JOINT IMPLEMENTATION PROJECT

"Reduction of CO2 emissions by systematic utilization of No-till technology in agriculture at LLC "Ahrodar LTD"

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

LLC "Ahrodar LTD"

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	PS	

Kiev - 2012

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

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SECTION A. General description of the project

A.1. Title of the project:

Reduction of CO_2 emissions by systematic utilization of No-till technology in agriculture at LLC“Ahrodar LTD”

Sectoral scope:
Sector 15 - Agriculture.

PDD Version: 02

Date: October 19, 2012

A.2. Description of the project:

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

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

Situation that existed prior to the Project
“Ahrodar LTD” LLC” (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. The company is also engaged in dairy farming with the purpose of milk realization and also provides services on cropping grain and grain legumes.
Before the starting project at "Ahrodar LTD" LLC used conventional tillage system. This farming system consists of machined soil, which provides rotation of its surface layer to create a uniform seedbed with friable soil.

The baseline scenario
The baseline scenario provides for use of traditional technology tillage of soil that consists of mechanical treatment of soil which results in CO_2 emissions.The basic operation causing CO_2 emissions is ploughing during which crop residues are buried in the soil and weeds are removed. For more details on this technology see Section B.

In 2006, the Farm started to grow crops applying No-till technology (also referred to as “direct sowing technology”) (see Table 1). This technology differs from the traditional technology with fewer technological procedures, which prevents the topsoil from a major disturbance, as well as with the way to utilize plant residues. The number of technological procedures of plant growing and harvesting is almost the same in the two technologies, the main difference being that the traditional technology separates fertilizer application, land ploughing, cultivation furrowing and seeding (multiple passage of the machinery in the field) in contrast to direct sowing with simultaneous fertilizer application (single 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.**

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 farmlands, which causes their exhaustion and has a negative effect on the yields. Humus, which is lost, oxidize and in a form of carbon dioxide released into the air. In addition, loss of humus soil causes exhaustion and negatively affect yield of crops.

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 No-till technology

Year	Area	
	ha	share in the total farmland area of the Farm, %
2006	7543,5163	100
2007	7543,5163	100
2008	7543,5163	100
2009	7543,5163	100
2010	7543,5163	100
2011	7543,5163	100
As of 07/2012	7543,5163	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.

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 use of chemical fertilizers for crops production;
b) lower impact of weather conditions on yields;
c) lower wind and water soil erosion, better soil fertility.

Table 2. Historical details of the project

Project milestones	Documentary evidence	Date
Purchase of equipment for No-till	# B-0619 Goods delivery note	29/08/2005

Preparation and submission of the project idea note to support anthropogenic GHG emissions reductions, to the State Environmental Investment Agency of Ukraine.	Supporting materials on the JI project "Reduction of CO_2 emissions by systematic utilization of No-till technology in agriculture at LLC "Ahrodar LTD"	28/08/12
Obtaining of a Letter of Endorsement from the State Environmental Investment Agency of Ukraine	Letter of Endorsement No.3086/23/7 for the Joint Implementation project "Reduction of CO_2 emissions by systematic utilization of No-till technology in agriculture at LLC "Ahrodar LTD" dated 18/10/2012	18/10/2012

A.3. Project Participant

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)	• "Ahrodar LTD" LLC"	No
Estonia	• LHCarbon OÜ	No
* Please indicate if the Party Involved is a Host party		

"Ahrodar LTD" LLC" is an organization that implements the project (Applicant, Supplier). ESREOU code – 31790783; type of activity – 01.11.0 - Growing of wheat, corn, sunflower, barley, sugar beets and other crops. "Ahrodar LTD" LLC" is responsible for project activities implemented using in-house man-power or by subcontractors. The enterprise provides project financing and receives no profit. LLC "Ahrodar LTD " will be responsible for all administrative issues of the host party and investor country.

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

A.4. Technical description of the project:

A.4.1. Location of the Project:

The project is located in Kirovohrad region, Ukraine.
The geographical location of the project is shown in Figure 1.

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

Figure 2. Location of agricultural facilities of "Ahrodar LTD" LLC" on the map of Kirovohrrad region – Oleksandrivka and Onufriivka districts (marked areas)

A.4.1.1. Host Party(ies):

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

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

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

Kirovohrad region.

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

“Ahrodar LTD” LLC” facilities are located in Oleksanrdivka and Onufriivka districts of Kirivihrad region, Ukraine.

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

Headquarters of “Ahrodar LTD” LLC”
Berezivka village, Oleksandrivka district, Kirovohrad region, Ukraine
Coordinates of Berezivka:
Latitude: 48°44’41’’ N
Longitude: 33°05’50’’ E

Berezivka is a village located in Oleksandrivka district, Kirovohrad region. Population – 587 people. Local government - Protopopivska Village Council.
Kirovohrad region - the administrative and territory unit of Ukraine. Area - 24.600 km² (4.1% of the total territory of Ukraine). Population - 999 401 people (01/05/2012).

The JI project is planned to be implemented in the territory of agricultural facilities of “Ahrodar LTD” LLC”:

Table 3. Agricultural facilities of “Ahrodar LTD” LLC” where the JI project is implemented

Region	District
Kirovohrad	Oleksandrivka
Kirovohrad	Onufriivka

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 direct seeding requirements.

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

There is one more important element of the systematic use of No-till technology in addition to strict fulfilment of all technological procedures that must be synchronized in time and space. It is specialized

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

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 No-till technology to all crop areas, the pilot application of direct sowing technology and preparation of agricultural resources for "Ahrodar LTD" LLC" were carried out on the basis of import John Deere and Case sowing complexes.
The project provides for the use of technology that corresponds to current global practice. In particular, such countries as the USA, Brazil, Argentina, and Canada started to implement o-till technology back in the 1980s. Some of these countries apply No-till technology 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] and Case[5] and Belarus[6]. Operation of this equipment requires relevant staff training. All the personnel will be trained in accordance with the requirements. Project activity is unlikely to be replaced during the project life because this technology meets the modern agricultural standards.
Technological issues of soil cultivation using the traditional technology and No-till technology are provided in Table 4.

Table 4. Main activities disturbing topsoil

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

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

1. Planning crop rotation and rotation cultures

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

[3] http://ru.wikipedia.org/wiki/%D0%A1%D0%B8%D1%81%D1%82%D0%B5%D0%BC%D0%B0_%D0%BD%D1%83%D0%BB%D0%B5%D0%B2%D0%BE%D0%B9_%D0%BE%D0%B1%D1%80%D0%B0%D0%B1%D0%BE%D1%82%D0%BA%D0%B8_%D0%BF%D0%BE%D1%87%D0%B2%D1%8B
[4] http://www.deere.ua/wps/dcom/uk_UA/regional_home.page
[5] http://www.caseih.com/distributor_en/Pages/home.aspx
[6] http://www.belarus-tractor.com/

Figure 3. Soil covered with crop residues

As No-till technology slows down the warming of the soil, yields may decrease either if vegetation period is shorter than the total of effective temperature periods or if the soil has poor drainage system. In order to minimize the risk of slow soil warming, the project provides for balance of sufficient soil cover and achievement of soil warming at the beginning of the vegetation period.

Project crop rotation schemes are provided in Table 5.

Table 5. Possible crop rotation schemes

Crop rotation # 1	Crop rotation # 2	Crop rotation # 3	Crop rotation # 4
Barley	Sunflower	Winter wheat	Com
Winter wheat	Pea	Sunflower	Soybean
Com	Winter wheat	Com	Winter wheat
Soybean	Com	Barley	Com
Winter wheat	Winter wheat	Com	Sunflower

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

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

2. Evaluation of soil

Soil analysis is necessary to achieve a balanced pH ratio; it is important for achieving the best results in the No-till system. If low content of any element is detected in the soil, corresponding fertilizers, including lime, should be applied, to achieve at least average rates of any element at the beginning and ultimately a high level of nutrients in the soil. Usually direct sowing technology causes high moisture content and low temperature in the top layer of the soil, which allows roots to develop well under the mulch and consume a large amount of phosphorus in this layer. If the analysis shows a low level of phosphorus, it will be increased to a level above average. If necessary, a surface lime application will be made every 2-3 years in amount from 1/7 to ½ of the normal amount.

3. Crop residue management

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

4. Topsoil management

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

Removal of soil compaction. Many years of ploughing with the same tools, especially when the soil is moist, result in plough pans at a depth of 20 cm and more, depending on the depth of ploughing[7], as well as in compacted layer of the soil at a depth of 40-45 cm[8] due to the pressure of heavy equipment moving across the field. In some cases, the soil develops paedogenetic (natural) compaction. The first stages of No-till implementation may show poor yields and low profit without a prior anti-compaction campaign. Natural and ploughing-caused compaction should be eliminated with a chisel plough or other deep tillage tools.

Mulching the soil surface. Almost all the benefits of No-till system arise from permanent soil cover and only a few of them are caused by refusal from ploughing. No-till system will not be effective with little amount of crop residues.

5. Weed control

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

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

6. Mound-mice population control

Growth of mound-mice population is one of the problems in the area of the project location that may be aggravated after the refusal from ploughing. During their life cycle, the mice create mounds which make the use of No-till technology less efficient given the basic requirement of smooth ground surface. The project budget includes the cost of Baktorodentsyd (formulation: loose granules populated by single-purpose murine typhus bacillus Salmonella enteritidis). The preparation is spread in 10-gramme portions within 5-meter radius from rodent habitats.

All the above-mentioned steps are necessary technological procedures of No-till technology implementation, leading to GHG emission reductions.

The project provides for the implementation of agricultural machinery, namely:

- John Deere 1890 Drill of direct seeding
- KINZE 3600 Precision seeder
- KINZE 3700 Precision seeder
- MAP II 3250 Self-propelled sprayer
- AXIS 30.1K Fertilizer sprayer

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[7] 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

[8] 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

- RC-25 Trailer chipper nutrient residues
- Case MX 310 Tractor
- John Deere W 650 Combine
- John Case 8940 Tractor
- John Deere 8335 R Tractor
- John Deere 8430 Tractor

With proper technical maintenance replacement of equipment which was implemented under the project during the years of the project activity is not expected since implementing technology is in line with modern practice of agriculture. Training of workers and specialists of "Ahrodar LTD" LLC will be in accordance with existing practice before the project and, an if appropriate, namely the lack of skills for working with agricultural machinery which implemented within the project activity, the manufacturers/suppliers of equipment will conduct briefings and training , due to contracts for the purchase of equipment.

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

The use of John Deere[9] and Case[10] and Belarus[11] 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 the JI project schedule at the Farm.

Table 6. Schedule of JI project implementation at the Farm

№	Project stage	Period
1	Preparation of feasibility study	2005
2	Equipment purchase	2005-2012
3	Implementation of No-till technology	2006

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

– In Ukraine there are no legal requirements associated with the introduction of direct sowing technology instead of conventional mechanical tillage systems. Implementation of this project could only be an initiative of an enterprise itself. No significant changes in the legislation that could force enterprises to give up the existing tillage practice, involving ploughing, are expected.
– GHG emission restrictions are absent and not expected to be implemented until 2012 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

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

[10] http://www.caseih.com/distributor_en/Pages/home.aspx

[11] http://www.belarus-tractor.com/

productivity and use of new machinery. The project is not attractive enough in terms of investment without the income from sales of emission reduction units (ERUs)
- Without the project activity, LLC "Agrodar LTD" would continue its regular activities, which consists in mechanical tillage, resulting in GHG emissions. Thus, without the project activity, GHG emission reductions are impossible.

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

Table 7. Estimated emission reductions before the first commitment period

	Years
Duration of the crediting period	2
Years	Estimated annual GHG emission reductions in tonnes of CO_2 equivalent
2006	19 592
2007	41 675
Total estimated GHG emission reductions in the crediting period (tonnes of CO_2 equivalent)	**61 267**
Annual average of estimated GHG emission reductions over the crediting period (tonnes of CO_2 equivalent)	**30 634**

Table 8. Estimated emission reductions for the first commitment period

	Years
Duration of the crediting period	5
Years	Estimated annual GHG emission reductions in tonnes of CO_2 equivalent
2008	58 508
2009	81 110
2010	101 957
2011	121 709
2012	145 724
Total estimated GHG emission reductions over the crediting period (tonnes of CO_2 equivalent)	**509 008**
Annual average of estimated GHG emission reductions over the crediting period (tonnes of CO_2 equivalent)	**101 802**

Table 9. Estimated emission reductions after the first commitment period

	Years
Duration of the crediting period	13
Years	Estimated annual GHG emission reductions in tonnes of CO_2 equivalent
2013	145 724
2014	145 724
2015	145 724

2016	145 724
2017	145 724
2018	145 724
2019	145 724
2020	145 724
2021	145 724
2022	145 724
2023	145 724
2024	145 724
2025	145 724
Total estimated GHG emission reductions over the crediting period (tonnes of CO_2 equivalent)	**1 894 412**
Annual average of estimated GHG emission reductions over the crediting period (tonnes of CO_2 equivalent)	**145 724**

A.5. Project approval by the Parties involved:

Letter of Endorsement No. 3086/23/7 dated 18/10/2012 for the Joint Implementation project “Reduction of CO_2 emissions by systematic utilization of No-till technology in agriculture at LLC “Ahrodar LTD” was issued by the State Environmental Investment Agency of Ukraine.

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

SECTION B. Baseline

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

According to p. 9 of the "Guidance on criteria for baseline setting and monitoring", Version 03[12], approved by the JI Supervisory Committee[13], project participants may select either:

(a) An approach for baseline setting and monitoring developed in accordance with appendix B of the JI guidelines (JI-specific approach); or
(b) A methodology for baseline setting and monitoring approved by the Executive Board of the clean development mechanism (CDM); or
(c) An approach for baseline setting and monitoring already taken in comparable JI cases.

When the project was under development, there were no approved CDM methodologies for this type of activity. Therefore, the proposed project applies a specific approach to baseline setting and monitoring based on provisions of the following documents:
Calculation of greenhouse gas emissions due to ***mechanical tillage*** when traditional farming technology is applied:
- *2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 5, Vol. 4, 5.2.3. Soil Carbon (Agriculture, Forestry and Other Land Use)* [14]
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).*[15]
Provisions of this Tool are used for calculation of CO_2 emissions due to mechanical tillage in the course of crops production.

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

The specific approach applied in the project is based on constant monitoring of field areas (land use is situation-dependent), where CO_2 emissions occur, as well as such parameters as humus content in the soil of the field, soil density, list of crops grown by the Farm (new crops may be introduced during the project implementation).
Anthropogenic GHG emissions from this project take place at cultivated lands, namely farmlands, due to the commercial activity. (Cultivated land includes lands occupied by annual and perennial crops, as well as black fallow lands) According to 2006 IPCC Guidelines (IPCC Chapter 1 Vol.4)[16] , the project boundary may include the following GHG emissions:

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

No-till technology, i.e. the project scenario, provides for lower amount of nitrogen fertilizers used for crops growing than the baseline scenario[17]. Thus, the project scenario provide for lower N_2O emissions. However, according to the conservative principle, project participants do not include N_2O into the project boundary.

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

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

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

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

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

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

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

The proposed project applies a JI-specific approach based on the JI Guidance on criteria for baseline setting and monitoring, Version 03[18], which meets with the requirements of Decision 9/CMP.1[19], Appendix B of the "Criteria for baseline setting and monitoring".

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

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

To set the baseline scenario and further development of additionality justification in Section B.2. the following was taken into account:
- State policy and applicable law in the agrarian sector;
- Economic situation in the agrarian sector of Ukraine and demand forecast for agricultural products;
- Technical aspects of agricultural land management system;
- Availability of capital (including investment barriers);
- Local availability of technology / equipment;
- Price and availability of fuel.

Step 2. Application of the approach chosen.

The choice of the plausible baseline scenario is based on assessment of coal mining alternatives, which potentially could occur as of 2006.

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

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

Alternative 1.1: Continuation of the existing practice without the JI project implementation, which provides for the use of tillage technology. 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 sm depth. Then mineral fertilizers are applied and soil is simultaneously ploughed with a plough-point to a depth of up to 20-30 sm. 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.

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

[19] http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=2

This technology allows the "Ahrodar LTD" LLC to keep its yields at a sustainable level without re-equipment, with subsequent ineffective combustion of fossil fuels in obsolete agricultural machinery and disturbance of the soil to a depth of up to 20-30 sm.
This *Alternative* is the most plausible baseline scenario, as it:

- allows growing required amount of crops
- requires no investment into new technological equipment.

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

Alternative 1.2: Proposed project activity without the use of the JI mechanism. Project No-till technology with zero tillage provides either direct sowing into the soil previously sprayed with herbicides or sowing in the spring with stubble drill with starter dose of fertilizer application after the soil reaches maturity. The technology also involves spraying of crops with herbicides and, if necessary, insecticides. Harvesting is traditionally made by combines. Zero tillage eliminates ploughing and soil cultivation and implies extensive use of plant protection agents.
This Alternative is the least plausible baseline scenario because:

- it requires large investment in new equipment;
- it requires higher expenses for chemical plant protection from weeds, pests and diseases;
- it requires compliance with higher requirements towards the use of plant protection agents, mineral fertilizers, ameliorants; there may be difficulties with the use of organic fertilizers which are inefficient unless directly applied in the soil;
- there are significant financial risks for the enterprise since not all cultures give high yields with zero tillage.

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

Alternative 1.3: Partial implementation of the project (only some of project activities implemented) without the use of the JI mechanism. This alternative provides for exclusion of any non-core activities from the project, such as introduction of tractors, combines, etc. Since the proposed new technology is a complex process that requires a comprehensive approach, the partial implementation will not lead to neither extensive implementation of No-till technology no 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 above alternatives shows that *Alternative 1.1* is the most plausible one.

The investment analysis (see Section B.2) showed that *Alternatives 1.2* and 1.3 could not be considered as the most attractive ones from a financial standpoint. The results of simple cost analysis carried out in accordance with the "Tool for the demonstration and assessment of additionality" (Version 06.0.0)[20] in Section B.2. show that the project is additional.

Baseline scenario

The baseline scenario provides for continuation of current practices of traditional mechanical tillage system that involves ploughing process. The issues of application of this technology are provided above. Continuation of this practice is characterized by a continuous reduction of humus (soil organic carbon) content in the soil caused by the following factors:

- soil organic carbon oxidation and its emission into the atmosphere in the form of CO_2 as a result of soil turnover during tillage;
- activity of aerobic organisms, which consume the organic component of the soil in the course of tillage.

[20] 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). [21]

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 field No.75 (field 75-50,65 ha) in Oleksandrivka district, Kirovohrad region, Figure 4.

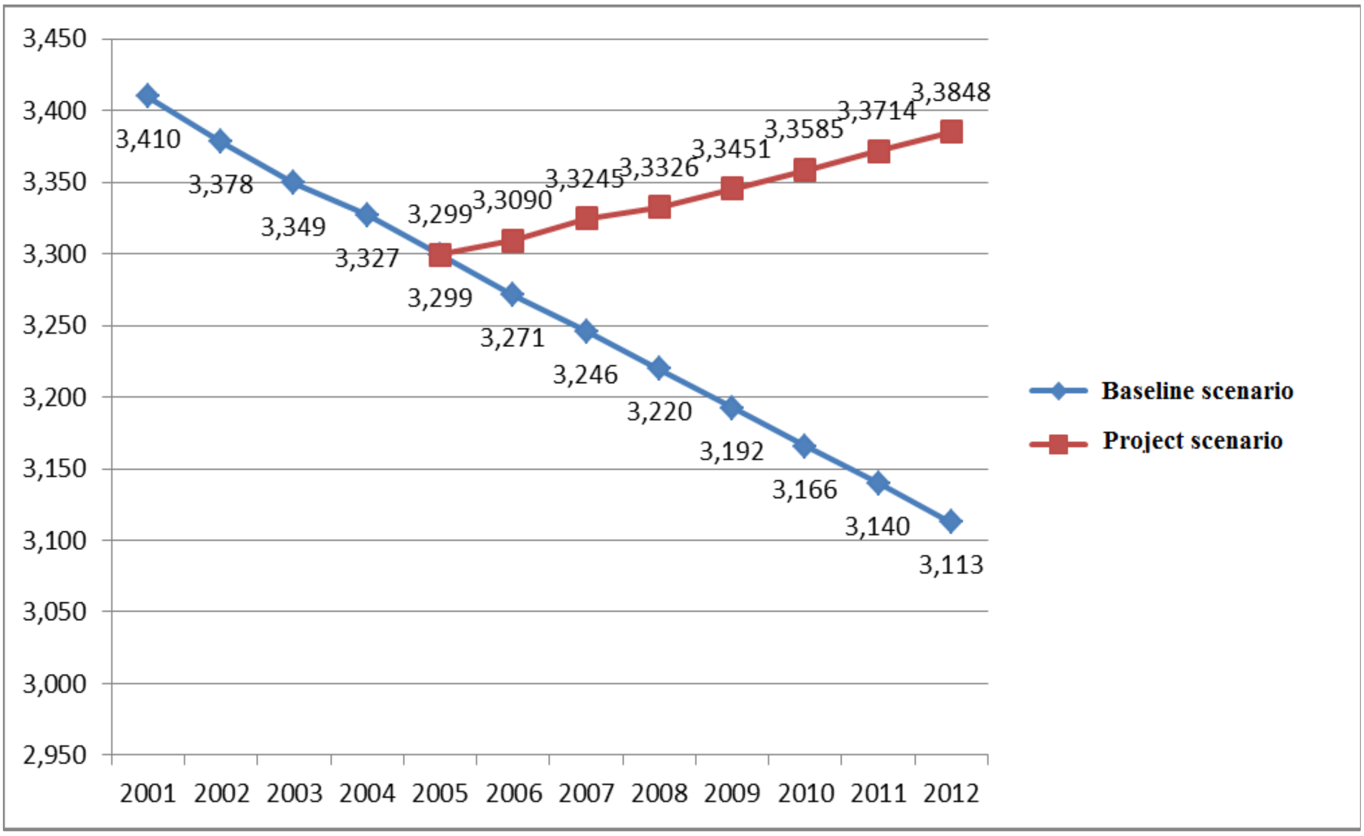

Figure 4. Humus content in soil of field No.75 (field 75-50.65 ha) in Oleksandrivka district, Kirovohrad region, Figure 4. for the baseline and the project scenarios.

Data on humus content in 2001-2005 for fields cultivated by baseline tillage technology, with similar crop rotation patterns were taken as historical data to establish the baseline.

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

The results of the baseline analysis indicate that humus content in the soil would have slid by 0.12% 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"[22]. Thus, further decline in humus content would lead to soil exhaustion and lower yields of the farm.

Detailed GHG emission calculations are provided in Section D.

Greenhouse gas emissions under the Baseline scenario:

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

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

Where:
BE_y – baseline GHG emissions in period "*y*", tCO_2eq;
$BE_{A,y}$ – baseline GHG emissions due to baseline land cultivation technology, in period "*y*", tCO_2eq;
[y] - index for monitoring period;
[A] – index for baseline land cultivation technology.

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

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

Where:
$BE_{A,y}$ – baseline GHG emissions due to baseline land cultivation technology, in period "*y*", tCO_2eq;
$BE_{A,i,y}$ – baseline GHG emissions due to baseline land cultivation technology, in period *y*"", tCO_2eq;
[y] - index for monitoring period;
[A] – index for baseline land cultivation technology;
[i] - index for number of fields.

Baseline GHG emissions due to baseline land cultivation technology, which involves tillage, for field i are calculated using the formula, according to the "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities" (Version 01.1.0)[23]:

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

Where:
$BE_{A,i,y}$ – baseline GHG emissions due to baseline land cultivation technology, in period *y*, tCO_2eq;
$S_{p,i}$ –area of field *i* cultivated using No-till technology, ha;
$SOC_{p,y,i}$ – soil organic carbon content in the soil of field "*i*" cultivated using No-till technology in period "*y*", t C/ha;
$SOC_{b,y,i}$ – soil organic carbon content in the soil of field "*i*" cultivated using traditional tillage technology in period "*y*", t C/ha;
44/12 – CO_2 to C molecular masses ratio;
0.9 – factor that takes account of 10% of emissions from the project activity, which includes creation of anti-fire furrows and minimal topsoil disturbance when No-till technology is implemented;
[y] - index for monitoring period;

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

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

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

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

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

Where:
$SOC_{p,y,i}$ – soil organic carbon content in the soil of field "*i*" cultivated using No-till technology in period "*y*", t C/ha;
$h_{b,i}$ – depth of soil disturbance in field "*i*" cultivated using traditional tillage, m;
ρ_i– pre-project soil density in field "*i*", cultivated using traditional tillage, 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*[24])
10000 – m^2 to ha conversion coefficient;
[y] - index for monitoring period;
[b] - index for baseline technology;
[p] - index for project technology;
[i] - index for number of fields.

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

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

Where:
$SOC_{b,y,i}$ – soil organic carbon content in the soil of field "*i*" cultivated using traditional tillage technology in period "*y*", t C/ha;
$h_{b,i}$ – depth of soil disturbance in field "*i*" cultivated using traditional tillage, m;
ρ_i– pre-project soil density in field "*i*", cultivated using traditional tillage before starting the project, t/m^3;
$k_{b,i,y}$ – humus content in the soil of field "*i*" cultivated using traditional tillage technology, %;
1,724 – organic carbon to humus conversion coefficient (according to GOST 23740*[25])
10000 – m^2 to ha conversion coefficient;
[b] - index for baseline technology;
[y] - index for monitoring period;
[i] - index for number of fields.

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

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

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*" cultivated using traditional cultivation technology in period "*y*", %;

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

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

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

Baseline analysis showed that humus content in the soil will drop by 0.4-0.5% over the 20 years of the project life.

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

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

Data / Parameter	$k_{p,i,y}$
Data unit	%
Description	Humus content in the soil of field "*i*" cultivated using No-till technology in period "*y*"
Time of determination/monitoring	Annualy
Source of data (to be) used	Measurement logs of soil quality indicators
Value of data applied (for ex ante calculations/determinations)	See Supporting Document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The Research Laboratory determines the value of humus content in soil according to the State Standard of Ukraine 4289:2004 and fills in field passports with these data
QA/QC procedures (to be) applied	The Research Laboratory
Any comment	Data will be archived in paper and electronic format.

Data / Parameter	$k_{b,i,y}$
Data unit	%
Description	Humus content in the soil of field "*i*" cultivated using traditional tillage technology in period "*y*"
Time of determination/monitoring	Calculated using data defined for every field "*i*" prior to the start of the project

Source of data (to be) used	Measurement logs of soil quality indicators
Value of data applied (for ex ante calculations/determinations)	See Supporting Document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The content of humus in the soil for the baseline scenario is calculated, taking into account its linear decrease over time, under the condition of the use of conventional mechanical tillage that involves ploughing. This linear dependence is based on the historical data using the least square method.
QA/QC procedures (to be) applied	Historical data for the 5 years prior to the start of the project (provided in Supporting Document 1) are obtained from the Research Laboratory authorized to conduct measurements according to the state standards of Ukraine.
Any comment	Data will be archived in paper and electronic format.

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

Data / Parameter	$h_{b,i}$
Data unit	m
Description	Depth of soil layer disturbance at field "*i*" when conventional tillage is applied
Time of determination/monitoring	Determined at the beginning of the project activity
Source of data (to be) used	Company data; ploughing depth is a fixed value (for each crops) for traditional land cultivation.
Value of data applied (for ex ante calculations/determinations)	See Supporting Document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This is the usual depth of soil layer disturbance when conventional tillage is applied[26]
QA/QC procedures (to be) applied	N/A
Any comment	Data will be archived in paper and electronic format.

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

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

Additionality of the project

Additionality of the project activity is demonstrated and assessed below using the "Tools for the demonstration and assessment of additionality"[27] (Version 06.0.0). This tool was originally developed for CDM projects but it is also applicable to JI projects.

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

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

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

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

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

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

Alternative 1.1: Continuation of the current situation in the agricultural sector of Kirovohrad region and is the most realistic and plausible alternative to the Project implementation because it entails minimum expenses for "Ahrodar LTD" LLC.
According to Article 2 of the Law of Ukraine "On the basic principles of the governmental agrarian policy for the period until 2015"[28] 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, "Ahrodar LTD" LLC 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 "Ahrodar LTD" LLC to implement No-till technology and nothing puts legislative limits on the baseline scenario.
Alternative 1.2: "Ahrodar LTD" LLC did not conduct any agricultural modernization campaigns prior to the project. Moreover, "Ahrodar LTD" LLC has neither incentive nor means to implement the measures

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

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

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). "Ahrodar LTD" LLC 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 no substantial reduction in consumption of energy resources. Moreover, Alternative 1.3 requires investment in new equipment and is characterized by a lack of qualified personnel to service this equipment. Therefore, Alternative 1.3 may not be considered a plausible baseline.

Modernization activities in the agrarian industry without the use of JI mechanisms comply with binding laws and regulations. The legal consistency analysis was made for Alternative 1.1, which is similar in regards to consistency with mandatory laws and regulations for Alternatives 1.2 and 1.3.

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

Therefore, Step 1 is satisfied.

According to the "Tool for the demonstration and assessment of additionality" [29] (Version 06.0.0), further justification of additionality shall be performed by means of investment analysis.

Step 2 – Investment analysis.

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

Sub-step 2a - Determination of appropriate analysis method.

There are three methods used for investment analysis: a simple cost analysis (Option I); an investment comparison analysis (Option II); and a benchmark analysis (Option III). If the project activities and alternatives identified in Step 1 generate no financial or economic benefits other than JI related income, then the simple cost analysis (Option I) is applied. Otherwise, the investment comparison analysis (Option II) or the benchmark analysis (Option III) are used.

Additionality guidelines allow for performance of investment comparison analysis, which compares corresponding financial indicators for the most realistic and plausible investment alternatives (Option II), or the benchmark analysis (Option III). For this project it is appropriate to apply analysis using Option III, according to the instructions of the Additionality guidelines.

Sub-step 2b – Simple cost analysis

Project implementation will require costs in addition to the existing costs for the management of surface soil, control weeds, proper implementation of direct seeding. Project costs include: purchase of new agricultural technology. The cost of implementation and realization of project "Reduction of CO_2 emissions by systematic utilization of No-till technology in agriculture at LLC "Ahrodar LTD" constitute more than 42 291 ths. UAH.

Table 10. Investments

	FACT							**FORECAST**
Years	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**

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

Equipment costs, UAH	7032 5	7180 0	111265 8	4 712 650	1 658 965	10 154 182	11 547 577	11 291 440
Other, UAH	0	0	12 587	70 258	58 985	145 789	153 720	1 231 016
Total, UAH	**7032 5**	**7180 0**	**112524 5**	**4 782 908**	**1 717 950**	**10 299 971**	**11 701297**	**12 522 456**

The equipment used in this project is the best in terms of efficiency factor of performance and the technical solutions presented on the market of Ukraine the materials and equipment. An important parameter in the selection of equipment was the availability of spare parts in Ukraine.

At the start of the project at "Ahrodar LTD" LLC is using outdated agricultural machinery produced in the USSR.

The use of the Kyoto mechanisms to this project makes these measures cost effective and is the only way for their implementation.

Since the emission reduction does not bring economic benefit to "Ahrodar LTD" LLC except that which formed under the Joint Implementation Project (JI), concludes that the project is not possible without receiving proceeds under JI, as there is a barrier motivation for investment.

Outcome of Sub-step 2b - Realisation of project “Reduction of CO_2 emissions by systematic utilization of No-till technology in agriculture at LLC “Ahrodar LTD” require significant additional resources and therefore are not attractive from a financial point of view.

Sub-step 2c – Calculation and comparison of financial indicators.

According to the Additionality guidelines, the calculation and comparison of financial indicators was not conducted.

Sub-step 2d: Sensitivity analysis

According to the Additionality guidelines, the sensitivity analysis was not conducted.

Step 3: Barrier analysis

According to the Additionality guidelines, the barrier analysis was not conducted.

Step 4: Common practice analysis

Sub-step 4a. Analysis of other activities similar to the proposed project activity

Analysis similar activities demonstrated the absence of similar projects in Ukraine.

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

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

Sub-step 4b. Discussion of any similar Options that are occurring

N/A

According to the “Tool for the demonstration and assessment of additionality”[30] (Version 06.0.0), all steps are satisfied although there are some obstacles.

One of them is additional expenses for the JI project implementation to modernize operations.

The obstacle is associated with the structure of the existing tariffs for agricultural products, which does not consider investment in improvement of agrarian industry system by creating appropriate conditions

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

for the reduction of GHG emissions. This situation entails a constant fund shortage as well as the impossibility of timely technological updates and investment in infrastructure upgrade and development.
We may conclude that the above-mentioned factors might hamper the implementation of the proposed project as well as other alternatives - Partial implementation of the project (only some of project activities implemented) without the use of the JI mechanism.
However, one of the alternatives is continuation of "business as usual" scenario. Since the barriers identified above are directly related to investment in technology upgrade, "Ahrodar LTD" LLC has no obstacles for further exploitation of land at the previous level. Therefore, the identified obstacles cannot prevent the introduction of at least one alternative scenario - "business as usual."

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

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

The project boundary encompasses farmlands (fields) where "Ahrodar LTD" LLC grows crop products using No-till technology (7543, 5163 ha).

Table 11. Emission sources under the baseline scenario

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

Table 12. Emission sources under the project scenario

Source	Gas	Included / excluded	Substantiation / Explanation
Project activity			
GHG emissions due to No-till technology	CO_2	Excluded	Emissions due to No-till technology are absent.
	CH_4	Excluded	CH_4 emissions as a result of the project technology implementation are absent.
	N_2O	Excluded	N_2O emissions when project technology is applied are lower than when traditional tillage is applied. Excluded for simplification. This is a conservative practice.

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

Date of baseline setting: 23/04/2011
The baseline is identified by CEP Carbon Emissions Partners S.A., EVO CARBON TRADING SERVICES LTD and "Ahrodar LTD" LLC.

"Ahrodar LTD" LLC
Kirovohrad region, Ukraine
2A, Myru Str., Berezivka village,
Volodymyr Ivanovych Miroshnichenko, Director
Phone: +38 (05235) 6-21-85
Fax: +38 (05235) 6-21-85
"Ahrodar LTD" LLC is a project participant (stated in Annex 1).

EVO CARBON TRADING SERVICES LTD
869 High Road, London, UK, N12 8QA.
Telephone: +447500828771
E-mail: negorova@evocarbontrading.co.uk
EVO CARBON TRADING SERVICES LTD is a project participant (stated in Annex 1).

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

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

The starting date of the project was identified using the "Glossary of Joint Implementation Terms" version 03[31] and is considered 29/08/2005, when "Ahrodar LTD" LLC starts purchase equipment necessary for No-till.

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[32] Version 01.1.0, the accumulation of soil organic carbon in the project scenario will be increasing for 20 years at a constant rate.
Lifetime of the project is – 01/01/2006 to 31/12/2025 (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: 01/01/2006- 31/12/2012 (7 years, or 84 months), upon prolongation of the Kyoto Protocol: 01/01/2013- 30/12/2025 (13 years, or 156 months).
The starting date of the crediting period is the date when the first emission reductions are expected to be generated, namely January 01, 2006.
ERU generation belongs to the first commitment period of 5 years (January 01, 2008 – December 31, 2012).
The end date of the crediting period is the end date of the commitment period according to the Emission Reductions Purchase Agreement under which the project owner shall transfer to the buyer verified greenhouse gases emission reductions resulting from the project, which is January 01, 2013 to December 31, 2025.
Prolongation of the crediting period beyond 2012 is subject to approval by the Host Party.

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

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

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

The proposed project applies a JI-specific approach based on the JI Guidance on criteria for baseline setting and monitoring, Version 03[33] , which meets with the requirements of Decision 9/CMP.1, Appendix B of the "Criteria for baseline setting and monitoring".
The monitoring plan for this project was developed based on the monitoring of soil organic carbon content using traditional tillage technology and No-till technology.
The key variables that are subject to monitoring are the content of humus (organic carbon) in the soil cultivated using No-till technology and area cultivated by No-till technology.

Humus (organic carbon) content of the soil cultivated using No-till technology are measured annually after the September harvesting by the Research Laboratory, which is subject to certification in accordance with the state standards of Ukraine. The method is based on the oxidation of organic matter by potassium dichromate with further estimation of its amount used in the process of oxidation. The amount of dichromate used in oxidation is equivalent to the amount of organic carbon in the sample. The output organic carbon content is converted into humus content by multiplying the obtained value by the constant coefficient of 1.724 (according to GOST 23740-79*[34]) in order to fight the crisis in the industry. Thus, the obtained values of humus content in the soil can be converted back into the content of organic carbon knowing the constant coefficient on which humus content should be divided. The mass of samples may vary from 3 to 5 grams. The number of samples depends on the field area. A sample is taken from the grinded soil for further blenderizing preceded with removal of nutrients and plant residues. The sample is sieved through a wicker mesh (0.25 mm). Then the sample is blenderized in pounders and blenders from solid materials. No significant fluctuations of soil characteristics are expected, therefore this measurement periodicity is appropriate.
Soil density in project fields is measured by the Research Laboratory prior to the project for each field individually since no major fluctuations of the parameter are expected. Research Laboratory engineers measure soil density using standard bottle method.
The Center conducts measurement of humus (organic carbon) content in accordance with state standards of Ukraine 4289:2004 "Soil quality. Methods for determining organic matter" by using the Tyurin method.

Field areas are measured by agrotechnicians and verified by accountants of "Ahrodar LTD" LLC using GPS equipment installed in Challenger agricultural machinery John Deere, Case and Belarus.

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

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

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

$k_{b,i,y}$	humus content in the soil of field "*i*" cultivated using traditional tillage in period "*y*", %
ρ_i	soil density at field "*i*" cultivated using traditional tillage before the start of the project, t/m^3
$h_{b,i}$	depth of soil layer disturbance at field "*i*" cultivated using traditional tillage, m

Data and parameters that are monitored throughout the crediting period:

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

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

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

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

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

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

Greenhouse gas emission under the Project scenario: none.

$PE_y = 0$ (1)

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

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

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

Data / Parameter	$k_{p,i,y}$
Data unit	%
Description	Humus content in the soil of field "*i*" cultivated using No-till technology in period "*y*"
Time of determination/monitoring	Annualy
Source of data (to be) used	Measurement logs of soil quality indicators

Value of data applied (for ex ante calculations/determinations)	See Supporting Document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The Research Laboratory determines the value of humus content in soil according to the State Standard of Ukraine 4289:2004 and fills in field passports with these data
QA/QC procedures (to be) applied	The Research Laboratory
Any comment	Data will be archived in paper and electronic format.

Data / Parameter	$k_{b,i,y}$
Data unit	%
Description	Humus content in the soil of field "*i*" cultivated using traditional tillage in period "*y*"
Time of determination/monitoring	Calculated using data defined for every field *i* prior to the start of the project
Source of data (to be) used	Measurement logs of soil quality indicators
Value of data applied (for ex ante calculations/determinations)	See Supporting Document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The content of humus in the soil for the baseline scenario is calculated, taking into account its linear decrease over time, under the condition of the use of conventional mechanical tillage that involves ploughing. This linear dependence is based on the historical data using the least square method.
QA/QC procedures (to be) applied	Historical data for the 5 years prior to the start of the project (provided in Supporting Document 1) are obtained from the Research Laboratory authorized to conduct measurements according to the state standards of Ukraine.
Any comment	Data will be archived in paper and electronic format.

Data / Parameter	ρ_i

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

Data / Parameter	$h_{b,i}$
Data unit	m
Description	Depth of soil layer disturbance at field *i* when conventional tillage is applied
Time of determination/monitoring	Determined at the beginning of the project activity
Source of data (to be) used	Company data; ploughing depth is a fixed value (for each crops) for traditional land cultivation.
Value of data applied (for ex ante calculations/determinations)	See Supporting Document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This is the usual depth of soil layer disturbance when conventional tillage is applied[35]

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

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

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

Greenhouse gas emissions under the Baseline scenario:

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

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

Where:
BE_y – baseline GHG emissions in period "*y*", tCO_2eq;
$BE_{A,y}$ – baseline GHG emissions due to baseline land cultivation technology, in period "*y*", tCO_2eq;
[y] - index for monitoring period;
[A] – index for baseline land cultivation technology.

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

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

Where:
$BE_{A,y}$ – baseline GHG emissions due to baseline land cultivation technology, in period "*y*", tCO_2eq;
$BE_{A,i,y}$ – baseline GHG emissions due to baseline land cultivation technology, in period "*y*", tCO_2eq;
[y] - index for monitoring period;
[A] – index for baseline land cultivation technology;
[i] - index for number of fields.

Baseline GHG emissions due to baseline land cultivation technology, which involves tillage, for field "*i*" are calculated using the formula, according to the "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities" (Version 01.1.0)[36]:

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

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

Where:
$BE_{A,i,y}$ – baseline GHG emissions due to baseline land cultivation technology, in period "*y*", tCO_2eq;
$S_{p,i}$ –area of field *i* cultivated using No-till technology, ha;
$SOC_{p,y,i}$ – soil organic carbon content in the soil of field "*i*" cultivated using No-till technology in period "*y*", t C/ha;
$SOC_{b,y,i}$ – soil organic carbon content in the soil of field "*i*" cultivated using traditional tillage technology in period "*y*", t C/ha;
44/12 – CO_2 to C molecular masses ratio;
0.9 – factor that takes account of 10% of emissions from the project activity, which includes creation of anti-fire furrows and minimal topsoil disturbance when No-till technology is implemented;
[y] - index for monitoring period;
[b] - index for baseline technology;
[p] - index for project technology;
[A] – index for baseline land cultivation technology;
[i] - index for number of fields.

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

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

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*[37])
10000 – m^2 to ha conversion coefficient;
[y] - index for monitoring period;
[b] - index for baseline technology;
[p] - index for project technology;
[i] - index for number of fields.

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

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

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

Where:
$SOC_{b,y,i}$ – soil organic carbon content in the soil of field "*i*" cultivated using traditional tillage technology in period "*y*", t C/ha;
$h_{b,i}$ – depth of soil disturbance in field "*i*" cultivated using traditional tillage, m;
ρ_i – pre-project soil density in field "*i*", cultivated using traditional tillage before the starting of project, t/m^3;
$k_{b,i,y}$ – humus content in the soil of field "*i*" cultivated using traditional tillage technology, %;
1,724 – organic carbon to humus conversion coefficient (according to GOST 23740*[38])
10000 – m^2 to ha conversion coefficient;
[b] - index for baseline technology;
[y] - index for monitoring period;
[i] - index for number of fields.

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

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

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*" cultivated using traditional tillage in period "*y*", %;
a – coefficient of linear dependence;
b - coefficient of linear dependence;
y – monitoring period;
[b] - index for baseline technology;
[i] - index for number of fields;
[y] - index for monitoring period.

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

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

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

Option 1 was chosen for monitoring.

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

Option 1 was chosen for monitoring.

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

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

No leakage is expected.

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

No leakage is expected.

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

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

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

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

Supporting Document 1 contains a calculation of baseline emissions and project emissions as well as emission reductions for each year of the reporting period.

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

Law of Ukraine "On environmental protection"[39] and the State Building Norms A.2.2-1-2003, "Structure and content of environmental impact assessment (EIA) in the process of design and construction of plants, buildings and structures"[40] “Ahrodar LTD” LLC is not obliged to carry out collection of data on the environmental impact for this type of project.

D.2. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:		
Data *(Indicate table and ID number)*	Uncertainty level of data (high/medium/low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
$S_{p,i}$	low	Measurements of parameter are conducted in accordance with the standards of Ukraine

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

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

$k_{p,i,y}$	low	The Research Laboratory

For the sake of conservativeness of parameters, metering equipment is subject to regular calibration and the latest versions of regulations and specifications are used. If the latest versions are unavailable, the previous versions are used.

Verification (calibration) of measurement devices is carried out in accordance with manufacturer's manuals, approved methodologies on metering devices verification/calibration, as well as with the state standards of Ukraine.

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

To implement the project the operational structure was created; it includes "Ahrodar LTD" LLC agrotechnicians (responsible for accounting of area treated with No-till technology),), the Research Laboratory (responsible for provision of agrochemical data for project monitoring), "Ahrodar LTD" LLC chief agrotechnician (recording and reporting data in the table), and "Ahrodar LTD" LLC manager (data processing and archiving). The data subject to monitoring and required for the determination and further verification will be archived and stored in paper and electronic form at "Ahrodar LTD" LLC for two years after the transfer of emission reduction units generated by the project.

Management structure includes the Director of "Ahrodar LTD" LLC and developers of the project CEP Carbon Emissions Partners S.A. and EVO CARBON TRADING SERVICES LTD.

Detailed operational structure and data collection scheme for the project activity are provided in Figure 5.

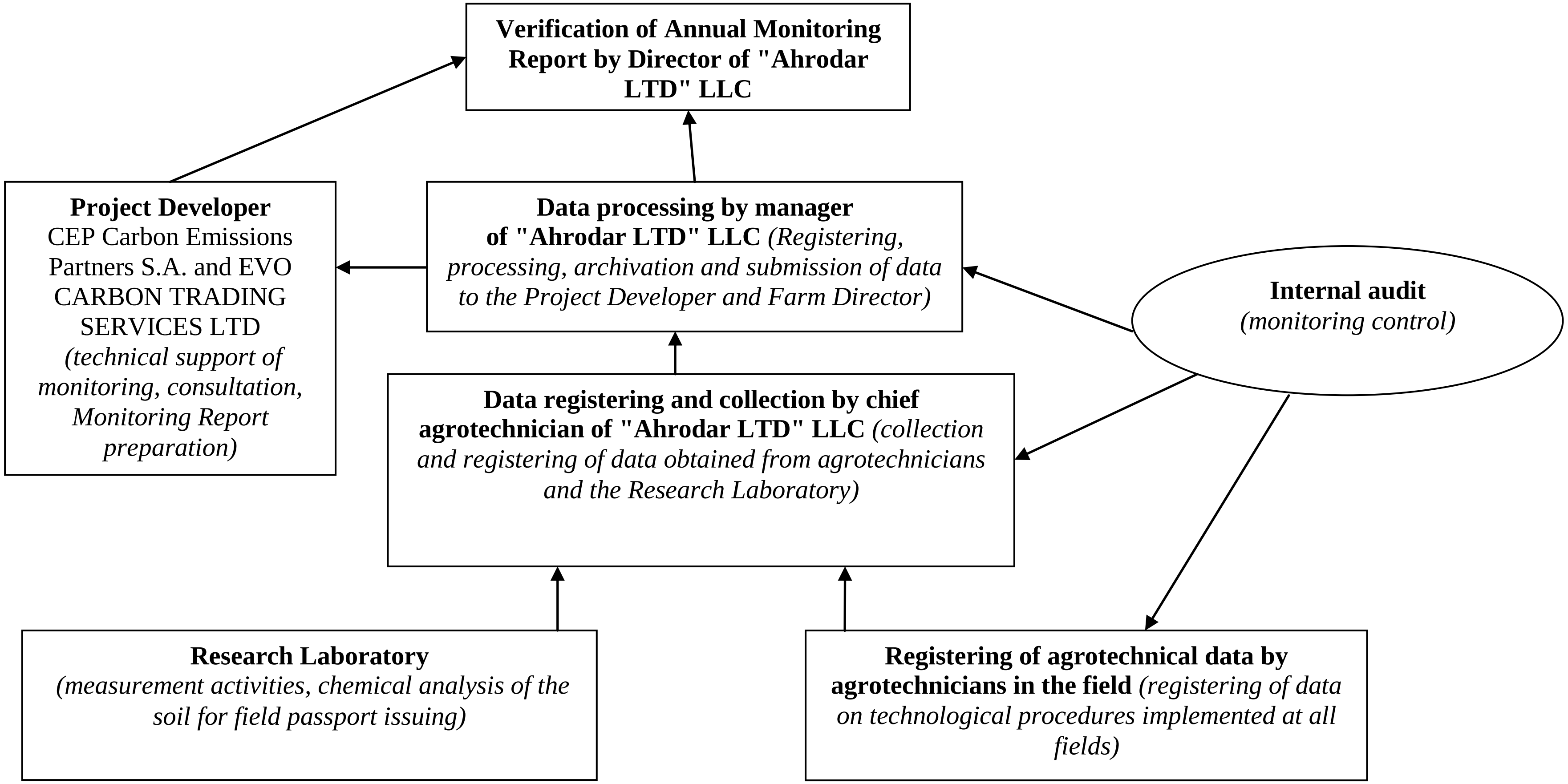

Figure 5. Operational structure and data collection scheme for the project monitoring

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

Monitoring plan is set by "Ahrodar LTD" LLC, CEP Carbon Emissions Partners S.A. and EVO CARBON TRADING SERVICES LTD:

"Ahrodar LTD" LLC
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Kirovohrad region, Ukraine
Volodymyr Ivanovych Miroshnichenko, Director
Phone: +38 (05235) 6-21-85
Fax: +38 (05235) 6-21-85
"Ahrodar LTD" LLC is a project participant (stated in Annex 1).

EVO CARBON TRADING SERVICES LTD
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Telephone: +447500828771
E-mail: negorova@evocarbontrading.co.uk
EVO CARBON TRADING SERVICES LTD is a project participant (stated in Annex 1).

CEP Carbon Emissions Partners S.A.
52 Route de Thonon, Geneva, Casepostale 170 CH-1222 Vésenaz, Switzerland
Fabian Knodel
Phone: +41763461157
Fax: +41763461157
E-mail: 0709bp@gmail.com
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 sum of E.1 and E.2 equals E.1.

E.4. Estimated baseline emissions:

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

Table 13. Estimated baseline emissions

Year	Estimated baseline emissions (t CO_2 equivalent)
2006	19 592
2007	41 675
Total 2006 – 2007	**61 267**
2008	58 508
2009	81 110
2010	101 957
2011	121 709
2012	145 724
Total 2008 – 2012	**509 008**
2013	145 724
2014	145 724
2015	145 724
2016	145 724
2017	145 724
2018	145 724
2019	145 724
2020	145 724
2021	145 724
2022	145 724
2023	145 724

2024	145 724
2025	145 724
Total 2013 – 2025	**1 894 412**
Total (tonnes CO_2 equivalent)	**2 433 773**

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

Estimated annual GHG emission reduction in the project is calculated by the formula:

Estimated reduction = Estimated Baseline Emissions - (Estimated project emissions + Estimated leakage)

All results of estimation of emission reductions under the project are listed in Table 14 below.

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

Table 14. Table containing results of estimation of emission reductions for the period of January 1, 2007 – December 31, 2007

Year	Estimated project emissions (tonnes CO_2 equivalent)	Estimated leaks (tonnes CO_2 equivalent)	Estimated baseline emissions (tonnes CO_2 equivalent)	Estimated emission reduction (tonnes CO_2 equivalent)
2006	0	0	19 592	19 592
2007	0	0	41 675	41 675
Total 2006 – 2007	**0**	**0**	**61 267**	**61 267**
2008	0	0	58 508	58 508
2009	0	0	81 110	81 110
2010	0	0	101 957	101 957
2011	0	0	121 709	121 709
2012	0	0	145 724	145 724
Total 2008 – 2012	**0**	**0**	**509 008**	**509 008**
2013	0	0	145 724	145 724
2014	0	0	145 724	145 724
2015	0	0	145 724	145 724
2016	0	0	145 724	145 724
2017	0	0	145 724	145 724
2018	0	0	145 724	145 724
2019	0	0	145 724	145 724
2020	0	0	145 724	145 724
2021	0	0	145 724	145 724
2022	0	0	145 724	145 724
2023	0	0	145 724	145 724
2024	0	0	145 724	145 724
2025	0	0	145 724	145 724
Total 2013 – 2025	**0**	**0**	**1 894 412**	**1 894 412**
Total (tonnes CO_2 equivalent)	**0**	**0**	**2 464 687a**	**2 464 687**

SECTION F. Environmental impacts

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

According to Law of Ukraine "On environmental protection"[41] and the State Building Norms A.2.2-1-2003, "Structure and content of environmental impact assessment (EIA) in the process of design and construction of plants, buildings and structures"[42] “Ahrodar LTD” LLC is not obliged to carry out EIA for this type of project.

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

Transboundary impacts from the project activity, according to their definition in the text of "Convention on long-range transboundary pollution"[43] 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.

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

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

[43] http://zakon3.rada.gov.ua/laws/show/995_223

SECTION G. Stakeholders' comments

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

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

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

Owner of the project

Organisation:	"Ahrodar LTD" LLC
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Personal e-mail:	hannu@online.ee

Annex 2

BASELINE INFORMATION

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

Data / Parameter	$S_{p,i}$
Data unit	ha
Description	Area of field "*i*" cultivated using No-till technology
Source of data (to be) used	2006-2012 Field Registry of the Farm
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Data from the Land Inventory are applied. If the area of the field cultivated in the corresponding year changes, the actual area is measured using GPS equipment.

Data / Parameter	$k_{p,i,y}$
Data unit	%
Description	Humus content in the soil of field "*i*" cultivated using No-till technology in period "*y*"
Source of data (to be) used	Measurement logs of soil quality indicators
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The Research Laboratory determines the value of humus content in soil according to the State Standard of Ukraine 4289:2004 and fills in field passports with these data

Data / Parameter	$k_{b,i,y}$
Data unit	%
Description	Humus content in the soil of field "*i*" cultivated using traditional tillage technology in period "*y*"
Source of data (to be) used	Measurement logs of soil quality indicators
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The content of humus in the soil for the baseline scenario is calculated, taking into account its linear decrease over time, under the condition of the use of conventional mechanical tillage that involves ploughing. This linear dependence is based on the historical data using the least square method.

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

Data / Parameter	$h_{b,i}$
Data unit	m

Description	Depth of soil layer disturbance at field "*i*" when conventional tillage is applied
Source of data (to be) used	Company data; ploughing depth is a fixed value (for each crops) for traditional land cultivation.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This is the usual depth of soil layer disturbance when conventional tillage is applied[44]

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

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

Annex 3

MONITORING PLAN

The proposed project applies a JI-specific approach based on the JI Guidance on criteria for baseline setting and monitoring, Version 03[45] , which meets with the requirements of Decision 9/CMP.1, Appendix B of the "Criteria for baseline setting and monitoring".
The monitoring plan for this project was developed based on the monitoring of soil organic carbon content using traditional tillage technology and No-till technology.
The key variables that are subject to monitoring are the content of humus (organic carbon) in the soil cultivated using No-till technology and area cultivated by No-till technology.
Humus (organic carbon) content of the soil cultivated using No-till technology are measured annually after the September harvesting by the Research Laboratory, which is subject to certification in accordance with the state standards of Ukraine. The method is based on the oxidation of organic matter by potassium dichromate with further estimation of its amount used in the process of oxidation. The amount of dichromate used in oxidation is equivalent to the amount of organic carbon in the sample. The output organic carbon content is converted into humus content by multiplying the obtained value by the constant coefficient of 1.724 (according to GOST 23740-79*[46]) in order to fight the crisis in the industry. Thus, the obtained values of humus content in the soil can be converted back into the content of organic carbon knowing the constant coefficient on which humus content should be divided. The mass of samples may vary from 3 to 5 grams. The number of samples depends on the field area. A sample is taken from the grinded soil for further blenderizing preceded with removal of nutrients and plant residues. The sample is sieved through a wicker mesh (0.25 mm). Then the sample is blenderized in pounders and blenders from solid materials. No significant fluctuations of soil characteristics are expected, therefore this measurement periodicity is appropriate.
Soil density in project fields is measured by the Research Laboratory prior to the project for each field individually since no major fluctuations of the parameter are expected. The Research Laboratory engineers measure soil density using standard bottle method.
The Center conducts measurement of humus (organic carbon) content in accordance with state standards of Ukraine 4289:2004 "Soil quality. Methods for determining organic matter" by using the Tyurin method.
Field areas are measured by agrotechnicians and verified by accountants of "Ahrodar LTD" LLC using GPS equipment installed in agricultural machinery John Deere, Case and Belarus.

Monitoring data and parameters:

Data / Parameter	$S_{p,i}$
Data unit	ha
Description	Area of field "*i*" cultivated using No-till technology
Time of determination/monitoring	Annually
Source of data (to be) used	2006-2012 Field Registry of the Farm
Value of data applied (for ex ante calculations/determinations)	See Supporting Document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Data from the Land Inventory are applied. If the area of the field cultivated in the corresponding year changes, the actual area is measured using GPS equipment.
QA/QC procedures (to be) applied	The Main Administration of the State Land Committee in Kirovohrad region conducts relevant area verification once a year

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

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

Comments	Data will be archived in paper and electronic format.

Data / Parameter	$k_{p,i,y}$
Data unit	%
Description	Humus content in the soil of field "*i*" cultivated using No-till technology in period "*y*"
Time of determination/monitoring	Annualy
Source of data (to be) used	Measurement logs of soil quality indicators
Value of data applied (for ex ante calculations/determinations)	See Supporting Document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The Research Laboratory determines the value of humus content in soil according to the State Standard of Ukraine 4289:2004 and fills in field passports with these data
QA/QC procedures (to be) applied	The Research Laboratory
Comments	Data will be archived in paper and electronic format.

Annex 4

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

- *Drill equipment*

John Deere 1890 direct seeding drill.
Drill for direct seeding of grain in the ground and parallel fertilization.
Brief specifications listed below and also available on the website of equipment manufacturers[47].

Figure 1. John Deere 1890 Seeding Drill

Coulters for direct seeding on John Deere 1890 drill which designed to operate in any soil conditions. Single disc coulter is only effective on fields with a large number of plant residues.

Table 1. John Deere 1890 Drill complex Specifiations

Specifications		
Working width	12,8 m	
Type bunker	Grain	Grain / Fertilizer
Capacity Hopper, l	8x109	430
Speed drills, ha/h	14	
Row spacing	50,8 sm	

KINZE 3700 Precision seeder.
Precision seeder for direct sowing of grain into the soil with seeding control.
Brief specifications listed below and also available on the website of equipment manufacturers[48].

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

48 http://www.kinze.com/

Fig. 2 KINZE 3700 Precision seeder

Table 2. KINZE 3700 Precision seeder Specifications

Specifications	
Working width	3, 96 m
Type bunker	Grain
Capacity Hopper, l	58 sm
Row spacing, sm	70
Seeding control	
Hydraulics	4 hydrocylinders (2 work and 2 reserve)

- *Techniques for spraying plants with herbicides*

The project provides for the use of modern self-propelled sprayers MAP II 3250 (Fig. 3) is intended for application of plant protection products on large areas of crops, industrial crops. Specifications of self-propelled sprayer MAP II 3250 provided below and on the website seller equipment[49].

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

Figure 3. MAP II 3250 Self-propelled sprayer

Table 3. MAP II 3250 Self-propelled sprayer Specifications

Specifications	
Volume of tank	3250 l
Width	3,3 m
Engine	DEUTZ – BFL 913 – turbo 140 h.p.
Length of hose	30 m
Computer	Bravo 300 S
Fuel tank	250 l

- Power units

Tractors John Deere 8430 and Case 8940 (Fig. 4) Brief description and specifications listed below, as well as on the website of equipment manufacturer.[50][51]

Figure 4. John Deere 8430 and Case 8940 Tractors

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

[51] http://www.caseih.com/distributor_en/Pages/home.aspx

Table 4. John Deere and Case Specifications

Model	Type of engine	Rated power hp	Maximum power hp
John Deere 8430	John Deere PowerTech Plus, 9,0 l	295	-
Case 8940	6- cylinder turbocharged, 8,3 l	255	-

These tractors are designed to perform manufacturing operations in crop, feed production and transport operations. The big mass and extended wheelbase tractors in this series provide not only longitudinal stability, but also increases the traction-grip performance when working with tillage machines.

Belarus Tractor – 1025.

Brief description and specifications listed below, as well as on the website of seller equipment.[52]

Fig. 5 Belarus – 1025 Tractor

Table 5. Belarus – 1025 Tractor Specifications

Model	Engine type	Rated power h.p.	Maximum power h.p.
Belarus – 1025	Diesel engine turbine with gas turbine supercharged D-245	105	-

[52] http://www.belarus-tractor.com/