JOINT IMPLEMENTATION PROJECT

«Reduction of CO2 emissions by systematic utilization of No-till technologies in agricultural industry»

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

Director of Evo Carbon Trading Services Ltd		**N.L. Egorova**
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	PS	

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

Director of "Beta-Agro-Invest" LLC		**V.A. Gnennyy**
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Yasynuvata - 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 technologies in agricultural industry

Sectoral scope:
Sector 15 - Agriculture.

Version of the Project Design Document: 03

Date: 07/06/2012.

A.2. Description of the project:

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

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

Situation existing prior to the commencement of the Project
LLC "Beta-Agro-Invest" (the "Farm"), established in 2000, is engaged in agricultural activity in the eastern part of Ukraine.
The company's primary activity is growing, processing, storage and sale of agricultural products. Moreover, the company is engaged in diary husbandry, focusing on milk sales, and also provides grain and pulse harvesting services.

Circumstances in which the project is implemented
Prior to the project, LLC "Beta-Agro-Invest" 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 2007, 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 fields, which causes their exhaustion and has a negative effect on the yields.

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

Table 1. Project land area cultivated using direct sowing technology

Year	Area	
	ha	share in the total farmlands of the Farm, %
2007	8 991.30	44.3
2008	13 350.70	65.7
2009	17 838.30	87.8
2010	19 554.00	96.27
2011	20 311.15	100

In 2005, the Farm started purchases of necessary agricultural equipment for direct sowing farming as part of the Joint Implementation Project. The equipment package included:
- seed drills for direct seeding;
- special tractors;
- herbicide sprayers;
- seed and fertilizer drill systems;
- combine harvesters and other machinery required by the technology.

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

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

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 LLC “Beta-Agro-Invest” and FIRMA P.H.P. Agro-Efect S.P. Z.O.O. for the purchase of agricultural equipment dated 22/02/2005.	22/02/2005
Project design document development for the project “Reduction of CO_2 emissions by systematic utilization of No-till technologies in agricultural industry”	JI PDD “Reduction of CO_2 emissions by systematic utilization of No-till technologies in agricultural industry”, version 01	01/05/2005
At the first stages of project development and implementation, a decision was made that the project would be implemented	(access link http://ji.unfccc.int/JI_Projects/DB/4YBIVDG5WLDY6KY3JZ1TO5WD	15/02/12 – 16/03/12

using the Track 2 procedure. The PDD version 01 was uploaded to the UNFCCC web-site and made available for public and expert comments for 30 days. No comments on the PDD were received.	X8U4Z1/PublicPDD/EUW2GBRTQE15KZ8FLLIYPJYEOY0KMU/view.html).	
After the 19th Meeting of the Branch of the Compliance Committee of the Kyoto Protocol decided to re-instate the eligibility of Ukraine to participate in the mechanisms under the Kyoto Protocol on March 9, 2012, the project owner made a decision to implement the project under the national Track 1 procedure. 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 technologies in agricultural industry”	28/04/12
Obtaining of a Letter of Endorsement from the State Environmental Investment Agency of Ukraine	Letter of Endorsement No. 1462/23/7 for the Joint Implementation project “Reduction of CO_2 emissions by systematic utilization of No-till technologies in agricultural industry” dated 07/06/2012	07/06/2012

A.3. Project participants:

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

A.4. Technical description of the project:

A.4.1. Location of the project:

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

Figure 1. Location of LLC "Beta-Agro-Invest" facilities on the map of Ukraine.

Figure 2. Location of LLC "Beta-Agro-Invest" farmlands on the map of Donetsk region (districts designated).

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].

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

Donetsk region.

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

LLC "Beta-Agro-Invest" facilities are located in Yasynuvatskyi, Dobropilskyi, Kostiantynivskyi and Krasnoarmiiskyi districts of Donetsk region, Ukraine.

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

LLC "Beta-Agro-Invest" headquarters
Ocheretyne urban-type village, Yasynuvatskyi district Donetsk region.
Geographic coordinates of Ocheretyne urban-type village:
48°14′34″ N
37°36′38″ E
Ocheretyne is an urban-type settlement located north-west from Donetsk. Ocheretyne population is 3709 people (as of 01/01/2011).
Donetsk region is an administrative unit of Ukraine. Its area is 26 517 km² (4.4 % of Ukraine's total area). Population of the region is 4 414 243 people (as of 1/08/2011).

The JI project will be implemented at the farmlands of LLC "Beta-Agro-Invest":

Table 3. Farmlands of LLC «Beta-Agro-Invest» where the JI project is realized

Facility	Region	Locality
Novokalynove	Yasynuvatskyi	Novokalynove village
Novoselivka	Yasynuvatskyi	Novoselivka Persha village
Rozivka	Yasynuvatskyi	Rozivka village
Oksamyt	Dobropolske	Volodymyrivka village
Pravdivka	Kostiantynivskyi	Pravdivka village
Vozdvyzhenka	Krasnoarmiiskyi	Vozdvyzhenka village

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:

[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

- 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 LLC "Beta-Agro-Invest" 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 the 1980s. 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 direct sowing technology, which will cause GHG emission reductions, include:

1. Planning crop rotation and rotation cultures

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

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

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

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.

Figure 3. Soil covered with crop residues

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

Project crop rotation schemes are provided in Table 5.

Table 5. Possible crop rotation schemes

Crop rotation # 1	Crop rotation # 2	Crop rotation # 3	Crop rotation # 4
Winter wheat	Corn	Sunflower	Corn
Sunflower	Sunflower	Winter wheat	Winter wheat

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

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

2. Evaluation of soil

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

3. Crop residue management

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

4. 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 direct sowing implementation may show poor yields and low profit without a prior anti-compaction campaign. Natural and ploughing-caused compaction should be eliminated with a chisel plough or other deep tillage tools.
Mulching the soil surface. Almost all the benefits of direct sowing system arise from permanent soil cover and only a few of them are caused by refusal from ploughing. Direct sowing system will not be effective with little amount of crop residues.

5. Weed control

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

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

6. Mound-mice population control

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

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.

Table 6 shows JI project schedule at the Farm

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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. Schedule of the JI project implementation at the Farm

Years of No-till technology implementation at farmland areas of the Farm					
Oksamyt	**Novoselivka**	**Novokalynove**	**Rozivka**	**Pravdivka**	**Vozdvyzhenka**
2007	2007	2007	2007	2008	2009
2008	2008	2008	2008	2009	2010
2009	2009	2009	2009	2010	2011
2010	2010	2010	2010	2011	
2011	2011	2011	2011		

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 for the period preceding the first commitment period

	Years
Duration before the crediting period	1
Year	Estimated annual emission reductions in tonnes of CO_2 equivalent
2007	17 293
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	**17 293**
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	**17 293**

Table 8. 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	41 724
2009	76 201
2010	108 609
2011	151 406
2012	182 923
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	**560 863**
Annual average of estimated emission reduction over the crediting period (tonnes of CO_2 equivalent)	**112 172**

Table 9. Estimated amount of emission reductions for the period following the first commitment period

	Years
Length of the crediting period	14
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2013	182 923
2014	182 923
2015	182 923
2016	182 923
2017	182 923
2018	182 923
2019	182 923
2020	182 923
2021	182 923
2022	182 923
2023	182 923
2024	182 923
2025	182 923
2026	182 923
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	**2 560 922**
Annual average of estimated emission reduction over the crediting period (tonnes of CO_2 equivalent)	**182 923**

A.5. Project approval by the Parties involved:

Letter of Endorsement No. 1462/23/7 dated 07/06/2012 for the JI project "Reduction of CO_2 emissions by systematic utilization of No-till technologies in agricultural industry" 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:

- CO2 emissions due to the change in soil carbon content;
- N2O 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 N2O emissions. However, according to the conservative principle, project participants do not include N2O 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 and obsolete and worn-out agricultural machines.
The traditional tillage technology of grain cultivation comprises about a dozen of technological procedures. In autumn, after the harvesting, primary tillage is carried out with hydroficated disk tiller to 6-8 cm depth. Then mineral fertilizers are applied and soil is simultaneously ploughed with a plough-point to a depth of 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 LLC "Beta-Agro-Invest" to keep its yields at a sustainable level without re-equipment, with subsequent ineffective combustion of fossil fuels in obsolete agricultural machinery and disturbance of the soil to a depth of up to30 cm.
This *Alternative* is the most plausible baseline scenario, as it:

- allows growing required amount of crops

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

- 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 5 years prior to the start of the project using the least square method for each field individually. This tendency is illustrated for 30-ha field No.2 in Oksamyt unit, Figure 4.

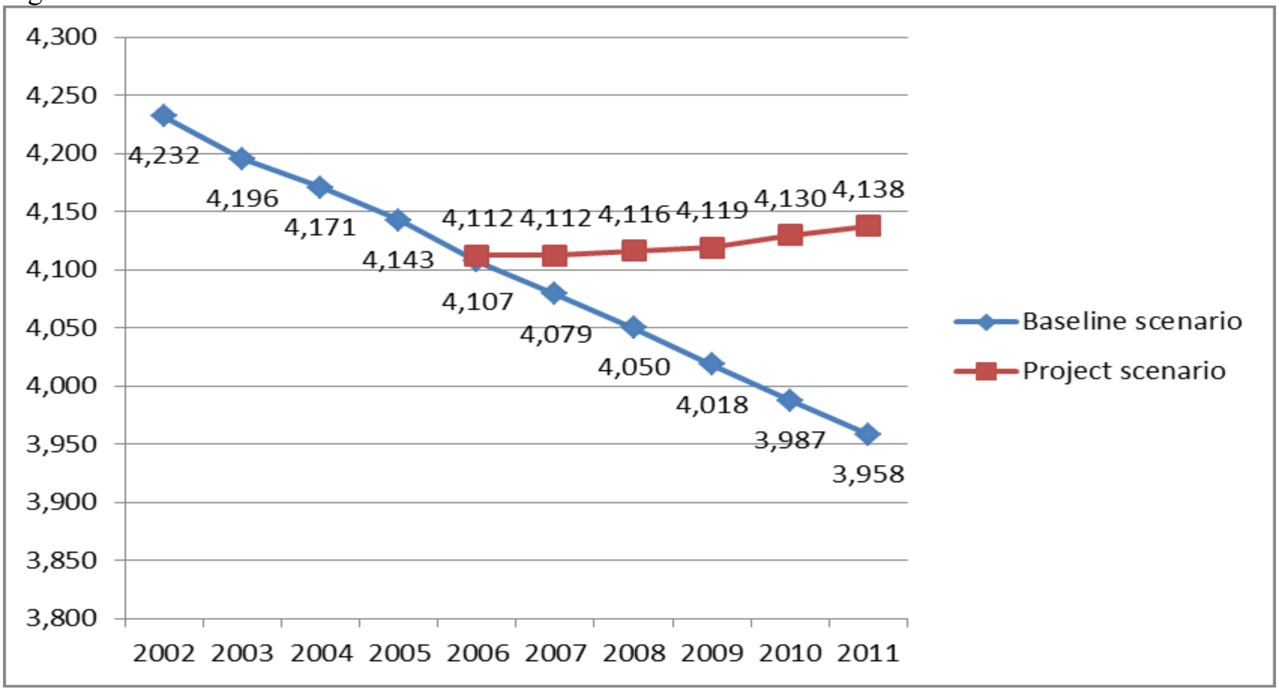

Figure 4. Humus content in soil of 30-ha field No.2 in Oksamyt unit for the baseline and the project scenario.

Data on humus content in 2002-2006 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 5 years. The Ukrainian legislation does not regulate the minimum humus content in the soil required for agricultural activity, although it has been proven that low humus content has bad impact on yields. Humus-rich soils bring stable yields of high-quality crops with better resistance to disease excitants and bad environment. There is a direct relation between humus content and soil energy and yields. US researchers Alexander and Middleton stated that "organic content in the soil indicates its condition and physical properties"[14]. Thus, further decline in humus content would lead to soil exhaustion and lower yields of the farm.

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

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

Detailed GHG emission calculations are provided in Section D.

GHG emissions in the Baseline scenario:

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

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

where

BE_y – baseline GHG emissions in period *y*, tCO_2e;
$BE_{A,y}$ – baseline GHG emissions due to baseline land cultivation technology, in period *y*, tCO_2e;
[y] – 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.

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

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

where

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

$SOC_{p,y,i}$ – 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:

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

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 five-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):

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

Coefficients a, b (see Supporting Document 1) are determined using Microsoft Excel features by building a trend line on the basis of historical data over the 5 years prior to the project. The linear dependence has the lowest function error.

where
$k_{b,i,y}$ – humus content in the soil of field *i* 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.

Key information and input data for baseline setting are provided in the tables below.

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

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	2007-2011 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 Donetsk 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 5 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)	0.3 m for corn and sunflower 0.25 m for grain crops
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:

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.

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

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

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 Donetsk region is the most realistic and plausible alternative to the Project implementation because it entails minimum expenses for LLC "Beta-Agro-Invest".
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, LLC "Beta-Agro-Invest" is not obliged to and not motivated to spend their own funds to build and improve the agricultural production system, according to Ukrainian legislation. There are neither programmes nor policies to bind LLC "Beta-Agro-Invest" to implement No-till technology and nothing puts legislative limits on the baseline scenario.
Alternative 1.2: LLC "Beta-Agro-Invest" did not conduct any agricultural modernization campaigns prior to the project. Moreover, LLC "Beta-Agro-Invest" has neither incentive nor means to implement the measures planned in the framework of the JI project in the absence of its support with mechanisms established by Article 6 of the Kyoto Protocol to the UN Framework Convention on Climate Change (Step 1.2, Step 2 and Step 3 below). LLC "Beta-Agro-Invest" 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*

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

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 – Benchmark analysis
The proposed project «Reduction of CO_2 emissions by systematic utilization of No-till technologies in agricultural industry» will be implemented by the project participant LLC "Beta-Agro-Invest". The approach proposed in paragraph 12 of the "Guidelines on the assessment of investment analysis" Version 05[21] provides for using of a discount rate that is determined by considering the weighted average cost of capital (WACC). WACC is calculated as a weighted average cost of own and debt capital. Since details on financing structure are not available, the structure of capital is taken in the form of 50% of own and 50% of debt capital. In accordance with paragraph 18 of the "Guidelines on the assessment of investment analysis" ver. 05[22], the cost of own capital is calculated as the sum of risk-free rate (3%), the risk premium on investment in own capital (6.5%) and country risk (6%)[23], according to the "Default values for the expected return on equity"[24]. Thus, the cost of own capital is 15.5%. The cost of debt capital is estimated at the average cost of credit in foreign

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

[21] http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf

[22] http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf

[23] http://pages.stern.nyu.edu/~adamodar/pc/archives/ctryprem05.xls

[24] http://cdm.unfccc.int/Panels/meth/meeting/11/049/mp49_an14.pdf

currency as of the beginning of 2005 according to the NBU, which was 11.58%[25]. The nominal discount rate (WACC) equals to 13.5%. Cash flow is adjusted by inflation index for eurozone in 2005 (2.2%)[26]
If the proposed project (not implemented as a JI project) has a less favourable rate, i.e. lower internal rate of return (IRR), than the total limit level, the project may not be considered as financially attractive.

Sub-step 2c – Calculation and comparison of financial indicators.
Financial analysis refers to the time of making investment decisions. The following assumptions were used based on information provided by the company.

- The project requires investment of approximately 6 million euros (According to the NBU's rate)[27];
- The project duration is 20 years (minimal term of the equipment operation);
- The residual value is calculated as the result of multiplication of unused resource by initial expenses.

Analysis of cash flow takes into account the cash outflow connected with investment and operating costs[28] and cash inflow associated with the receipt of revenues from the sale of products by the enterprise.
Financial Indicators of the project are given in Table 10 below.

Table 10. Financial indicators of the project

Revenues without VAT (EUR)	Cash flow (EUR)	Discount rate dr (%)	NPV (EUR)	IRR (%)	Residual value (EUR)
165659931	42222849	13,5%	-1858224	9,1%	2030960

The source of income and expenses of LLC "Beta-Agro-Invest" is the information provided by the company.
When analyzing the cash flow the IRR shows 10% that is below the established limit level of IRR which is 13.5%. As the result net present value (NPV) is negative. Therefore the project cannot be considered financially attractive.

Sub-step 2d: Sensitivity analysis
The sensitivity analysis is conducted to confirm whether the conclusions on the financial / economic attractiveness are stable enough for different reasoned variants of the change of baseline conditions.
The account of the following two key factors was taken in the sensitivity analysis: investment expenses as well as prices for agricultural products. According to the "Guidelines on the assessment of investment analysis" ver. 05 (Paragraph 21) the sensitivity analysis should be made for key indicators in the range of variation ± 10%.

Table 11. Company revenue

	-10%	0%	10%
Operational costs (ths EUR)	5310169.812	5310169.812	5310169.812
Investment costs (ths EUR)	1917776.436	1917776.436	1917776.436
Company revenue (ths EUR)	8523982.678	9471091.864	10418201.05
Net present value (NPV)	-10512132.3	-6137790.91	-2148761.928
Internal rate of return (IRR)	5.0%	9.1%	12.1%

Table 12. Investment costs

	-10%	0%	10%
Operational costs (ths EUR)	5310169.812	5310169.812	5310169.812

[25] http://www.bank.gov.ua/doccatalog/document?id=40070

[26] http://www.finfacts.ie/inflation.htm

[27] http://www.bank.gov.ua/Statist/ses.htm

[28] Supporting document 2

Investment costs (ths EUR)	2109554.079	1917776.436	1725998.792
Company revenue (ths EUR)	9471091.864	9471091.864	9471091.864
Net present value (NPV)	-5689924.28	-6137790.91	-6337083.51
Internal rate of return (IRR)	9.5%	9.1%	9%

The calculations are given in Supporting Document 2.

Sensitivity analysis was used to assess the sensitivity of the project to changes that may occur during the project implementation and operation. Analysis of changes in revenues from the sale of agricultural production in the range of -10% and +10% demonstrated that the IRR varies within 5% - 12.1%. Analysis of investment costs in the range of -10% and +10% demonstrated that the IRR varies within 9% - 9.5%. Expenditures that are considered in the framework of the project are high, and their increase will result in a negative NPV. Even in case of expected price of the investment and the income from the sale of ERUs the project is not viable and will not bring enough profit even in case of credit financing of the project and it should not make a profit even if the above changes in price of investment take place.
Outcome of Step 2: sensitivity analysis consistently supports (for a realistic range of assumptions) the conclusion that the project is unlikely to be financially / economically attractive.

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"[29] (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.

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

However, one of the alternatives is continuation of "business as usual" scenario. Since the barriers identified above are directly related to investment in technology upgrade, LLC "Beta-Agro-Invest" 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 (fields) where LLC "Beta-Agro-Invest" grows crop products using No-till technology (20 311,15 ha).

Table 13. An overview of all sources of emissions in the baseline scenario

Source	Gas	Included / Excluded	Substantiation / Explanation
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 14. 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: 21/05/2011
The baseline has been set by EVO CARBON TRADING SERVICES LTD, project developer, and LLC "Beta-Agro-Invest".

LLC "Beta-Agro-Invest".
Donetsk region, Ukraine
Ocheretyne urban-type settlement, Yasynuvatskyi district
Vitalii Anatoliiovych Hnennyi, Director
Telephone: (+38 06247) 21646

Fax: (+38 06247) 21646
LLC "Beta-Agro-Invest" is a project participant (stated in Annex 1).

EVO CARBON TRADING SERVICES LTD
869 High Road, London, United Kingdom, N12 8QA
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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[30] and is set on 22/02/2005, 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 [31] 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: 01/01/2007- 31/12/2012 (6 years, or 72 months), upon prolongation of the Kyoto Protocol: 01/01/2013- 30/12/2026 (14 years, or 168 months).
The date on which the first assigned amount units are expected to be generated, namely 01/01/2007, 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 01/01/2013-31/12/2026.
Prolongation of the crediting period beyond 2012 is subject to approval by the Host Party.

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

[31] 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)[32] 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.
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.
Humus (organic carbon) content of the soil cultivated using No-till technology are measured annually after the September harvesting by the Biotekhnika Engineering Institute, which is subject to certification in accordance with the state standards of Ukraine. The method is based on the oxidation of organic matter by potassium dichromate with further estimation of its amount used in the process of oxidation. The amount of dichromate used in oxidation is equivalent to the amount of organic carbon in the sample. The output organic carbon content is converted into humus content by multiplying the obtained value by the constant coefficient of 1.724 (according to GOST 23740-79*).
Thus, the obtained values of humus content in the soil can be converted back into the content of organic carbon knowing the constant coefficient on which humus content should be divided. The mass of samples may vary from 3 to 5 grams. The number of samples depends on the field area. A sample is taken from the grinded soil for further blenderizing preceded with removal of nutrients and plant residues. The sample is sieved through a wicker mesh (0.25 mm). Then the sample is blenderized in pounders and blenders from solid materials. No significant fluctuations of soil characteristics are expected, therefore this measurement periodicity is appropriate. Soil density in project fields is measured by the Biotekhnika Engineering Institute prior to the project for each field individually since no major fluctuations of the parameter are expected. Biotekhnika engineers measure soil density using standard bottle method. The Center conducts measurement of humus (organic carbon) content in accordance with state standards of Ukraine 4289:2004 "Soil quality. Methods for determining organic matter" by using the Tyurin method. Field areas are measured by agrotechnicians and verified by accountants of LLC "Beta-Agro-Invest" using GPS equipment installed in John Deere agricultural machinery.

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, %
ρ_i	Soil density at field *i* cultivated using traditional tillage before the start of the project, t/m^3

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

$h_{b,i}$	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	2007-2011 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 Donetsk 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)	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

applied	
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 5 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)	0.3 m for corn and sunflower 0.25 m for grain crops
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[33]
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):

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

GHG emissions in the Baseline scenario:

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

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

where

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

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

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

where
$BE_{A,y}$ – baseline GHG emissions due to baseline land cultivation technology, in period y, tCO_2e;
$BE_{A,i,y}$ – baseline GHG emissions due to baseline land cultivation technology, in period y, tCO_2e;
[y] – 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)[34]:

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

where
$BE_{A,i,y}$ – baseline GHG emissions due to baseline land cultivation technology, in period y, tCO_2e;
$S_{p,i}$ –area of field *i* cultivated using No-till technology, ha;
$SOC_{p,y,i}$ – soil organic carbon content in the soil of field *i* cultivated using No-till technology in period *y*, t C/ha;
$SOC_{b,y,i}$ – soil organic carbon content in the soil of field i cultivated using traditional tillage technology in period y, t C/ha;

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

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.

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*[35])

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

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 five-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):

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

Coefficients a, b (see Supporting Document 1) are determined using Microsoft Excel features by building a trend line on the basis of historical data over the 5 years prior to the project. The linear dependence has the lowest function error.

where
$k_{b,i,y}$ – humus content in the soil of field i 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.

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 I 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 I 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:

$$ER_y = BE_y - PE_y \qquad (8)$$

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"[36] 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"[37], LLC "Beta-Agro-Invest" 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.

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

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

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

To implement the project the operational structure was created; it includes LLC "Beta-Agro-Invest" agrotechnicians and engineers (responsible for accounting of area treated with No-till technology), the Biotekhnika Engineering Institute (responsible for provision of agrochemical data for project monitoring), LLC "Beta-Agro-Invest" chief agrotechnician (recording and reporting data in the table), and LLC "Beta-Agro-Invest" manager (data processing and archivation). The data subject to monitoring and required for the determination and further verification will be archived and stored in paper and electronic form at LLC "Beta-Agro-Invest"for two years after the transfer of emission reduction units generated by the project.
Management structure includes the Director of LLC "Beta-Agro-Invest" and developers of the project (EVO CARBON TRADING SERVICES LTD).
Detailed operational structure and data collection scheme for the project activity are provided in Figure 5.

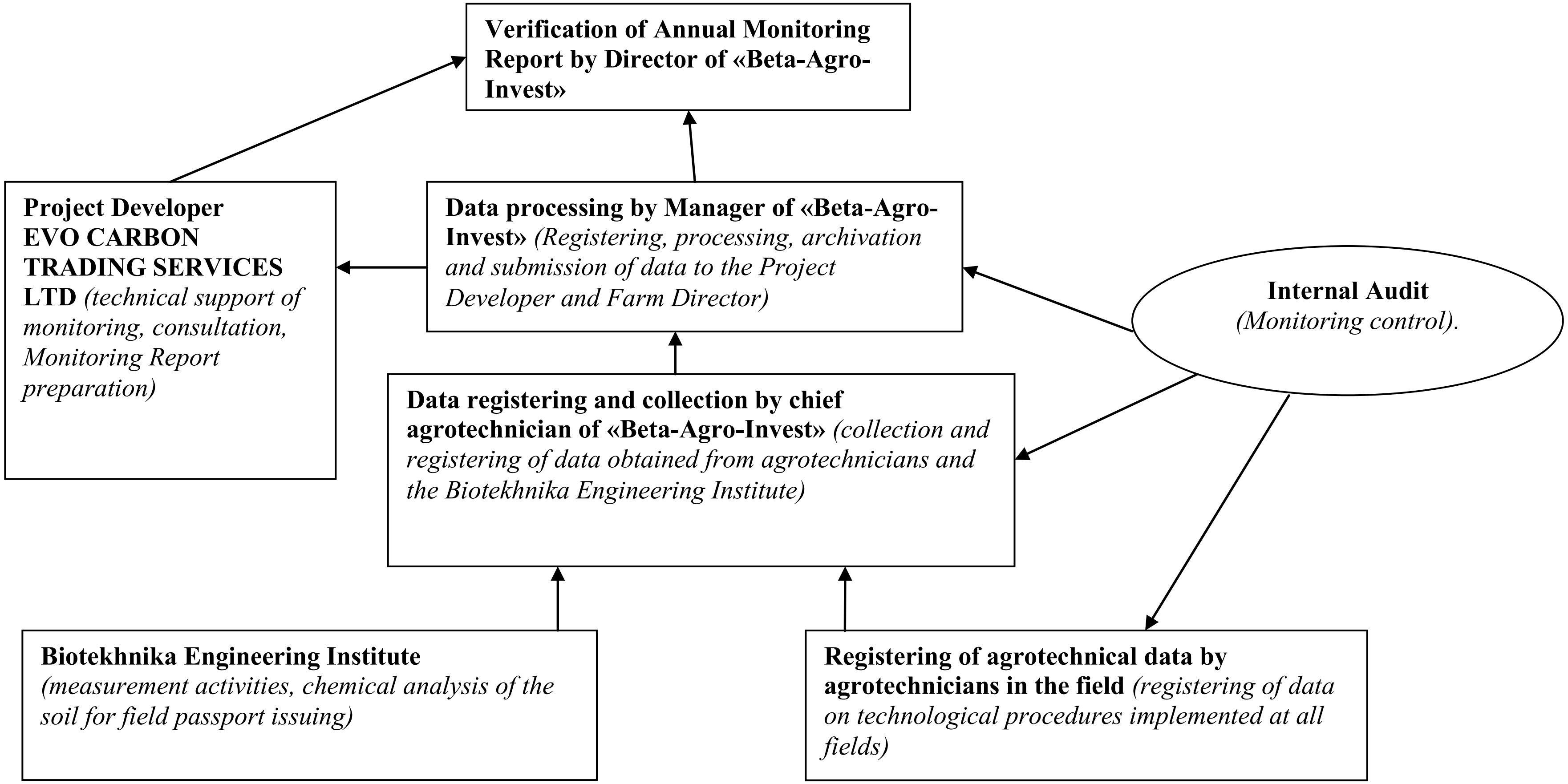

Figure 5. Operational structure and data collection scheme for project monitoring.

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

Monitoring plan is set by LLC "Beta-Agro-Invest" and EVO CARBON TRADING SERVICES LTD

LLC "Beta-Agro-Invest".
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LLC "Beta-Agro-Invest" is a project participant (stated in Annex 1).

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EVO CARBON TRADING SERVICES LTD is a project participant (stated in Annex 1).

Technical consultants
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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 are absent.

E.2. Estimated leakage:

No leakage is expected.

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

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

E.4. Estimated baseline emissions:

Baseline emissions are estimated according to the formulae provided in Section D.1.1.4.
Calculation results are provided in tables below. Calculations are provided in Supporting Document 1 attached to the PDD.

Table 15. Estimated baseline emissions in the period of January 1, 2007– December 31, 2007

Year	Estimated baseline emissions (t CO_2 equivalent)
2007	17 293
Total (t CO_2 equivalent)	**17 293**

Table 16. Estimated baseline emissions in the period of January 1, 2008 - December 31, 2012

Year	Estimated baseline emissions (t CO_2 equivalent)
2008	41 724
2009	76 201
2010	108 609
2011	151 406
2012	182 923
Total (t CO_2 equivalent)	**560 863**

Table 17. Estimated baseline emissions in the period of January 1, 2013 - December 31, 2026

Year	Estimated baseline emissions (t CO_2 equivalent)
2013	182 923
2014	182 923
2015	182 923
2016	182 923
2017	182 923
2018	182 923
2019	182 923
2020	182 923
2021	182 923

2022	182 923
2023	182 923
2024	182 923
2025	182 923
2026	182 923
Total (t CO_2 equivalent)	**2 560 922**

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

Emission reductions are calculated according to formula (8) given in section D.1.4.
Results are provided in the tables below. Calculations are provided in the Supporting Document 1, attached to the PDD.

Table 18. Estimated emission reduction for the period January 1, 2007– December 31, 2007

Year	Estimated emission reduction (t CO_2 equivalent)
2007	17 293
Total (t CO_2 equivalent)	**17 293**

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

Year	Estimated emission reduction (t CO_2 equivalent)
2008	41 724
2009	76 201
2010	108 609
2011	151 406
2012	182 923
Total (t CO_2 equivalent)	**560 863**

Ttable 20. Estimated emission reduction for the period January 1, 2013 - December 31, 2026

Year	Estimated emission reduction (t CO_2 equivalent)
2013	182 923
2014	182 923
2015	182 923
2016	182 923
2017	182 923
2018	182 923
2019	182 923
2020	182 923
2021	182 923
2022	182 923
2023	182 923
2024	182 923
2025	182 923
2026	182 923
Total (t CO_2 equivalent)	**2 560 922**

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

Table 21. Table containing results of estimation of emission reductions for the period from January 1, 2007 to December 31, 2007

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)
2007	0	0	17 293	17 293
Total (t CO_2 equivalent	0	0	**17 293**	**17 293**

Table 22. 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	41 724	41 724
2009	0	0	76 201	76 201
2010	0	0	108 609	108 609
2011	0	0	151 406	151 406
2012	0	0	182 923	182 923
Total (t CO_2 equivalent	0	0	**560 863**	**560 863**

Table 23. 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 equivalent)	Estimated baseline emissions (t CO_2 equivalent)	Estimated emission reduction (t CO_2 equivalent)
2013	0	0	182 923	182 923
2014	0	0	182 923	182 923
2015	0	0	182 923	182 923
2016	0	0	182 923	182 923
2017	0	0	182 923	182 923
2018	0	0	182 923	182 923
2019	0	0	182 923	182 923
2020	0	0	182 923	182 923
2021	0	0	182 923	182 923
2022	0	0	182 923	182 923
2023	0	0	182 923	182 923
2024	0	0	182 923	182 923
2025	0	0	182 923	182 923
2026	0	0	182 923	182 923
Total (t CO_2 equivalent	0	0	**2 560 922**	**2 560 922**

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"[38] 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»[39], LLC «Beta-Agro-invest» is not obliged to carry out EIA development for this type of project.

In general, the project will have positive impact on the environment because the replacement of conventional tillage with No-till technology will result in lower GHG emissions into the atmosphere and lower diesel fuel consumption for LLC «Beta-Agro-invest» 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.

SECTION G. Stakeholders' comments

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

LLC "Beta-Agro-Invest" informed the community through mass media. All comments received were positive. No negative comments on the project have been reported.

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

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

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

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Project technical consultant

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Annex 2

BASELINE INFORMATION

Key information for baseline setting is provided in the tables below:

Data/Parameter	$S_{p,i}$
Data unit	ha
Description	Area of field *i* cultivated using No-till technology
Source of data (to be) used	2007-2011 Field Registry of the Farm
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Data from the Land Inventory are applied. If the area of the field cultivated in the corresponding year changes, the actual area is measured using GPS equipment.

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

Data/Parameter	$k_{b,i,y}$
Data unit	%
Description	Humus content in the soil of field *i* cultivated using traditional tillage in period *y*
Source of data (to be) used	Calculated using data defined for every field *i* prior to the start of the project
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.

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

Data/Parameter	$h_{b,i}$
Data unit	m
Description	Depth of soil layer disturbance at field *i* when conventional tillage

	is applied
Source of data (to be) used	Company data; ploughing depth is a fixed value (for each crops) for traditional land cultivation.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This is the usual depth of soil layer disturbance when conventional tillage is applied[40]

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.

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

Annex 3

MONITORING PLAN

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

Monitoring data and parameters:

Data/Parameter	$S_{p,i}$
Data unit	ha
Description	Area of field *i* cultivated using No-till technology
Time of determination /monitoring	Annually
Source of data (to be) used	2007-2011 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 Donetsk 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

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) John Deere 5430i Self Propelled Sprayer for herbicide application. Brief specifications are available below as well as at the manufacturer's website[41].

Figure 1. John Deere 5430i Self Propelled Sprayer

Table 21. Specifications of John Deere 5430i

Specifications	
Fuel tank capacity	4 000 l
Sprayer boom	33 m
Engine	PowerTech Plus Diesel, Tier III
Engine capacity	6.8 l
Engine rating	169 kW/230 hp

- ***Equipment for sowing:***
  a) John Deere 1780 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[42]

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

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

Figure 2. John Deere 1780 No-Till Box Drill

John Deere *1780* 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 1780 No-Till Box Drill

Working width	5.6m	
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. [43]

Figure 3. John Deere 8530 tractor

Figure 4. John Deere 8520 tractor

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

John Deere *8530* and *8520* are third-class power rating tractors 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 and 8520 tractors

Model	**8530**	**8520**
Nominal engine power, kW (hp) ECE-R24	236	220
Maximum capacity of rear hinge-plate, kg	10249	8320
Operation weight without ballast, kg	14000	9822
Total length, mm	5850	5850
Total width, mm	2540	2540
Height from the ground to the upper point, mm	3150	3120
Wheelbase, mm		
Front	600	480
Rear	800	420

John Deere 6930 is a universal machine with high functionality. These tractors are ideal sowing and tillage tools used in crops growing and feed industry. Great weight and extended wheelbase of these tractors provide high maneuring ability. An overview and specifications are available below as well as on the seller's website.[44]

Figure 5. John Deere 6930 Tractor

Table 4. John Deere 6930 Tractor specifications

Model	6930
Nominal engine power, kW (hp) ECE-R24	100 (150)
Maximum capacity of rear hinge-plate, kg	8400
Operation weight without ballast, kg	5880
Total length, mm	4728

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

Total width, mm	2382
Height from the ground to the upper point, mm	2906

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.[45]

Figure 6. 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

John Deere 8345R and John Deere 8360R. John Deere 8R series tractors combine legendary performance and reliability. Narrow body and panoramic vision provide the possibility to monitor and control operations whenever they take place. Moreover, John Deere 8360R are equipped with new 9.0 l John Deere PowerTech Plus engines. An overview and specifications are available below as well as on the seller's website.[46]

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

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

Figure 7. John Deere 8360R Tractor

Figure 8. John Deere 8345R Tractor

Table 6. John Deere 8345R and 8360R Specifications

Model	**8345R**	8360R
Nominal engine power, kW (hp) ECE-R24	345	360
Fuel tank capacity, l	681	
Operation weight without ballast, kg	14000	13000
Wheelbase, mm Front Rear	 620 620	 600 710