Biotekhnika Engineering Institute authorized to conduct measurements according to the state standards of Ukraine.
Any comment	The information will be archived in paper and electronic form

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	Defined for every field *i* prior to the start of the project
Source of data (to be) used	Measurement logs
Value of data applied	See Supporting Document 1

(for ex ante calculations/determinations)	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The Biotekhnika Engineering Institute determines soil density and fills in measurement logs with the obtained figures.
QA/QC procedures (to be) applied	The Biotekhnika Engineering Institute is authorized to conduct measurements according to the state standards of Ukraine.
Any comment	The information will be archived in paper and electronic form

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	Prior to the start 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[27]
QA/QC procedures (to be) applied	N/A
Any comment	The information will be archived in paper and electronic form

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

GHG emissions in the Baseline scenario:

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

GHG emissions in the baseline scenario in the period *y* are calculated according to the following formula**:**

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

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] – monitoring period;
[A] – baseline land cultivation technology.

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

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

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] – monitoring period;
[A] – baseline land cultivation technology;
[i] – 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)[28]:

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

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;

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

0.9 – conservative factor that makes up for possible emissions in the project scenario in the course of anti'fire furrow creation and minimum topsoil disturbance when No-till technology is implemented;
[y] – monitoring period;
[b] – baseline technology;
[p] – project technology;
[A] – baseline tillage technology;
[i] – number of fields.

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

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

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

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

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

where
$SOC_{b,y,i}$ – soil organic carbon content in the soil of field *i* cultivated using traditional tillage technology in period *y*, t C/ha;
$h_{b,i}$ – depth of soil disturbance of 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*[29])
10000 – m^2 to ha conversion coefficient;

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

[b] – baseline emissions;
[y] – monitoring period;
[i] – system of number of fields.

The content of humus in the soil in the baseline scenario is calculated using historical data over a 3-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):

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

Coefficients a, b (see Supporting Document 1) are determined using trend line generation methods in Microsoft Excel application based on historical data of 3 years prior to the project. The linear dependance ensures the lowest function error. Taking account of the fact that Ltd “Obriy-MTS-Rozdylna” was established in 2005, the period of 2005-2007 was taken as the historical period for baseline setting. Given the linearity of the function (refer to the determined project "Reduction of CO2 emissions by systematic utilization of No-till technologies in agricultural industry" (LLC "Beta Agro Invest")), it is noteworthy that 3 years is enough to identify the baseline.
Where:
$k_{b,i,y}$ – humus content in the soil of field *i* in period *y* cultivated using traditional tillage, %;
a – coefficient of linear dependence, %;
b - coefficient of linear dependence, %
y – monitoring period;,
[b] – baseline emissions;
[i] – number of fields;
[y] – monitoring period.

Baseline analysis showed that humus content in the soil will drop by 0.5% over the 20 years of the project life.

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

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 resulting from the project activity are calculated using the following formula:

$$ER_y = BE_y - PE_y$$

(8)

where

ER_y - GHG emission reductions due to the project activity in period *y*, t CO_2e;

BE_y - baseline GHG emissions in period *y*, t CO_2e;

PE_y - project GHG emissions in period *y*, t CO_2e.

[y] – 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:

In accordance with the Law of Ukraine "On environmental protection"[30] and State Construction Standard DBN A.2.2-1-2003 "Structure and contents of the environmental impact assessment (EIA) materials during design and construction of enterprises, buildings and facilities"[31], Ltd "Obriy-MTS-Rozdylna" is not obliged to collect data on environmental impact for this project type.

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.
$S_{p,i}$	Low	Measurements of parameter are conducted in accordance with the standards of Ukraine
$k_{p,i,y}$	Low	Biotekhnika Engineering Institute

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 metering devices is carried out in line with manufacturer's manuals, approved verification / calibration methodologies and the national standards of Ukraine.

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

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

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 Ltd "Obriy-MTS-Rozdylna" agrotechnicians (responsible for accounting of area treated with No-till technology), the Biotekhnika Engineering Institute (responsible for provision of agrochemical data for project monitoring), Ltd "Obriy-MTS-Rozdylna" chief agrotechnician (recording and reporting data in the table), and Ltd "Obriy-MTS-Rozdylna" manager (data processing and archivation). The data subject to monitoring and required for the determination and further verification will be archived and stored in paper and electronic form at Ltd "Obriy-MTS-Rozdylna"for two years after the transfer of emission reduction units generated by the project.
Management structure includes the Director of Ltd "Obriy-MTS-Rozdylna" 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 12.

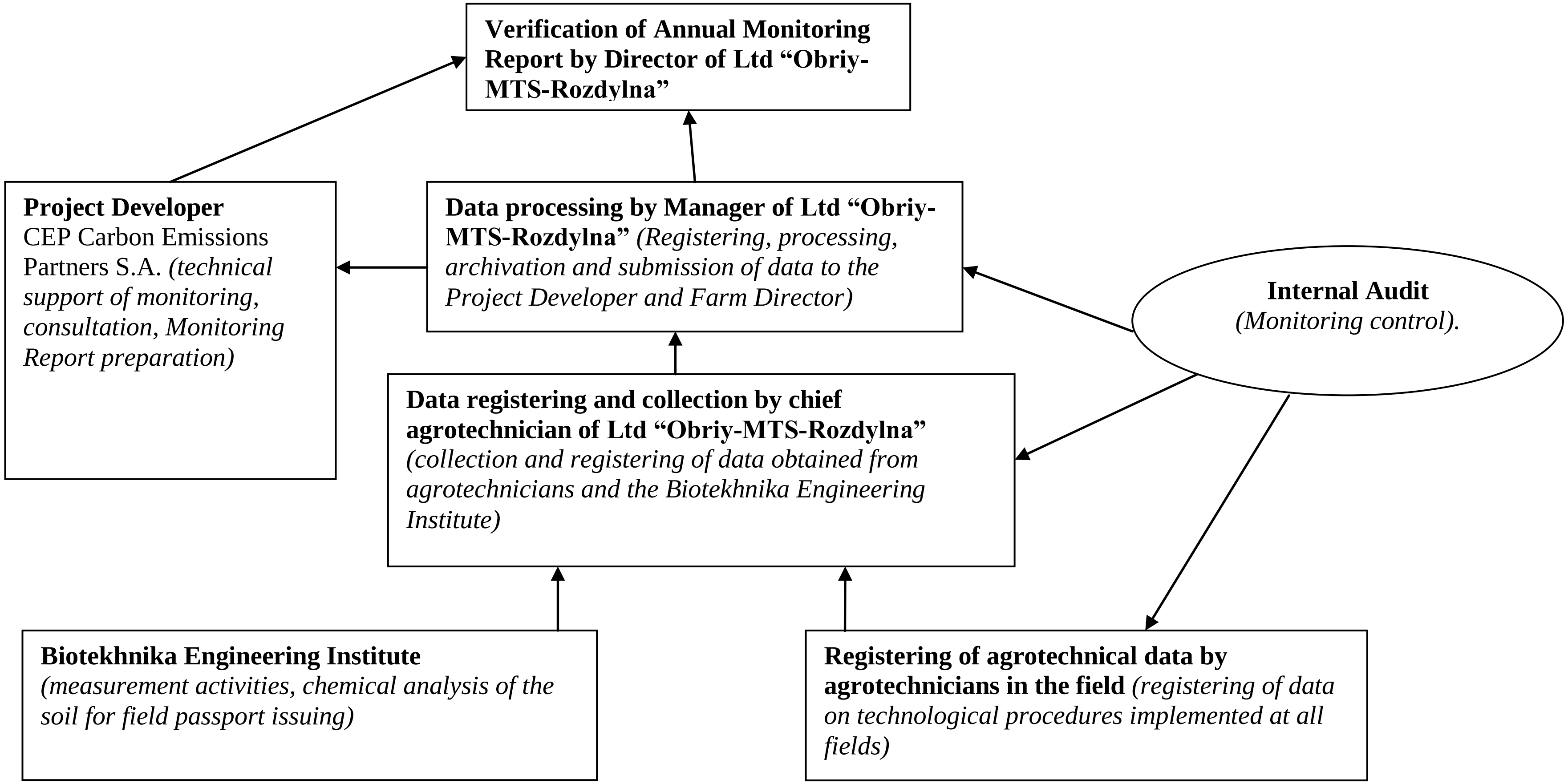

Figure 5. Operational structure and data collection scheme for project monitoring.

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

Monitoring plan is set by Ltd "Obriy-MTS-Rozdylna", CEP Carbon Emissions Partners S.A.

Ltd "Obriy-MTS-Rozdylna".
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Odesa region, Ukraine
Dmytro Dobrovolskyi, Director
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Ltd "Obriy-MTS-Rozdylna" is a project participant (stated in Annex 1).

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CEP Carbon Emissions Partners S.A. is a project participant (stated in Annex 1).

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

Project emissions were estimated in accordance with the formulae given in Section D.1.1.2. Results of calculation are provided in the tables below. The calculations are stated in Supporting Document 1 annexed to the PDD.

Table 12. Estimated project emissions for the period January 1, 2008 – December 31, 2012

Year	Project emissions (t CO_2 equivalent)
2008	0
2009	0
2010	0
2011	0
2012	0
Total (t CO_2 equivalent)	0

Table 13. Estimated project emissions for the period January 1, 2013 - December 31, 2027

Year	Project emissions (t CO_2 equivalent)
2013	0
2014	0
2015	0
2016	0
2017	0
2018	0
2019	0
2020	0
2021	0
2022	0
2023	0
2024	0
2025	0
2026	0
2027	0
Total (t CO_2 equivalent)	0

E.2. Estimated leakage:

All emissions from diesel fuel combustion are included into potential project emissions but not into leakage, because diesel fuel is combusted on the site and is encompassed by the project boundary. No leakage is expected.

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

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

E.4. Estimated baseline emissions:

Table 14. Estimated baseline emissions for the period January 1, 2008 – December 31, 2012

Year	Estimated baseline emissions (t CO_2 equivalent)
2008	17 702
2009	37 050
2010	58 484
2011	82 783
2012	105 329
Total (t CO_2 equivalent)	**301 348**

Table 15. Estimated baseline emissions for the period January 1, 2013 – December 31, 2026

Year	Estimated baseline emissions (t CO_2 equivalent)
2013	105 329
2014	105 329
2015	105 329
2016	105 329
2017	105 329
2018	105 329
2019	105 329
2020	105 329
2021	105 329
2022	105 329
2023	105 329
2024	105 329
2025	105 329
2026	105 329
2027	105 329
Total (t CO_2 equivalent)	**1 579 935**

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

Emission reductions are calculated according to formula (15) given in section D.1.4.
Results are provided in the tables below. Calculations are provided in the Supporting Document 1, attached to the PDD.

Table 16. Estimated emission reduction for the period January 1, 2008 – December 31, 2012

Year	Estimated emission reduction (t CO_2 equivalent)
2008	17 702
2009	37 050

2010	58 484
2011	82 783
2012	105 329
Total (t CO_2 equivalent)	**301 348**

Ttable 17. Estimated emission reduction for the period January 1, 2013 - December 31, 2026

Year	Estimated emission reduction (t CO_2 equivalent)
2013	105 329
2014	105 329
2015	105 329
2016	105 329
2017	105 329
2018	105 329
2019	105 329
2020	105 329
2021	105 329
2022	105 329
2023	105 329
2024	105 329
2025	105 329
2026	105 329
2027	105 329
Total (t CO_2 equivalent)	**1 579 935**

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

Table 18. Table containing results of estimation of emission reductions for the period from January 1, 2008 to December 31, 2012

Year	Estimated project emissions (t CO_2 equivalent)	Estimated leakage (t CO_2 equivalent)	Estimated baseline emissions (t CO_2 equivalent)	Estimated emission reduction (t CO_2 equivalent)
2008	0	0	17 702	17 702
2009	0	0	37 050	37 050
2010	0	0	58 484	58 484
2011	0	0	82 783	82 783
2012	0	0	105 329	105 329
Total (t CO_2 equivalent	0	0	**301 348**	**301 348**

Table 19. Table containing results of estimation of emission reductions for the period from January 1, 2013 to December 31, 2026

Year	Estimated project emissions (t CO_2 equivalent)	Estimated leakage (t CO_2	Estimated baseline emissions (t CO_2	Estimated emission reduction (t CO_2 equivalent)

		equivalent)	equivalent)	
2013	0	0	105 329	105 329
2014	0	0	105 329	105 329
2015	0	0	105 329	105 329
2016	0	0	105 329	105 329
2017	0	0	105 329	105 329
2018	0	0	105 329	105 329
2019	0	0	105 329	105 329
2020	0	0	105 329	105 329
2021	0	0	105 329	105 329
2022	0	0	105 329	105 329
2023	0	0	105 329	105 329
2024	0	0	105 329	105 329
2025	0	0	105 329	105 329
2026	0	0	105 329	105 329
2017	0	0	105 329	105 329
Total (t CO_2 equivalent	0	0	**1 579 935**	**1 579 935**

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 the law of Ukraine "On Environmental Protection"[32] and DBN A.2.2-1-2003 «Composition and content of the materials of environment impact assessment (EIA) for design and construction of plants, buildings and structures»[33], Ltd "Obriy-MTS-Rozdylna" is not obliged to carry out EIA development for this type of project.

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

Transboundary impacts due to the project activity according to their definition in the text of "Convention on transboundary long-range 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. Since the number of technological procedures associated with diesel fuel combustion will decrease, greenhouse gas emissions will shrink. In addition, the implementation of No-till technology will reduce carbon dioxide emissions from humus decomposition (oxidation).

Impact on land use
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.

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

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

SECTION G. Stakeholders' comments

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

Ltd "Obriy-MTS-Rozdylna" informed the community through mass media. All comments received were positive. No negative comments on the project have been reported.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

Project owner

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Title:	Director
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Personal e-mail:	hannu@online.ee

Annex 2

BASELINE INFORMATION

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	2008-2012 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 G PS equipment.
QA/QC procedures (to be) applied	The Main Administration of the State Land Committee in Odesa region conducts relevant area verification once a year
Any comment	The information will be archived in paper and electronic form

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 Biotekhnika Engineering Institute 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 Biotekhnika Engineering Institute
Any comment	The information will be archived in paper and electronic form

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	Defined for every field *i* prior to the start of the project
Source of data (to be) used	Calculated using data defined for every field *i* prior to the start of the project
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	Humus content in the soil for the baseline scenario is calculated taking into account its linear decrease over the time where traditional tillage is applied. This linear dependence is based on 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 Biotekhnika Engineering Institute authorized to conduct measurements according to the state standards of Ukraine.
Any comment	The information will be archived in paper and electronic form

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	Defined 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 Biotekhnika Engineering Institute determines soil density and fills in measurement logs with the obtained figures.
QA/QC procedures (to be) applied	The Biotekhnika Engineering Institute is authorized to conduct measurements according to the state standards of Ukraine.
Any comment	The information will be archived in paper and electronic form

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	Prior to the start 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[34]
QA/QC procedures (to be) applied	N/A
Any comment	The information will be archived in paper and electronic form

Baseline emission calculation methodology is given in Section D.1.1.4**;** astimation of baseline emission values is given in Tables E.4-E.6 of Section E.4.
Calculations are given in Supporting Document 1 attached to the PDD.

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

Annex 3

MONITORING PLAN

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, as well as on the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" Version 02[35].

The key variables that are subject to monitoring are the content of humus (organic carbon) in the soil cultivated using No-till technology; area cultivated by No-till technology and area cultivated by ploughing to create anti-fire furrows. In addition, soil density is also subject to monitoring.

Humus (organic carbon) content and density of the soil cultivated using No-till technology are measured annually by the Biotekhnika Engineering Institute, which is subject to certification in accordance with the state standards of Ukraine. No significant fluctuations of soil characteristics are expected, therefore this measurement periodicity is appropriate. The Biotekhnika Engineering Institute measures soil density once prior to the start of the project for each field individually.

The Institute 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. 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*[36])

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.

Since it is virtually impossible to organize the measurement of the volume of diesel fuel consumed for every farmland area, the data obtained during the research of Ltd "Obriy-MTS-Rozdylna" were used for the calculation. Diesel fuel consumption will be determined depending on the crops.

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	2008-2012 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 Odesa region conducts relevant area verification once a year
Any comment	The information will be archived in paper and electronic form

Data/Parameter	$k_{p,i,y}$
Data unit	%
Description	Humus content in the soil of field *i* cultivated using No-till

[35] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf

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

	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 Biotekhnika Engineering Institute 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 Biotekhnika Engineering Institute
Any comment	The information will be archived in paper and electronic form

Annex 4

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

– ***Equipment for herbicide spraying.*** Spraying of herbicides is necessary to control weeds (both perennial and annual), which, along with crops, consume limited resources of water, minerals and organic elements:

a) *Montana PARPUDA MA 2627M* Self Propelled Sprayer for herbicide application. Brief specifications are available below as well as at the manufacturer's website[37].

Figure 1. Montana PARPUDA MA 2627M Self Propelled Sprayer

Table 1 - Specifications of Montana PARPUDA MA 2627M

Specifications	
Fuel tank capacity	2 600 l
Sprayer boom	27 m
Engine capacity	4.3 l
Engine rating	169 kW/230 hp

– ***Equipment for sowing:***

a) John Deere 7000 No-Till Box Drill.

A Box Drill for direct grain sowing with mineral fertilizer attachment. Brief specifications are available below as well as at the manufacturer's website[38]

Figure 2. John Deere 7000 No-Till Box Drill

[37] http://investa.ru/agro/app/webroot/files/montana.pdf

[38] [illegible]

John Deere *7000* opener is designed to operate in the soil of any type and condition. The single-disk opener provides extreme effeciency at fields with thick mulch cover.

Table 2 - Specifications of John Deere 7000 No-Till Box Drill

Working width	6 m	
Seedbox type	Grain	Grain/fertilize r
Seedbox capacity	8x109	4x230
Sowing rate, km/h	0-10.5	
Spacing	70 cm	

– ***Power units:***

John Deere 8530 Tractor. An overview and specifications are available below as well as at the manufacturer's website.[39]

Figure 3. John Deere 8530 tractor

John Deere *8530* is a third-class power rating tractor designed for operation in plant farming, feed industry and transport. Great weight and extended wheelbase of these tractors provide not only the longitudinal stability, but also increase the traction-grip performance while working with tillage machinery such as ploughs, chisel ploughs, cultivators, disk harrow, etc. Tractors of the series are compatible with front loaders.

John Deere 7030 series has the following advantages:

a. This is a universal machine that works all year round regardless of farmland area.
b. John Deere PowerTech.
c. The series has relatively low fuel consumption.

Table 3 – Specifications of John Deere 8530 tractors

Model	**8530**
Nominal engine power, kW (hp) ECE-R24	236
Maximum capacity of rear hinge-plate, kg	10249

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

Operation weight without ballast, kg	14000
Total length, mm	5850
Total width, mm	2540
Height from the ground to the upper point, mm	3150
Wheelbase, mm Front Rear	 600 800

BELARUS 82.1 (4x4) wheel tractor is a universal first-class machine with 87 hp engine, designed for operation with mounted, semi-mounted tools and trailers. The machine can be also used for labour-consuming operations with earthmovers, dredgers, loaders, hole diggers, as well for special works and driving of immobile agricultural machines. An overview and specifications are available below as well as on the seller's website. [40]

Figure 4. Belarus 82.1 Tractor

Table 4- Belarus 82.1 Tractor specifications

Model	82.1
Nominal engine power, kW (hp) ECE-R24	81
Operation weight without ballast, kg	3900
Total length, mm	3930
Total width, mm	1970
Height from the ground to the upper point, mm	2780

John Deere 7930 tractors are universal ploughing facilities manufactured in the USA. It is a third-class power rating series of tractors designed for operation in plant farming and feed industry.

John Deere 7930 is equipped with a monobloc frame. In addition, John Deere tractors have 6-cylinder John Deere Power Tech Plus engines with a capacity of 6.8 l. The tractor is equipped with an IPM system. An overview and specifications are available below as well as on the seller's website.[41]

[40] http://www.agroserver.ru/b/traktor-belarus-82-1-180399.htm

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

Figure 5. John Deere 7930 Tractor

Table 5 - John Deere 7930 Tractor Specifications

Model	**7930**
Nominal engine power, kW (hp) ECE-R24	160 (215)
Maximum capacity of rear hinge-plate, kg	9177
Operation weight without ballast, kg	8130
Total length, mm	4027
Total width, mm	2438
Height from the ground to the upper point, mm	3184
Turning radius, m	5.3

The use of John Deere and Belarus machinery will ensure optimization of agricultural equipment operation in the field, reduce the number of technological procedures, which entails lower diesel fuel consumption and lower GHG emissions into the atmosphere.
Table 6 shows JI project schedule at the Farm